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ORIGINAL RESEARCH

ACCP Frontiers Career Development Award

1. Evaluation of a Novel Charcoal Cookie Formulation for Drug Adsorption.

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Background: Activated charcoal is most effective within 1 hour of toxin ingestion, but its use in the home and prehospital setting is limited by the slurry's poor palatability.

Objectives: To determine the relative effect of a new charcoal cookie formulation on the absorption of orally administered cimetidine compared with a standard aqueous charcoal product; to compare the relative palatability of the two products.

Methods: This study was a prospective, open-label, three-way crossover trial in eight healthy volunteers (aged 18–35 years). After an overnight fast, subjects ingested cimetidine 800-mg tablet. Fifteen minutes after the cimetidine dose, subjects ingested water, three charcoal cookies (equivalent to 7.2 g of charcoal), or 7.2 g of aqueous activated charcoal suspension. Venous blood samples were obtained over an 8-hour period for noncompartmental pharmacokinetic analysis including area under the curve (AUC) and maximum concentration (C_{max}). K: Subjects evaluated the palatability of each product using visual analog scales (VASs).

Results: Both charcoal products effectively adsorbed cimetidine resulting in decreased absorption of most of the cimetidine dose. There was no difference in median percent decrease in cimetidine AUC (mg*hour/L) for the charcoal suspension and charcoal cookie (91.8% vs. 82.1%; p=0.505). There was no difference in the median percent decrease in C_{max} (mg/L) for the charcoal suspension and charcoal cookie (82.6% vs. 64.0%) (p=0.574). Based on the VASs, subjects rated the cookie significantly more palatable than the suspension (p=0.001). All products were well tolerated, and no adverse events were reported.

Conclusions: A new charcoal cookie formulation is as effective as the aqueous charcoal suspension at reducing absorption of cimetidine. The charcoal cookie is more palatable than the aqueous charcoal suspension.

Adult Medicine

2. Evaluation of Hydration Status of Patients with Hyperglycemia.

Kurt A. Wargo, Pharm.D., BCPS,[1] Thomas M. English, Ph.D.,[2] Vishal Mandge, M.D.,[3] Mobin Shah, M.D.,[4] Robert Centor, M.D.[3]; (1) Auburn University Harrison School of Pharmacy, Huntsville, AL; (2) University of Alabama School of Medicine, Huntsville Regional Medical Campus, Huntsville, AL; (3) University of Alabama-Birmingham School of Medicine, Huntsville Regional Medical Campus, Huntsville, AL; (4) York Hospital, York, PA

Objective: The goal of this study was to compare common equations used to calculate osmolality to actual measured serum osmolality in patients hospitalized with hyperglycemia, to evaluate their level of dehydration.

Methods: In this cross-sectional study, data was collected from adult patients who presented with serum glucose levels greater than 200 mg/dL. Serum osmolality was measured directly and compared to osmolality estimates using the Dorwart and Chalmers equation and the Rasouli and Kalantari equation. Sodium correction factors for hyperglycemia of 1.6 and 2.4 were also utilized for each equation, yielding six equations in total. Patients with measured serum osmolality of 295 mOsm/L or greater were included in the analysis. Regression analysis was performed to determine the best equation to predict hydration status of patients with hyperglycemia.

Results: A total of 195 consecutive hospitalized adult hyperglycemic patients admitted to our institution were evaluated for inclusion in the study. Twelve of 195 hyperglycemic patients had normal hydration (serum osmolality 280–294 mOsm/L); thus, they were excluded from the analysis. Among the equations used, the Rasouli and Kalantari equation using a sodium correction factor of 2.4 was the most accurate predictor of dehydration, correctly identifying 94% of those patients.

Conclusions: The two commonly used equations to estimate osmolality consistently underestimated the actual measured osmolality level of patients with hyperglycemia. The Rasouli and Kalantari equation using a sodium correction factor of 2.4 was the most accurate equation for predicting measured osmolality; however, it still tended to underestimate osmolality. To determine the hydration status of patients with hyperglycemia rapidly and improve their outcomes, we recommend direct measurement of osmolality.

3. Impact of CIWA Implementation in Medically Ill Patients.

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Objectives: Current American Society for Addiction Medicine guidelines recognize the revised clinical institute for withdrawal assessment (CIWA) scale as the optimal tool to manage inpatient alcohol withdrawal syndrome (AWS). Until recently, our institution had not adopted a uniform symptom-based algorithm for the treatment of AWS. The purpose of this study is to evaluate the implementation of a CIWA protocol for the management of AWS in medically ill patients, specifically its effect on medication administration and patient safety.

Methods: We conducted an observational, retrospective cohort study of AWS therapy before and after the availability of the CIWA protocol on two medical wards at an urban, academic medical center. The control arm consisted of patients treated with the standard of care from October 2007 through May 2008. The cohort group consisted of patients treated using the CIWA protocol from October 2008 through May 2009. The primary outcome measure was duration benzodiazepine (BZD) therapy. Secondary outcomes include mean BZD administered and length of stay. Patient safety measures including seizure, delirium tremens, and ICU transfer were also captured.

Results: The two groups were similar at baseline, with the exception of more whites seen in the cohort group (62.5%) than in the control group (35.3%), p<0.001. Patients in the cohort arm (n=54) had a mean duration of therapy of 40.7 hours compared with 85.1 hours seen in the control arm (n=41), p<0.001. Mean BZD administered was 31.3 mg in the cohort arm and 42 mg in the control arm (p=0.02). Length of stay was 4.2 days and 6.4 days in the cohort and control arms respectively (p=0.05). Patient safety measures were similar between the two groups.

Conclusions: Use of the CIWA protocol significantly decreased duration of benzodiazepine therapy in medically ill patients, while maintaining patient safety and showing a trend toward affecting the duration of hospital stay.

4. Incidence, Diagnoses, Medication Use, and Outcomes of Patients with Class III (morbid) Obesity at a Single Academic Medical Center.

Eli N. Deal, Pharm.D., James M. Hollands, Pharm.D., Scott T. Micek, Pharm.D.; Barnes-Jewish Hospital, St. Louis, MO

Objectives: Despite the recognition of the epidemic of obesity in the United States, few reports exist regarding medication use among individuals with Class III obesity. The goal of this project was to describe the incidence, affiliated diagnoses, medication use, and discharge status of hospitalized patients with Class III obesity.

Methods: Patients at a single academic center with BMI greater than 40 kg/m^2 from 2002 to 2007 were retrospectively evaluated.

Results: 9508 patients were identified with a mean weight of 133.8 kg (SD 31.8). The absolute number of patients with Class III obesity increased during the study period from 1272 admissions/year to 1768.

There was a linear increase in total number of patients from 2.5 per 100 admissions to 3.32 per 100 admissions (slope 0.14, $R^2 = 0.84$, $p<0.05$). Similar trends were noted in the non-surgical (2.94 per 100 admissions to 3.79 per 100 admissions; slope 0.15, $R^2 = 0.87$, $p<0.05$) and surgical populations (1.4 per 100 admissions to 2.3 per 100 admissions; slope 0.16, $R^2 = 0.82$, $p<0.05$). More patients with Class III obesity were admitted to non-surgical services (81%), but the trend in increases in either the non-surgical and surgical populations were not significantly different than the total population (p=0.74 and 0.51, respectively). Only the non-surgical populations experienced increases in mortality (3.4%–6.3%, p<0.05). Heart failure (25% of all patients), diabetes (29%), and hypertension (48%) were the most frequently identified diagnoses. Medications with the most frequent use were as follows: aspirin (58% of patients), insulin (54%), furosemide (48%), lansoprazole-esomeprazole (48%), heparin (45%), potassium chloride (42%), metoprolol (37%), enoxaparin (29%), lisinopril (25%), vancomycin (24%), ciprofloxacin (21%), famotidine (19%), warfarin (18%), morphine (18%), magnesium (17%), and prednisone (14%).
Conclusion: The number of patients with class III obesity requiring hospital care increased over 6 years. The identification of the most common disease states and medications used in this patient population is a guide for future studies.

Ambulatory Care

5. Factors Associated with Medication Record Discrepancies in an Ambulatory Care Setting.
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Objective: Medication reconciliation is recognized as a critical patient safety initiative in all practice settings. Studies suggest that physician and patient characteristics may affect the presence of discrepancies in the medication record. This study seeks to identify patient characteristics associated with the presence of discrepancies between patient-reported medications and medications listed in the medical chart as identified during pharmacist medication reconciliation.
Methods: An observational case-series design was utilized. Participants were recruited from a primary care clinic. Patient interviews were conducted on-site by pharmacists or pharmacy students. Variables collected were demographics, adherence, medication name, dose, regimen, and indication. Medications were compared with data collected from the charted medication list to identify discrepancies.
Results: Ninety-seven patients were included, with the mean age of 47.9 ± 10.6 and 60% women. Chi-square test identified relationships between patient variables and the presence of medication discrepancies. Patient variables included age, gender, ethnicity, number of medications, adherence, and knowledge. African American race, age younger than 40 years, and three or more medications were each associated with the presence of at least one discrepancy ($p<0.05$). No association for medication discrepancy and adherence (using Morisky scale) or gender was identified. Recall of the medication name, dose, regimen, or indication for more than 80% of medications had fewer discrepancies ($p<0.05$). Knowledge of medication indication was most notable among these.
Conclusions: Several patient-related factors may be associated with the presence of discrepancies between charted medications and patient-reported medications. Knowledge of these variables may be useful in identifying patients at greatest risk of discrepancies and interventions to prevent and resolve them. Further research is required to identify how these variables contribute to the presence of discrepancies.

6. Seasonal Variation in International Normalized Ratio Impacts Clinical Management: The Rise and Fall of Anticoagulation.
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Objectives: European studies reported seasonal variation in international normalized ratio (INR); lowest values in summer and highest in autumn. Such fluctuations could have consequences for anticoagulation management; however, these have yet to be examined. Therefore, we sought to determine if seasonal variation occurred in American patients and if this resulted in different anticoagulation management requirements.
Methods: Our retrospective chart-review examined 31 patients (INR target 2–3) enrolled in a pharmacist-managed anticoagulation clinic. Previous studies found renal dysfunction was associated with INR fluctuation; therefore, to maximize detection of potentially subtle changes, we only included patients with estimated glomerular filtration rates greater than 60 mL/minute/1.73m^2. For each clinic visit, we recorded INR and season; winter – December-February; spring – March-May; summer – June-August; autumn – September-November. To evaluate INR variation, we determined; (1) average seasonal values, (2) percentage of values more than 3.0, and (3) percentage of clinic visits requiring warfarin dose changes.
Results: We collected 1434 INRs in a cohort of predominantly male (65%) and African American (84%) patients; mean age 57 years and average follow-up time 924 days. Mean INRs were highest in autumn (2.68 ± 0.04) and winter (2.64 ± 0.04) and lowest in spring (2.54 ± 0.04) and summer (2.54 ± 0.03); $P<0.05$ for autumn versus spring and summer. In autumn, 26% of visits had INRs greater than 3.0; higher than the other seasons (winter=12%, spring=15%, summer=17%; $P<0.04$). In addition, more autumn clinic visits required dose changes (18%) than other seasons (all = 12%; $P<0.04$).
Conclusions: We confirmed the occurrence and seasonal pattern of INR variation. Moreover, we extended prior European studies and not only report INR variation in American patients, but also that above target-range INRs occurred most frequently in the autumn, subsequently leading to more required dose changes. Although the mechanism remains unknown, our findings indicate that anticoagulation management could be modified to consider seasonal variation and thereby reduce its impact on clinic workload.

7. Healthy Outcome Partnership for Employees with diabetes (HOPE) Program: Evaluation of an Employer-Sponsored Diabetes Management Program.
Virginia G. Williams, Pharm.D., Dave L. Dixon, Pharm.D., Debra J. Barnette, Pharm.D., James R. Beardsley, Pharm.D.; Wake Forest University Baptist Medical Center, Winston Salem, NC
Objectives: This study assessed the effectiveness of an employer-sponsored diabetes management program on diabetes-related clinical end points.
Methods: In February 2008, the HOPE program was implemented as a voluntary benefit for employees of Wake Forest University Baptist Medical Center, a self-insured employer. Participants met with hospital-employed clinical pharmacists for medication review and healthy lifestyle counseling. Pharmacists' recommendations were reviewed and approved by the patient's primary diabetes-provider before implementation. The first year's retrospective data was collected for all participants 18 years and older; clinical endpoints were analyzed for participants with baseline and follow-up data. The primary outcome was mean change in glycosylated hemoglobin from baseline to study end. Secondary outcomes included mean change in low-density lipoprotein cholesterol (LDL-C), blood pressure (BP), and body mass index (BMI).
Results: Of the 212 participants enrolled during the program's first year, 196 (mean age, 51 ± 9.1 years; 67% women, 66% white) met inclusion criteria. The mean time enrolled in the program was 6.5 ± 3.3 months. The mean hemoglobin A_{1c} decreased from 8.1% to 7.2% ($p<0.0001$). In a subanalysis of 98 participants with baseline hemoglobin A_{1c} greater than 7%, 32 of these participants (33%) reached goal hemoglobin $A_{1c\ of}$ 7% or less and achieved a mean reduction from 9.1% to 7.7% ($p<0.0001$) at study end. Mean LDL-C declined from 104.9 mg/dL to 97.5 mg/dL ($p<0.03$). Mean BP was reduced from 132/79 mm Hg to 129/75 mm Hg (systolic BP, p=0.01; diastolic BP, p=0.0001). Mean BMI change was not statistically significant.
Conclusion: Our data show that employees participating in the HOPE Program, a pharmacist-directed diabetes management program, had improvements in hemoglobin A_{1c}, LDL-C, and BP. This 1-year analysis supports the program's benefits in improving disease-oriented outcomes.

Cardiovascular

8. Relationship Between Clopidogrel and Cigarette Smoking Status in Patients with Acute Coronary Syndromes Without ST-segment Elevation Myocardial Infarction.

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Objectives: Recent evidence suggests that smoking status may have a clinically significant effect on the observed clopidogrel clinical event (CE) reduction in patients with ST-segment elevation myocardial infarction (STEMI). Smoking induces cytochrome P450-1A2, which helps convert the pro-drug clopidogrel into its active form. The current study assessed the reported relationship between cigarette smoking status and CE reduction in clopidogrel-treated ACS patients with non-STEMI (NSTEMI).

Methods: Evaluation of completed clopidogrel clinical studies of at least three-months in ACS patients with NSTEMI using a MEDLINE search, as well as an evaluation of online FDA Center for Drug Evaluation and Research Medical Reviews, from 1997 through October 2009 was conducted.

Results: One study was identified that met search criteria. The (2001) peer-reviewed publication and the (2002) supplemental New Drug Application (sNDA) for the Clopidogrel in Unstable Angina to Prevent Recurrent Events (CURE) trial were evaluated. The peer-reviewed CURE publication did not include analyses of clinical outcomes based on smoking status. However, the clopidogrel sNDA for the CURE trial reported incidence of primary CEs (CV death, MI, and Stroke) based on baseline smoking status as:

Never Smokers (n=4928) 10.2% vs 10.9%, HR 0.93 (95% CI 0.79, 1.11);

Former Smokers (n=4738) 10.3% vs 13.1%, HR 0.77 (95% CI 0.65, 0.91);

Current Smokers (n=2893) 6.1% vs 9.4%, HR 0.63 (95% CI 0.48, 0.83); for clopidogrel versus placebo, respectively.

Conclusion: In the landmark CURE trial, clopidogrel-treated patients identified as "never smokers" had no significant reduction in primary CEs when compared to placebo-treated patients; while clopidogrel-treated patients identified as "former smokers" or "current smokers" had significantly fewer primary CEs when compared to placebo-treated patients. Based on the unexpected corroborative findings in STEMI and NSTEMI large clinical outcome studies, the apparent clinically significant interaction between clopidogrel and smoking status may cause reconsideration of the ideal patient profile for successful clopidogrel therapy.

9. Clopidogrel and aspirin desensitization: clinical experience in a tertiary care center in cardiology.

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Background: Hypersensitivity to antiplatelet are not uncommon, and alternatives are limited. Dual antiplatelet therapy is recommended for almost one year after an acute coronary event with stent implantation to reduce the risk of ischemic events associated with premature discontinuation. A recent option, antiplatelet desensitization has started in March 2006, in a tertiary care center in cardiology and clinical experience is still limited.

Objective: We hypothesized that a standardized outpatient clopidogrel desensitization protocol and in-patient aspirin desensitization protocol would be safe and effective.

Methods: Patients with suspected clopidogrel or aspirin sensitivity were treated with escalating doses of the drug administered orally in solution. For clopidogrel, desensitization was performed using 15 doses. Aspirin desensitization was performed using 8 doses in subject with cutaneous hypersensitivity; one subject had also pulmonary symptoms. Successful desensitization was defined as the ability to take daily dose without a hypersensitivity reaction like cutaneous or anaphylactic response.

Results: All patients (62 ± 9 years old) received a recent diagnosis of acute coronary syndrome. Twenty patients with suspected reactions to clopidogrel received the desensitization protocol after coronarography and stent implantation. During desensitization, allergic-type reactions occurred in four patients, but clopidogrel desensitization was completed in all subjects. By a mean of 272 days, 19 patients remained asymptomatic to clopidogrel. One subject presented a cutaneous reaction the day after desensitization. Five patients (83%) received the aspirin desensitization protocol with success and still used it after 7 months.

Conclusions: Desensitization allowed the use of clopidogrel or aspirin for more than eight months without recurrence of hypersensitivity reaction in the vast majority of patients (80%). This procedure is an option to treat patients with hypersensitivity reaction who are at-risk for premature discontinuation of dual antiplatelet therapy.

10. High Sensitivity C-reactive Protein Value in Guiding Statin Therapy in a Primary Prevention Population.

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The value of high-sensitivity C-reactive protein (hs-CRP) testing in patients at risk for CAD has been debated since it was used in stratifying low risk patients to early treatment with a statin (i.e., JUPITER trial ; hs-CRP 2.0 mg/L or greater).

Objectives: We modeled a primary prevention group who met eligibility criteria for JUPITER but would not otherwise qualify for treatment according to NCEP III guidelines, including Framingham Risk Scoring (FRS), to determine how many more patients might qualify for treatment based on hs-CRP concentrations of 2.0 mg/L or greater.

Methods: Of 915 registered participants at our hospital's annual health fair, 127 were free of known CAD and equivalents and completed laboratory tests necessary to perform FRS and hs-CRP testing to be included in our analyses. We used NCEP III guidelines to determine treatment thresholds (FRS greater than 20 and LDL greater than 100, FRS 10–20, and LDL greater than 130; FRS less than 10 and LDL more than 190). Our hs-CRP cutoff was 2.0.

Results: Demographics (mean ± SE): Age 58.7 ± .0 with 71% being women. hs-CRP 3.4 ± 0.6. Lipid values were total 216 ± 4, LDL 130 ± 3, HDL 59 ± 2, and TG 140 ± 6. Congruence regarding whether to treat or not between NCEP III guidelines and hs-CRP testing was seen in 58% (n=74) of patients, leaving incongruence in 42% (n=53) (kappa =0.11; p=0.10). Using hs-CRP greater than 2.0, an additional 36% (n=46) of patients would need treatment not otherwise suggested using guidelines. Of those needing treatment according to guidelines (n=19), twelve (63%) also had high hs-CRP.

Conclusion: The high level of incongruence presents an opportunity for utilizing hs-CRP testing in treatment decisions for hyperlipidemia patients. In a generalizable sample of ambulatory adults, the sole use of NCEP III guidelines underestimates the number of subjects likely to benefit from treatment based on recent studies.

Critical Care

11E. Resolution of clinical signs in trauma intensive care unit patients following diagnosis of ventilator-associated pneumonia.

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Objectives: The ATS/IDSA Ventilator-Associated Pneumonia (VAP) guidelines suggest that clinical improvement of VAP should be apparent within 3–6 days. This study evaluated resolution of clinical signs of VAP in trauma patients after diagnosis.

Methods: Critically injured adults admitted to the trauma intensive care unit (ICU) from June 1, 2006, to December 31, 2007, and subsequently given a diagnosis of VAP were retrospectively assessed. Clinical signs, including derangements of maximum temperature (Tmax), white blood cell (WBC) count, and PaO_2/FiO_2, were evaluated on days 1–16 after VAP diagnosis. Data are presented as mean ± SD unless otherwise stated. Clinical parameters after VAP were compared using repeated-measures ANOVA with the Tukey test for multiple comparisons.

Results: A total of 82 patients were identified. Data for the 34 patients without concurrent infections are presented. Demographic data include: Age 46 ± 17 years; 71% men; 94% blunt trauma; median (IQR) Injury Severity Score 29.5 (24–38); duration of mechanical ventilation 33 ± 27 days; ICU length of stay (LOS) 39 ± 25 days; hospital LOS 53 ± 33 days. Clinical signs following VAP diagnosis: Tmax (°F): Day 1=101.8 ± 1.3, Day 3=101.1 ± 1.1, Day 6=101.1 ± 1.4, Day 16=100.1 ± 3. Compared to Day 1, there was a significant reduction in Tmax at days 10, 11, 12, 13, 14, and 16 ($p<0.05$ for all). WBC count (cells per microliter): day 1 = 12.9 ± 5, day 3 = 13.7 ± 5, day 6 = 14.4 ± 5, and day 16 = 13.8 ± 6. There was no significant difference in WBC on days 1–16 ($p=0.42$). PaO_2/FiO_2: day 1 = 232 ± 108, day 3 = 200 ± 87, day 6 = 218 ± 104, day 16 = 246 ± 126. Differences in PaO_2/FiO_2 on days 1–16 did not reach statistical significance ($p=0.06$).
Conclusion: Improvement of clinical parameters after a VAP diagnosis is delayed in trauma patients. Alternative methods for determining resolution should be investigated.
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12E. Association between Statins Therapy and the outcome of Critically Ill Patients.
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Objectives: To evaluate the association between statin use during intensive care unit (ICU) stay and overall hospital mortality of critically ill patients.
Methods: All 763 patients enrolled in the two original RCTs were included in this study. A total of 107 of 763 (14%) patients were taking statins during their ICU stay (group 1). All other patients were group II. The primary end point was the overall in-hospital mortality. Secondary end points included ICU mortality, overall infection rate, and the dose effect of statins on hospital mortality.
Results: Statin use was associated with a reduction in hospital mortality (adjusted odds ratio [AOR] 0.60, 95% confidence interval [CI] 0.36–0.99). In addition, the use of statins was associated with lower mortality in the following groups of patients: age older than 58 years (AOR 0.58, 95%CI 0.35-0.97, patients with APACHE II > 22 (AOR 0.54, 95% CI 0.31-0.96), diabetic patients (AOR 0.52, 95% CI 0.30-0.90), patients on vasopressor therapy (AOR 0.53, 95% CI 0.29-0.97), patients with creatinine <100 µmol/L (AOR 0.14. 95% CI 0.04-0.51), and patients with GCS <9 (AOR 0.34, 95% CI 0.17-0.71). Furthermore, equipotent doses of simvastatin and atorvastatin (> 40 mg) were associated with a reduction in the hospital mortality (AOR 0.22, 95% CI 0.06-0.87). In contrast, there were no differences in the overall ICU mortality and total infection rate between the two groups (95% CI 0.47-1.51) and (95% CI (0.52-1.37) respectively.
Conclusion: Statins use during ICU stay was associated with reduction in the overall hospital mortality. This is especially true in patients older than 58 years, those with diabetes, the patients more ill with APACHE II scores greater than 22, those on vasopressor therapy, and those with low GCS scores.
Presented at Saudi Critical Care Medicine December 2008.

13. A descriptive study of antipsychotic use in a medical intensive care unity.
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Objectives: A retrospective review of haloperidol use in critically ill patients showed an association with reduced mortality. However, the indications for routine antipsychotic use in the ICU have been minimally explored, especially for atypical antipsychotics (AA). We hypothesized that AA use for delirium would represent a significant portion of overall use.
Methods: An observational study of MICU patients prescribed an antipsychotic during a 3-month period. Variables collected included patient demographics, home medications, medical history, indication for antipsychotic, baseline QTc, depth of sedation, and daily presence of delirium. Drug indication was obtained by interviews with primary caregivers and retrospective chart review.
Results: Fifty-one patients were prescribed antipsychotics (haloperidol, n=26; AA = 19; both drug types = 6). Haloperidol was most commonly used to treat delirium and agitation with tachypnea and was most commonly administered as an isolated intravenous bolus. Quetiapine was the most frequently prescribed AA (22%). The primary indication for AA administration was an established premorbid psychiatric disorder (52.4%) and primary reason for selection was continuation of a home medication (61.9%). Six study patients received both AA and haloperidol most often for agitation with danger to self (33%) or delirium (33%). The most common reason cited for transition from haloperidol to an AA was QTc prolongation (50%). Olanzapine (66%) was the most frequently prescribed therapeutic alternative in cases of QTc prolongation.
Conclusions: Haloperidol is the primary antipsychotic used in our ICU population for a primary indication of delirium or agitation. Atypical antipsychotics are more often used for pre-existing psychiatric conditions. Transition from haloperidol to an AA was commonly prescribed secondary to QTc prolongation.

14. Incidence of nosocomial infections in critically ill patients sedated with propofol compared with benzodiazepines.
Philip E. Grgurich, Pharm.D., MBA,[1] John Marshall, Pharm.D.[2]; (1) Froedtert Hospital, Milwaukee, WI; (2) Actelion Pharmaceuticals, Stoneham, MA
Objectives: To determine whether sedation with propofol is correlated with greater rates of infection compared with sedation with benzodiazepine infusions in critically ill patients.
Methods: Electronic medical records of patients admitted 1/1/05 to 12/31/07 were reviewed to identify patients 18 years and older who had received a continuous infusion of propofol or a benzodiazepine for 48 hours or more during mechanical ventilation. Exclusion criteria included: sedation with both benzodiazepine and propofol infusions and immunosuppression. Data collection included: demographics, medical data, severity of illness, infection risk factors, length of stay, in-hospital mortality, and positive culture data. χ^2, Fisher exact, and Student *t*-tests were used to compare groups. Logistic regression was used to assess the impact of propofol on the acquisition of infection after adjustment for confounders.
Results: Data were collected on 84 subjects, with subjects equally divided between the two groups. All baseline characteristics were similar between groups, except propofol subjects were more often men and were more often admitted to an ICU because of trauma, whereas benzodiazepine subjects were more often black and were more often admitted to an ICU for cardiac indications. Overall, 14 infections occurred in subjects who received benzodiazepines and in 11 who received propofol. When patients who developed infections were compared to those who did not develop infections, only race was associated with infection status in the univariate analyses ($p=0.05$). In multivariate analyses propofol did not appear to be significantly associated with infection status (OR = 0.43, $p=0.18$). There was no difference in the incidence of infections when analyzed cumulatively or by type of infection. There was no difference in time to infection between the benzodiazepine and propofol groups or in in-hospital mortality.
Conclusion: This study found no association between type of sedative and incidence of infection when infections were analyzed cumulatively or by organ system involved.

Education/Training

15. Influence of introductory clinical experience on pharmacy students' self-confidence.
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Objectives: Each year, students complete 1440 hours of advanced pharmacy practice experience (APPE) through four core and two elective rotations. The purpose of this study was to determine if the implementation of a 300-hour introductory pharmacy practice experience (IPPE) preceding these APPEs for the class of 2009 increased students' self-confidence in the 10 general outcome-based abilities, (i.e., conceptual competence, scientific comprehension, mathematical competence, use of values, etc.) compared to students'

confidence in the class of 2008 who did not have IPPE.
Methods: Doctor of pharmacy students from two graduating classes, 2008 and 2009, were surveyed at three distinct times during their APPE year: 1) at the start, 2) at midpoint, and 3) at completion. The identical 82-question survey was administered each time.
Results: 428 Class of 2008 surveys and 435 Class of 2009 surveys were completed. Over the course of their APPE, students' confidence increased for nearly all of the survey items for both classes. In addition, both classes demonstrated the highest percentage of change (25%) for improved confidence in a drug utilization evaluation during the course of their APPE experience. Critical thinking and decision-making abilities were most improved competencies, and social awareness and self-learning abilities were least changed for both classes. Noteworthy, among other findings was in comparison to the 2008 Class, the additional 300 hours of IPPE in the 2009 Class decreased overall confidence by 16% at the start of their APPEs.
Conclusion: The results indicated the addition of the IPPE decreased the class of 2009's confidence at the start of APPE, which showed that these students had a more realistic image of confidence and an improved vision of which outcome-based abilities to concentrate on during their APPE year. Assessing pharmacy student self-confidence is an important component of determining student development of outcome-based abilities.

16. Assessment of Supplemental Instruction in a New Integrated Infectious Disease Pharmacotherapy Course.
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Objectives: To help student pharmacists improve their performances on examinations, faculty offered them an integrated curriculum and supplemental instruction. This study was designed to assess students' perceptions regarding an integrated infectious disease pharmacotherapy course and students' beliefs and confidence levels regarding supplemental instruction before and on completion of this course.
Methods: A new 5-credit hour infectious disease pharmacotherapy course that integrated medicinal chemistry, pharmacology, and therapeutics was offered to help third-year students acquire necessary knowledge, develop clinical skills, and improve core values in antimicrobial pharmacotherapy. Emphasis was placed on incorporating active learning and critical thinking into teaching styles. Both science and clinical faculty were asked to supplement lectures with review sessions before exams, review sessions after exams, case studies, study guides, and student-led presentations. Students were asked to voice their opinion regarding the idea of integrating basic and clinical sciences in one course. A survey designed to assess students' beliefs and confidence levels regarding supplemental instruction was administered at the beginning and end of the semester. Statistical analysis of the survey was performed with the Wilcoxon signed-rank test using SPSS program version 17.0.
Results: Of the 59 students enrolled in the course, all successfully completed it. Forty-two of 46 (91%) students who responded to the survey agreed that medicinal chemistry, pharmacology, and therapeutics should remain integrated in a pharmacotherapy course. There were statistically significant improvements in the median pre-assessment and post-assessment values of students' beliefs but not confidence levels regarding review sessions. There were statistically significant improvements in the median pre-assessment and post-assessment values of both students' beliefs and confidence levels regarding supplemental instruction.
Conclusion: Students strongly embrace an integrated curriculum. They believe that supplemental instruction is helpful and can better prepare them for exams. We recommend implementing supplemental instruction throughout integrated pharmacotherapy courses.

17. Pharmacy student opinions of faculty drafted course packets for a pharmacotherapeutics course.
Michael Steinberg, Pharm.D., Fae Wooding, Pharm.D., Kristine Willett, Pharm.D., Abir Kanaan, Pharm.D.; Massachusetts College of Pharmacy and Health Sciences, Worcester, MA
Objectives: On the Worcester/Manchester campuses of the Massachusetts College of Pharmacy and Health Sciences, pharmacotherapeutics is taught using a learner-centered approach with faculty facilitated discussions that encourage students' active engagement in acquiring and applying new knowledge to clinical situations. Students use required textbooks, readings, and faculty-prepared course packets, which contain informational outlines, patient cases, and/or self-study questions designed to meet specific learning objectives. Informal student feedback questioned the utility of the course packets and thus a student survey was conducted to determine the perceived utility of faculty drafted pharmacotherapeutics course packets.
Methods: Students were solicited to complete an online survey designed to assess the extent of use and perceived value of the course packets.
Results: 56 of 198 students completing the third of three semesters of the course participated in the survey, of which 75% reported using some portion of the packets to prepare for some of the lectures and 10% reported using them all the time. Only 12.5% reported completing all course packet assignments before each lecture. However, 93% felt the packets provided some value; 14% reported value for every lecture, while 46% reported positive value for packets in less than half of the lectures. Only 52% answered affirmatively that the course packets helped their learning of pharmacotherapeutic topics more than if they did not have them. Interestingly, 23% felt the course packets complemented class material all the time, while 57% felt this complementation was present some of the time. With regard to required or supplemental journal article readings, only 9% of students always completed these assignments.
Conclusion: Students use the pharmacotherapeutics course packets and assigned readings to enhance their learning, but do not always find them to be valuable educational tools.

18. Academic Performance in a Pharmacotherapeutics Course Taught Between Two Campuses Utilizing Distance Education Technology.
Michael Steinberg, Pharm.D., Anna K. Morin, Pharm.D., Fae Wooding, Pharm.D., Kristine Willett, Pharm.D., Abir Kanaan, Pharm.D.; Massachusetts College of Pharmacy and Health Sciences, Worcester, MA
Objectives: Massachusetts College of Pharmacy and Health Sciences offers an accelerated 3-year doctor of pharmacy degree, with most courses taught using audio-visual equipment on one campus (Worcester, MA) and broadcasted through distance education (DE) to another campus (Manchester, NH). This allows students on both campuses to be taught concurrently despite the geographic separation. It was unknown what impact the DE configuration may have on the academic success of students located on the Manchester campus who lack the face to face interaction with faculty. Thus, a study was conducted to determine whether there is a difference in academic outcomes among students on both campuses using the DE equipment.
Methods: All exam and final course grades for students participating in pharmacotherapeutics were compared between the two campuses over a four-year period.
Results: Mean results from 55 exams and course grades from 12 semesters were compared. Statistical differences ($p<0.01$) between individual mean examination grades favored the Worcester cohort on 1 of 55 examinations (2%) and favored the Manchester cohort on 5 of 55 examinations (9%). There was no statistical difference in the grades of the remaining 49 of 55 examinations (78%). Overall, there was no statistical difference between the mean examination grades (i.e., all 55 examinations pooled together) earned by Worcester and Manchester students (Worcester, 77.2%; Manchester 77.4%; $p=0.84$). With regard to individual semester final course grades, 1/12 (8%) favored Worcester and 2/12 (17%) favored Manchester, with 9/12 (75%) statistically equal. Overall course grades from all twelve semesters were not statistically different (Worcester, 77.3%; Manchester, 77.4%; $P=0.91$).
Conclusion: There is no difference in academic outcomes between students located on two respective campuses linked using DE technology.

19. Evaluation of the impact of inpatient anticoagulation teaching practices on patient knowledge and readmission rates.

Elizabeth A. Petrovitch, Pharm.D.,[1] Sheila M. Wilhelm, Pharm.D., BCPS[2]; (1) Harper University Hospital, Detroit, MI; (2) Wayne State University, Detroit, MI

Objectives: Patient education on warfarin therapy is critical to patient safety and successful therapy management. However, the true effect on outcomes is related to the efficacy of the education. The objectives of this study are to evaluate the impact of inpatient anticoagulation education on patient knowledge of warfarin and readmission rates for patients discharged home on warfarin.

Methods: A retrospective chart review established baseline 30- and 60-day readmission rates for patients discharged home on warfarin without education. Subsequently, a prospective study will identify patients discharged home on a warfarin from a large academic institution who have received standardized pharmacy anticoagulation education. Patients will be administered a ten question verbal warfarin knowledge assessment at baseline and by phone at 30–45 days after the initial assessment. Patient demographics, data on warfarin management, and 30- and 60-day readmission rates will also be collected. Overall knowledge assessment scores at baseline and at 30–45 days after discharge will be compared. Readmission rates of educated patients at 30 and 60 days will be compared to baseline readmission rates of patients who did not receive anticoagulation education.

Results: Fifty patients (mean age: 61.6 years, 62% women) discharged home on warfarin without education had 30- and 60-day readmission rates of 34% and 54%, respectively. Of these readmissions, 16% related to anticoagulation therapy (INR above goal, INR below goal with presence of venous thromboembolism, gastrointestinal bleed). Preliminary prospective data (six patients, mean age, 54.8 years; 67% women) indicate average patient knowledge score of 85% at discharge after education.

Conclusion: Patients who do not receive warfarin patient education are at risk of anticoagulation-related readmissions. Measurement of patient education indicates that pharmacy based anticoagulation education is effective in conveying key points on warfarin therapy and safety. Ongoing enrollment will determine the effect of this education on readmission rates.

20E. Comparison of coverage of obesity and post-bariatric surgery medication-related issues in the curriculum.

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Objectives: Due to the increasing incidence of obesity and bariatric surgeries in the United States over the past several years, it is necessary for pharmacists to be knowledgeable in these areas. The purpose of this survey is to determine the extent to which obesity and post-bariatric surgery medication-related issues are covered in the curricula of Accreditation Council for Pharmacy Education (ACPE)-accredited schools/colleges of pharmacy because these data are not available.

Methods: A brief electronic survey was distributed through the following American College of Clinical Pharmacy (ACCP) Practice and Research Network (PRN) e-mail lists: Education and Training, Ambulatory Care, Endocrine and Metabolism, GI/Liver/Nutrition. The goal participant sample was determined to be at least one survey response per ACPE-accredited institution (n=112).

Results: Ninety respondents, from sixty ACPE-accredited institutions, have been catalogued. Institutions that currently incorporate obesity and post-bariatric surgery medication-related topics into required courses account for 41.9%. Most content is offered in the second and third professional years (40.5% and 52.4%, respectively), in lecture-based and some problem-based learning format (44.7% and 39.5%, respectively), is team-taught (61.9%) by pharmacy practice faculty (85.4%) with expertise in primary care (55%), and for less than 20% of the time devoted within a course. Other data have been collected about specific course content and will be reported. Most surveyed participants (51.8%) indicate that they do not believe their institution's current didactic approach covers this content sufficiently.

Conclusion: The minority of ACPE-accredited colleges/schools of pharmacy offer obesity and post-bariatric surgery medication-related content in their curricula. This shared information regarding where these educational components are covered in some ACPE-accredited curricula may encourage all institutions to incorporate or expand the coverage of this information.

Presented at the American Association of Colleges of Pharmacy 2009 Annual Meeting, Boston, MA, July 18–22, 2009.

21E. Continuing professional development (CPD) compared to traditional continuing pharmacy education (CPE): A randomized, controlled trial.

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Objectives: To determine if continuing professional development (CPD) improves the practice of pharmacists compared to traditional continuing pharmacy education (CPE).

Methods: This randomized, controlled study recruited licensed pharmacists employed by Kaiser Permanente Colorado. All participants completed a basic CPD course, took a 139-question education survey (baseline data), and were subsequently randomized into the intervention or control group. The control group was instructed to continue with traditional CPE. The intervention group completed a CPD home study course and a live CPD Workshop to learn about and interactively participate in the CPD concept. The intervention group attended CPD Follow-Up sessions at 5 and 10 months. All participants took the 139-question education survey at 10 months for follow-up data collection.

Results: One hundred pharmacists were enrolled and consented. The intervention group (n=51, 7 drop-outs) reported significant differences, compared with the control group (n=49, 2 drop-outs), in better interacting with other health care providers (always/often 28 vs. 8%, $p<0.05$), initiating practice changes (always/often 18 vs. 0%, $p<0.05$) and changing patient care (always/often 33 vs. 18%, $p<0.05$) because of learnings. Compared with baseline, the intervention group reported a significant enhancement in knowledge (8 to 28%, $p<0.05$), skills (2 to 22%, $p<0.05$) and attitudes/values (0 to 16%, $p<0.05$) over the 10 month study period, and these learnings were better reinforced in their practice (10 to 31%, $p<0.05$) and more applicable to their work (20 to 31%, $p<0.05$) after utilizing CPD. The control group demonstrated no change in these parameters. Data that trended toward favoring CPD but did not show statistical significance between groups included self-confidence in work, job satisfaction, medication therapy management, and patient counseling. Three-quarters of the intervention group reported that CPD is more time intensive than traditional CPE.

Conclusion: These results suggest that CPD enhances the practice of pharmacists as compared to traditional CPE.

Presented at Presented at the Accreditation Council for Pharmacy Education conference, St. Louis, MO, October 2009.

22E. Pediatric oncology patients' medication understanding and the relationship to quality of life.

Tamara MacDonald, Pharm.D.,[1] Bruce Crooks, MB, ChB,[1] Derek B. MacDonald, Ph.D. Candidate,[2] Cherie Collicott, medical, student[3]; (1) IWK Health Centre, Halifax, NS, Canada; (2) University of Georgia, Halifax, NS, Canada; (3) Dalhousie University, Halifax, NS, Canada

Objectives: To explore how children diagnosed with Acute Lymphoblastic Leukemia understand their medications, and to determine if there is a relationship between medication understanding and quality of life.

Methods: A semi-structured interview was conducted with children between the ages of 6 and 18 years (n=16) about the properties of their medications, medication habits, and quality of life, which was also assessed through the Child Health Questionnaire (CHQ).

Results: The group of younger children (mean age 7.5 years) correctly answered, on average, 51% of the questions on color, 26% of the questions on name, 25% of the questions on frequency, and 8% of the questions on purpose. The older children (mean age 16 years) scored, on average, at least 35% higher for each characteristic than their younger counterparts. All of the younger children reported that physicians directed medication education to only the parents and that 9 of the 11 younger children were rarely present in the room. Children are being excluded from their own medication education and as a consequence do not report a good understanding. Interestingly, 13 of the 16 children stated that they want to learn more about their medications and be more involved. Quality of life was assessed and it

was found that the younger children scored significantly higher for physical activity [p=0.04; 95% CI (21.9, 75.5)] than the older children. Because of the small sample size, it is not possible to report a correlation between quality of life and medication understanding, but the data from this study suggest a relationship exists, which should be explored further. It has also shown that children want to know more about and have more responsibility over their medications.
Conclusion: Children want to know more about their medications, and health care professionals should speak directly to children, empowering them as rational medication users.
Presented at Beatrice Hunter Cancer Symposium, The Beatrice Hunter Cancer Research Institute in Halifax, Nova Scotia, Canada, November 17th, 2009

23. Developing an interprofessional partnership to serve a community in need.
Crystal Obering, Pharm.D., MBA, BCPS, Cameron C. Lindsey, Pharm.D., BC-ADM; University of Missouri Kansas City School of Pharmacy, Kansas City, MO
Objectives: To offer free screenings and education on a variety of health topics to an underserved community. To create a wellness fair incorporating the four medical professions on the UMKC Health Sciences campus. To provide students with an opportunity to work on an interprofessional team.
Methods: A need for provision of health care to the underserved population of Kansas City, MO was identified. A wellness fair was created by students, faculty, and staff from the University of Missouri Kansas City's (UMKC) Schools of Medicine, Pharmacy, Nursing, and Dentistry. This was the first time that all four professions combined their expertise to promote wellness through a large scale project.
Results: The Inaugural Health Sciences Wellness Fair was held on Saturday April 4, 2009. More than 500 adults and 200 children were served. Students and faculty from the four schools united with a common desire to help a community in need. There were approximately 140 participants from medicine, 110 from pharmacy, 80 from nursing, and 40 from dentistry. Patients were able to visit 25 booths offering free screenings and education on various health topics. Each individual booth was staffed by a variety of student volunteers from different disciplines. Translators were available for the Vietnamese and Spanish speaking patients. Patients were provided with a "safety net" provider list to receive follow-up care on any abnormal results that were identified.
Conclusion: The collaboration of the four schools demonstrated the importance of a team approach to community health care, while patients received integrated, comprehensive screening results and knowledge about their current health status. This project gave students an opportunity to work with, appreciate, and rely on one another across disciplines, as they will need to do throughout their careers. This interprofessional intervention can serve as a model for future wellness fairs and today's community health-care environment.

Emergency Medicine

24. Retrospective evaluation of blood pressure management during ischemic stroke.
Marc Lapointe, B.S., Pharm.D., Jennifer J. Glace, B.A., Pharm.D. Candidate, Robert S. Helmer, Pharm.D. Candidate; South Carolina College of Pharmacy, Charleston, SC
Retrospective evaluation of blood pressure management during ischemic stroke
Objectives: Delays in intravenous t-PA administration can prolong ischemia and worsen outcomes during ischemic stroke. Severe hypertension is a contraindication to t-PA and adequate blood pressure management is necessary to minimize the risk of hemorrhagic conversion. Stroke guidelines only offer general therapeutic strategies for blood pressure management. We hypothesize that during ischemic stroke: 1) severe hypertension can significantly delay the initiation of t-PA, and 2) intravenous antihypertensive agents can cause hypotensive excursions.
Methods: Electronic medical records from the Medical University of South Carolina (MUSC) were retrospectively examined to identify ischemic stroke patients presenting from May 2005 to November 2009. These records were used to determine the incidence of severe hypertension requiring acute blood pressure reduction in t-PA treated patients. Blood pressure reduction practices were described and evaluated in terms of efficacy and safety.
Results: During the study period, 74 patients received t-PA and 10 (13.5%) of them required acute blood pressure reduction. Of these patients, 8 (80%) received intravenous bolus labetalol first line and three (30%) required a nicardipine infusion. Overall, patients required a median of three doses or titration adjustments [range: 1–9] to achieve and/or maintain the targeted blood pressure (TBP). Fifty percent of the patients required more than one antihypertensive agent. The average time to achieve TBP was 26 minutes [range: 5–91]. Potentially significant hypotensive excursions were identified in 40% of patients. All patients who received nicardipine required a rapid dose reduction during treatment.
Conclusion: The incidence of blood pressure treatment before t-PA administration is relatively low. However, severe hypertension often requires polypharmacy and can significantly delay t-PA administration. We propose that specific antihypertensive regimens should be studied to optimize blood pressure management for rapid and safe administration of t-PA while preventing hypotensive excursions.

Family Medicine

25. Effectiveness of newer antidiabetic agents plus insulin in patients with type-2 diabetes.
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Objectives: Neither exenatide (EX) nor sitagliptin (SIT) are indicated for use with insulin; however, in clinical practice, both agents are used in combination with insulin. The objective of this study was to compare the effects of EX and SIT on metabolic parameters (A_{1c}, LDL, TChol, TG, and weight) when used in combination therapy with insulin for at least six months.
Methods: This IRB-approved retrospective two-cohort study included patients treated with insulin plus EX or SIT for at least 6 months. Drug effects were evaluated by comparing each patient's baseline and ending A_{1c}, lipid profile, and weight. In this study, the independent variables were treatment (EX or SIT) and time (before and after addition of the new agent). The primary dependent outcome variable was change in A_{1c}. The secondary outcome variables included changes in lipid profiles and weight. Data on other therapy changes that could affect the outcome measures were collected and analyzed. Data were extracted from existing computer files, recorded on scannable data forms, and imported into a database for analysis. The statistical tests used included a 2-factor ANOVA (treatment, time) with repeated measures on one factor (time), followed by two-tailed *t*-tests.
Results: Data were collected on 115 patients (51 in the EX group). There were no differences in the use of ancillary medications that would affect the outcome measures ($p>0.05$). There was no statistically significant difference in A_{1c}, LDL, TChol, or TG between treatments ($p>0.05$). There was a statistically significant difference in the change in weight between treatment groups (independent sample *t*-test, $p=0.019$).
Conclusion: Except for change in weight, this retrospective two-cohort study did not detect any significant differences among patients treated with insulin plus EX or SIT. Further study is warranted to confirm these findings and evaluate safety.
Geriatrics

26. Cognitive impairment in the elderly: a valid barrier to the initiation of warfarin therapy?.
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Objectives: Despite considerable data demonstrating warfarin's benefits, it remains underutilized in elderly patients. One barrier identified as a frequent factor in decisions not to anticoagulate is cognitive impairment (CI). However, there is limited data to justify this rationale. Since warfarin-treated patients are most vulnerable to

adverse events during the initial anticoagulation period, we sought to determine if CI prolonged the period to therapeutic anticoagulation or was associated with reduced anticoagulation stability versus patients with normal cognitive function (NCF).
Methods: We assessed 19 patients (77 ± 3 years old) whose initial warfarin therapy was managed by a pharmacist-run anticoagulation clinic. Patients were divided based on mini-mental status examination (MMSE) scores (maximum score 30); NCF of 27 or more (n=8), CI of 26 or less (n=11). We determined the number of clinic visits and days required to achieve therapeutic anticoagulation; defined as two consecutive in-range international normalized ratio (INR) values. We also assessed anticoagulation stability by; (1) calculating INR standard deviation (SD) – the smaller the SD, the greater the stability; and (2) measuring the percentage of INRs of 4 or greater.
Results: We found no difference in the number of visits (NCF= 6.1±1.5, CI= 5.9±1.7; p=0.90) or days (NCF= 56±16, CI= 70±22; p=0.65) required to achieve therapeutic anticoagulation. Furthermore, for CI patients, there was no correlation between MMSE score (range 15-26) and number of visits (p=0.53); consistent with no cognitive impairment-related prolongation of time to therapeutic anticoagulation. INR SD was similar for both groups (NCF= 0.68, CI= 0.62; p=0.96), as were visits with INRs ≥ 4.0 (NCF= 6% vs. CI= 4%; p=1.00).
Conclusions: We found cognitive impairment neither delayed the time required to achieve therapeutic anticoagulation, nor decreased anticoagulation stability versus patients with normal cognitive function. Therefore, we propose that cognitive impairment does not appear to be a valid barrier to initiation of anticoagulation in elderly patients attending an anticoagulation clinic.

27. Vitamin D deficiency and the response of 25-hydroxyvitamin D levels to ergocalciferol replacement therapy in elderly patients.
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Objectives: Limited studies have evaluated the efficacy of using weekly ergocalciferol for eight weeks to correct vitamin D deficiency, though this regimen is commonly recommended. The primary objective of this study was to evaluate the effectiveness of ergocalciferol 50,000 international units (IU) once weekly for eight weeks on increasing serum 25-hydroxyvitamin D [25(OH)D] levels to a goal of ≥30 ng/ml in elderly patients with inadequate vitamin D levels. The secondary objective was to assess for patient characteristics which may predict inadequate response.
Methods: A retrospective evaluation of 63 patients aged ≥60 years with inadequate vitamin D levels [25(OH)D levels <30 ng/ml] who received ergocalciferol 50,000 IU once weekly for at least eight weeks was conducted. Patients with significant renal dysfunction or a history of malabsorption disorders were excluded.
Results: Mean 25(OH)D levels increased 96% from baseline following replacement (16.4 ng/ml to 32.1 ng/ml; P<0.0001). Only 49% of patients achieved a 25(OH)D concentration of 30 ng/mL or more. Patients were divided into three categories based on severity of deficiency, 25(OH)D of 0–9 ng/mL, 10–19 ng/mL, and 20–29 ng/mL. The percentage of patients achieving target levels after replacement was 33%, 47%, and 94%, respectively. Patients with the lowest baseline 25(OH)D concentration had the largest absolute change in concentrations, with a mean increase from 7 to 29 ng/mL, 15 to 31 ng/mL, and 24 to 36 ng/mL, respectively. Gender, age, ethnicity, use of over-the-counter vitamin D, or receipt of more than 8 weeks of ergocalciferol were not significant predictors of response to therapy.
Conclusion: Ergocalciferol 50,000 IU once weekly for 8 weeks in elderly patients with 25(OH)D levels of 30 ng/mL or less does not appear to be an effective replacement regimen for many patients, particularly in patients with concentrations less than 20 ng/mL at baseline.

Health Services Research

28. How Physicians and Pharmacists Communicate: Implications for Patient Safety.
Alan J. Zillich, Pharm.D.,[1] Heather A. Jaynes, MSN,[1] Andrew N. Schmelz, Pharm.D.,[1] Jasmine D. Gonzalvo, Pharm.D.,[1] Brad N. Doebbeling, M.D.,[2] Karen S. Hudmon, Dr.PH,[1] Richard M. Frankel, Ph.D.[2]; (1) Purdue University, Indianapolis, IN; (2) Roudebush VA Medical Center, Health Services Research and Development Center of Excellence, Indianapolis, IN
Objectives: The purpose of this qualitative study is to explore how physicians and clinical pharmacists work together in providing patient care across a regional network of Veteran's Affairs (VA) hospitals and associated primary care clinics.
Methods: Snowball sampling procedures were used to recruit primary care physicians and ambulatory clinical pharmacists from eight sites to participate in telephone-administered, semi-structured interviews. Cognitive testing was used to standardize an interview guide, which focused on medication prescribing/monitoring, physician/pharmacist working relationships, and organizational attributes. All interviews were tape recorded, transcribed verbatim, and reviewed for accuracy. Using an iterative process of independent transcript review and consensus discussion among three investigators, themes and related codes were developed until "theme saturation" was reached. Themes and codes were assigned to transcript segments, and illustrative quotes were captured.
Results: Seventeen physicians and 25 clinical pharmacists completed interviews. Most (67%) participants were women with an average of 5.3 ± 5.0 years of clinic experience. A strong communication theme emerged from the data. Both types of practitioners relied heavily on electronic forms of communication such as e-mail and alerts through the electronic medical record. One physician commented "it's not an interchange … it's a hit and run." Face-to-face communication occurred less frequently, with the style of communication suggesting an authority gradient. Pharmacists used language such as "How do you feel about this?" or "Well, what do you think?" One pharmacist commented "I'm gentle with them [referring to the physician]."
Conclusion: Communication plays an integral role in promoting patient safety. Adoption of strategies that serve to improve face-to-face communication and overcome differences in power and status among pharmacists and physicians are needed. These strategies likely will lead to improved patient safety in health care settings and enhanced medical outcomes.

Hematology/Anticoagulation

29. Acute Kidney Injury and Response to Warfarin: Differential Effects of Initial INR.
Carrie Molesa, Pharm.D.,[1] Peter Whittaker, Ph.D.[2]; (1) Harper Hospital, Detroit, MI; (2) Wayne State University School of Medicine, Cardiovascular Research Institute and Dept of Emergency Medicine, Detroit, MI
Objectives: Others and we found that chronic kidney dysfunction increases sensitivity to warfarin, resulting in large reductions in required maintenance dose. However, the effects of acute kidney injury (AKI) on warfarin response have not been investigated.
Methods: We identified, through retrospective review of electronic medical records, cases of AKI in hospitalized subjects. We divided AKI events into three categories: (1) patients admitted with therapeutic INR who experienced an in-hospital AKI event, (2) AKI patients admitted with subtherapeutic INR, who subsequently received warfarin therapy to restore target INR, and (3) AKI patients admitted with supratherapeutic INR (greater than 4.0). We calculated the average per day INR change for each category. For AKI categories (2) and (3), we compared these average changes to those calculated in patients with unchanged kidney function; assessed using estimated glomerular filtration rate (eGFR). We assumed treatment during AKI was determined by standard dosing algorithms and best clinical practice and hence potential confounding effects of variable patient characteristics were minimized.
Results: Patients in cohort (1) [in-hospital AKI events] exhibited rapid INR increases (about 1.6/day). Furthermore, INR inversely correlated with eGFR (the lower the eGFR, the higher the INR; P=0.005). Conversely, in cohorts (2) and (3), patients had impaired responses: patients with subtherapeutic INR and AKI had slower INR increases than controls (0.13 ± 0.01 vs. 0.37 ± 0.04/day; p=0.024), while patients with supratherapeutic INR and AKI had slower INR

decreases than controls (0.85 ± 0.12 vs. 2.90 ± 0.49/day; p=0.028).
Conclusions: AKI was associated with profound acute effects on warfarin response. Rapid INR spikes from therapeutic levels correlated with eGFR decreases. Three-fold differences in responsiveness in AKI versus control patients implicate pharmacokinetic effects; however, the precise mechanisms remain unknown. Our findings not only indicate the need for close monitoring of warfarin-treated patients with AKI, but also that AKI should be considered a potential cause of unexplained INR increases.

HIV/AIDS

30. Assessment of antiretroviral medication knowledge: A survey of New York State pharmacists.
Tomasz Z. Jodlowski, Pharm.D., Donna Sym, Pharm.D., John Conry, Pharm.D., Tina Kanmaz, Pharm.D.; St. John's University, Queens, NY
Objectives: This study was conducted to assess antiretroviral medication knowledge of pharmacists licensed in New York State.
Methods: The research project included an anonymous, voluntary, self-administered survey, and it was approved by the St. John's University Institutional Review Board. The survey was distributed to the executive directors of the New York State Council of Health-system Pharmacists, St. John's University College of Pharmacy & Allied Health Professions' Continuing Education Department, New York/New Jersey AIDS Education and Training Center, and the Pharmaceutical Society of the State of New York. The executive directors forwarded the survey to their members and invited them to participate only once using an electronic Web-based survey software package.
Results: Two hundred and thirty eight pharmacists responded to the survey. More than half of the pharmacists (137/238;57.6%) completed the entire survey. Questions varied greatly in correct responses. More than one third (52/137;37.9%) of pharmacists surveyed were unable to identify a serious central nervous system side effect of efavirenz and (56/137;40.9%) were unable to identify a potentially serious abacavir hypersensitivity reaction. Less than half (65/137;47.4%) correctly identified a drug interaction between the concomitant use of esomeprazole and atazanavir and a contraindication with concurrent use of simvastatin and lopinavir/ritonavir (44/137;32.1%). One-third (42/137;30.6%) did not recognize the underdosing of zidovudine/lamivudine and one-third (40/137;29%) did not correctly identify the appropriate administration of didanosine. Almost all (131/137;95.6%) were able to identify the drug interaction with concurrent use of St. John's Wort and protease inhibitors.
Conclusion: Our research highlights the need for improved antiretroviral knowledge among pharmacists, particularly in the area of drug interactions, dosing and appropriate antiretroviral drug combination.

31E. GRACE (Gender, Race And Clinical Experience): 48-week results of darunavir/ritonavir-based therapy in the largest HIV treatment trial in North America focused on treatment-experienced women.
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Objectives: GRACE, which enrolled mainly women and people of color, evaluated sex-related differences in efficacy and safety of darunavir/ritonavir (DRV/r; protease inhibitor for HIV) 600/100 mg twice daily plus an optimized background regimen in treatment-experienced adults with HIV (HIV-1 RNA 1000 copies/mL or more).
Methods: This was a 48-week, multicenter, open-label, phase IIIb trial across 65 sites in North America. HIV-1 RNA less than 50 copies/mL through 48 weeks is reported as time-to-loss of virologic response (TLOVR) for the intent-to-treat (ITT) population and a population that excluded patients discontinuing for reasons other than virologic failure (non-VF censored).
Results: Of 429 patients enrolled (mean age, 42.9 years), 67% (n=287) were women and 84% (n=360) people of color. Baseline mean viral load (VL; log copies/mL) and median CD4 counts (cells/mm^3) were 4.65 and 210 in women and 4.73 and 175 in men, respectively. Significantly more women discontinued treatment versus men (32.8% vs 23.2%; P<0.05); few discontinuations were due to VF (women=2.1%; men=2.8%). ITT–TLOVR response rate was 50.9% for women and 58.5% for men. TLOVR–non-VF censored response rate was 73.0% for women and 73.5% for men. The difference in virologic response (women – men), adjusted for baseline VL and CD4 count, was –9.6 (95% CI: –19.85;0.68) for ITT–TLOVR and –3.9 (95% CI: –13.89;6.02) for TLOVR–non-VF censored, respectively. Frequent (2% or more overall incidence) grade 2–4 adverse events (AEs) in women and men considered possibly related to DRV/r included diarrhea (4.5% and 4.9%, respectively), nausea (5.2% and 2.8%, respectively), and rash (2.1% and 2.8%, respectively).
Conclusion: There were no statistically significant differences in virologic response rates between women and men receiving DRV/r-based therapy and no clinically relevant sex-based differences in AEs over 48 weeks. Women were more likely compared with men to discontinue for reasons other than virologic failure, emphasizing the need for strategies to retain diverse populations in future trials.
Presented at Squires K, Currier J, Averitt Bridge D, Hagins D, Zorrilla C, Ryan R, Falcon R, Tennenberg A, Mrus J, on behalf of the GRACE Study Group. GRACE (Gender, Race And Clinical Experience): 48-week results of darunavir/r-based therapy.

Infectious Diseases

32. A comparison of the efficacy of echinocandins and non-echinocandins in the treatment of Candida parapsilosis: A Meta-analysis.
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Background: Invasive fungal infections are a major cause of morbidity and mortality. In vitro echinocandin activity against *Candida parapsilosis* (CP) is decreased; whether this results in worse treatment outcomes is unclear.
Objectives: To compare the efficacy of echinocandins and non-echinocandins in the treatment of candidemia and invasive candidiasis due to CP.
Methods: The meta-analysis only included studies that met the following stringent criteria: randomized, blinded, published in English and human subjects that provided evaluable data on CP treatment success. Trials were excluded if the echinocandins were not compared to another antifungal class. PubMed, Medline, Toxnet and Cochrane Central Register of Controlled Trials were searched using the terms: echinocandins, candida, and CP. Study quality was assessed using the Jadad scoring system. Number of subjects, age, treatment success rate, was extracted by two investigators independently. Overall CP treatment success with echinocandins was compared to non-echinocandins.
Results: Five studies met all of the selection criteria. Jadad scores ranged from 2–5 out of 5 with a median of 4. Among a total of 1169 patients (mean age 55.5 years, 57.8% men) with invasive candidiasis or candidemia, there were 202 (17.3%) CP. Comparator drugs included fluconazole (n=12), amphotericin B (n=41) and liposomal amphotericin B (n=47). The success rates of treating CP were similar in echinocandin and other antifungal treatment groups (78 of 102 (76.5%) and 73 of 100 (73%) respectively). A fixed-effects model was applied secondary to a low level of heterogeneity among the studies (I2 = 0%). The combined risk ratio shows that echinocandins are not significantly different from other antifungal agents for the treatment of CP (RR 1.03, 95% CI, 0.88, 1.21).
Conclusion: Echinocandins are as effective as comparator drugs to treat invasive candidiasis secondary to CP. Overall, the incidence of adverse events is lower in the echinocandin group, including nephrotoxicity in contrast to the comparator group.

33. Bile and gallbladder tissue concentrations of moxifloxacin in patients with infectious cholecystitis.
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Objectives: Moxifloxacin has broad-spectrum activity against intra-abdominal pathogens including anaerobic bacteria. Although used for cholecystitis, limited data exist on gallbladder tissue and bile penetration of moxifloxacin.

Methods: Ten patients with infectious cholecystitis and planned cholecystectomy were enrolled in this study following written informed consent. Each patient received moxifloxacin 400 mg intravenously over 60 minutes once daily, with at least two doses given before surgery. A blood sample was obtained at the end of the infusion (C_{max}) and during gallbladder removal on the day of surgery, and before the next dose (C_{min}) on the day after surgery. Gall bladder tissue and bile were also obtained. Samples were assayed at National Jewish Health, Denver, CO (Dr. Peloquin) using a validated HPLC assay. The overall validation precision for moxifloxacin quality control samples was 4.2-6.6%.

Results: Eight women and two men were enrolled. Their mean age was 45 years (range, 23–75 years), and mean weight was 104 kg (range, 79–141 kg). The moxifloxacin C_{max} and C_{min} was 4.03 ± 0.75 µg/mL and 1.04 ± 0.55 mcg/mL, respectively. The mean gallbladder tissue and bile concentrations were 4.18 ± 2.50 µg/g and 2.84 ± 1.75 µg/ml, respectively. The simultaneous (surgical) mean serum concentration was 3.05 ± 1.54 µg/ml, resulting in tissue/serum ratios of 1.4 (range, 0.7-3.0) for gall bladder tissue and 0.9 (range, 0.2–9.7) for bile.

Conclusions: Moxifloxacin penetrates into gallbladder tissue and bile, and concentrations exceed the MICs for usual bacterial pathogens associated with acute cholecystitis.

34. Comparison of Health Outcomes and Nephrotoxicity for Diabetic and Non-Diabetic Patients Hospitalized for MRSA Bacteremia.

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Objectives: Type 2 diabetes mellitus is characterized by a progressive worsening of glycemic control. This may predispose diabetics to acquiring and experiencing complications from an array of superficial and systemic infections, including methicillin-resistant *Staphylococcus aureus* (MRSA) infections. The aim of the present study was to compare health care outcomes and nephrotoxicity for diabetics and non-diabetics admitted to the hospital with MRSA bacteremia.

Methods: Patient demographics, laboratory values, site(s) of infection, comorbidities, and medication use were obtained by retrospective chart review. Hospital mortality was the primary outcome, while nephrotoxicity, hospital length of stay (LOS), and intensive care unit (ICU) LOS were secondary outcomes. Peak serum creatinine (SCr_{peak}) was measured to compare nephrotoxicity between groups. χ^2 and Student's *t*-test were used to compare dichotomous and numeric variables, respectively.

Results: Of the 87 patients who met study criteria, 74% were men, 43% were diabetic, and 90% had a CrCl greater than 50 mL/minute. Patients with and without diabetes were similar with respect to most baseline characteristics except mean age (48 vs. 43 years, p=0.03) and Charleson Co-morbitidty Index (3.4 vs. 2.3, p<0.01). The most common sources of MRSA bacteremia were skin or soft tissue (45%) and pulmonary (22%) sites, followed by osteomyelitis (14%), endocarditis (9%), genitourinary (7%), and catheter-related (3%) infections. Medication use was similar between groups, with 87% of patients receiving vancomycin 1 g every 12 hours initially, 71% receiving at least one vancomycin dose adjustment, and 28% receiving concomitant aminoglycosides. There were no significant differences with respect to mortality [1(3%) vs. 5(10%) deaths, p=0.5], SCr_{peak} (1.47 vs. 1.46 mg/dl, p=0.36), LOS (19.5 vs. 23 days, p = 0.85), and ICU LOS (3.3 vs. 4.5 days, p=0.5).

Conclusion: Diabetics and nondiabetics admitted to the hospital with MRSA bacteremia experience similar health outcomes including mortality, nephrotoxicity, LOS, and ICU LOS.

35. Bioactivity of tetracycline antibiotic lock therapy in a model of catheter infection.

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Objectives: Instillation of an antimicrobial lock solution into the catheter, as an adjunctive therapy, is an option for central line-associated bloodstream infections (CLABSI) when the catheter is retained. Proven activity of minocycline in a lock solution supports investigation of additional tetracycline antibiotics. This study evaluates the activity of tetracycline antibiotic lock solutions against clinical isolates using a model of intravenous catheter infection.

Methods: The following lock solutions were evaluated: tetracycline 3 mg/mL, doxycycline 3 mg/mL, EDTA 30 mg/mL, and phosphate-buffered saline (PBS) as the control solution. Gentamicin (Gent) 5 mg/mL plus heparin served as an active control. The influence of variable saline concentrations on microbial growth was also investigated (data not presented here). Candidate lock solutions were tested with and without EDTA against the following organisms (isolated from CLABSI): methicillin-sensitive *Staphylococcus aureus* (MSSA), *Staphylococcus epidermidis* (CoNS), *Pseudomonas aeruginosa* (PSA), and *Candida albicans* (CA). Analysis was performed on 1-cm silicone Hickman catheter segments incubated overnight at 37°C in inoculated tryptic soy broth. The catheters were washed in PBS and incubated in the candidate lock solutions for periods of 0, 2, 4, and 24 hours. After the specified period, the segments were removed and washed in PBS, sonicated for 3 minutes, and vortexed for 10 seconds. The resulting solution was serial diluted and surface plated on blood agar. After incubating for 24 hours, colony-forming units (CFU) were counted and converted to log. Each condition was tested in quadruplicate, and a geometric mean was determined. Statistical analysis evaluated a reduction in CFU by individual lock solutions compared with PBS at the 24-hour data point.

Results:

Lock Solutions	Mean Log CFU Reduction at 24 h			
	MSSA	CoNS	PSA	CA
Tetracycline+EDTA1	3.73*	4.27*	2.66	0.18
Tetracycline	4.74*	4.73*	3.37*	1.08
Doxycycline+EDTA1	4.74*	4.98*	3.85*	3.75*
Doxycycline	3.79*	4.73*	4.32*	3.95*
EDTA	3.05*	3.96*	2.85	1.21
Gent+Heparin2	4.74*	5.24*	4.42*	3.95*
PBS (Control)	1.08	1.03	+0.08	+0.06

130 mg/mL; 21,000 units/mL; *p<0.05

Conclusions: Doxycycline, with and without EDTA in solution, significantly reduced the colony count of all isolates tested. Given the potential as an alternative to minocycline, doxycycline deserves further investigation as a candidate lock solution.

36. Colistin use for multi-drug resistant Acinetobacter infections.

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Objectives: Acinetobacter species are common nosocomial pathogens that are sometimes treated with colistin. Studies have reported a variable association between renal dysfunction and colistin use. This study evaluated the use of colistin in patients with *Acinetobacter* infections at our institution.

Methods: A retrospective review of patients treated with intravenous colistin from 2003 to 2006 was conducted. Clinical outcomes were assessed to evaluate efficacy, where positive outcomes were characterized as cure or improvement. Worsening symptoms or death during therapy was considered negative. Microbiological cure, recurrence and toxicity of the drug were examined. Acute renal dysfunction was defined as serum creatinine levels above 50% from baseline.

Results: Thirty patients were included in the study. Among these 30

patients, 33 cases were evaluated. The median length of hospital stay was 61 days (17-417 days), where the median hospital day when colistin started was day 29. Patients were treated for an average of 11.9 days (1-36 days), and the mean dose was 4 mg/kg/day. The median APACHE II and Charlson scores were 27 and 4, respectively. Positive outcomes were observed in 12 (36%) of infections, and negative outcomes in 17 (52%) of infections. No clinical change was observed in 4 (12%) infections. Microbiological cure occurred in 6/22 (27%) versus failure in 16/22 (73%). No recurrence was observed in evaluable patients. There was no statistical difference in clinical outcomes between mono- and combination therapy. Among 28 evaluable patients, nephrotoxicity occurred in five (18%). Death occurred in 8 (27%) patients at end of colistin therapy.
Conclusion: Though outcomes in our critically ill populations were largely negative, colistin may offer clinical benefit as a last-line agent for Acinetobacter infections. Low rates of acute renal dysfunction were seen in this population despite the severity of illness.

37E. Evaluation of a multidisciplinary intervention on initial vancomycin dosing in the intensive care unit.
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Objectives: A multidisciplinary intervention to improve the initial dosing of vancomycin was implemented with the goal of decreasing the number of subtherapeutic first troughs and increasing the number of therapeutic troughs.
Methods: Using the best available evidence, a nomogram was created to determine the initial vancomycin dose for patients admitted to the medical intensive care unit. The nomogram utilized actual bodyweight and glomerular filtration rate (GFR) estimated with the $MDRD_4$ equation. The dose was based on the 2009 ASHP/IDSA/SIDP guidelines which recommend 15–20 mg/kg every 8–12 hours. Providers ordered "vancomycin dosed per pharmacy." The goal vancomycin trough range was 10–20 µg/ml.
Results: The pre- (n = 65) and post-intervention (n = 68) cohorts had similar demographics with average age 53.8 and 51.5 years, 46% and 50% women, 84.1 and 88.4 kg actual body weight, 87.4 and 86.3 mL/minute/1.73 m^2 estimated GFR. The average total daily vancomycin dose was similar among pre- and postintervention groups (2,211 vs. 2,221 mg, p=0.67) and there was no significant difference in average troughs (14.5 vs. 16.3 µg/ml, *p*=0.24). Following the intervention, the proportion of troughs under 10 µg/ml significantly decreased (33.8% to 14.7%, p=0.008), while the proportion of troughs in the 10-20 mcg/ml therapeutic range significantly increased (50.7% vs. 67.6%, p=0.035). There was no difference in the proportion of troughs over 20 µg/mL (15.4% vs. 17.6%, p=0.81). An improvement in therapeutic troughs of similar magnitude was also seen in subgroups, including patients with GFR less than 60 or GFR greater than 90, and patients at the extremes of body weight (less than 60 kg or more than 100 kg).
Conclusions: A multidisciplinary intervention utilizing pharmacist-guided and nomogram-based dosing significantly improves the proportion of therapeutic initial vancomycin troughs and decreases the number of subtherapeutic troughs by half.
Presented at Presented at the Society of Hospital Medicine Meeting, Washington D.C., April 8-11, 2009.

Medication Safety

38. Characterization of medication errors in pediatric patients.
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Objectives: Previous studies in adult and pediatric patients have examined the association between time of day and medical errors. No studies have examined the association between medication errors and the time of day. This study was designed to characterize the types of medication errors that occurred in pediatric patients and to examine the influence of time of day on the rate and types of medication errors.
Methods: Medication error reports for pediatric patients over a one year period were reviewed and characterized by day and time, error type, medications involved, and error severity. Error severity was defined by the National Coordinating Council for Medication Error Reporting and Prevention. Data on error type and severity was collected and determined by two independent observers. Data discrepancies were resolved by a pediatric pharmacist.
Results: There were 140 unique medication errors reviewed with 35% during 1st shift, 33.5% during second shift, and 31% that occurred at an unknown time or over multiple shifts. Many errors were related to multiple parts of the distribution process. Over half (56%) of the errors were related to medication administration, 35% were related to preparation and dispensing, 24% were related to transcription of orders primarily to medication administration records, 12% occurred during the ordering process, and equipment factors contributed to 9% of errors. There was no correlation between error types and shift. Most errors (61%) were category C, meaning that the error reached the patient, but did not cause harm. Category B errors that did not reach the patient were the second most common (24%). There did not appear to be a correlation with shift and error severity.
Conclusion: Medication errors occurred at multiple points in the distribution process. Additional data on doses dispensed can help draw conclusions regarding an association between medication errors and the time of day.

39. A randomized trial of a warfarin management protocol to enhance communication between nursing home staff and physicians: the SBAR approach.
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Objectives: More than 1.6 million Americans currently reside in nursing homes. As many as 12% receive long-term oral anticoagulant therapy with warfarin. Previous research demonstrates overwhelming evidence of safety problems with warfarin therapy in this setting. These problems result from suboptimal prescribing and monitoring and inadequate communication between nursing home staff and prescribing physicians.
Methods: We conducted a randomized trial of a warfarin management protocol using facilitated telephone communication between nurses and physicians caring for residents of 26 nursing homes in Connecticut. Intervention facilities received a warfarin management communication protocol developed around the SBAR approach—an acronym for Situation, Background, Assessment, and Recommendation. The protocol included methods of identifying and highlighting residents taking warfarin, systematic procedures for tracking and communicating INR test results, a targeted training program for nursing staff, and an SBAR template to standardize telephone communication about residents on warfarin between nursing staff and physicians. The template emphasized providing standardized information about the situation triggering the call, relevant background information about the resident related to the use of warfarin therapy, the nurse's assessment of the resident's condition, and recommendations.
Results: 435 residents received warfarin therapy during the study period for a total of 55,167 days in the intervention homes and 53,601 in control homes. In intervention homes, residents' INR values were in the therapeutic range 4.37% more of the time than in control homes (95% CI 0.005, 8.74). Rates of preventable adverse warfarin-related events (AWEs), such as bleeds, were lower in intervention homes, although this result was not statistically significant: the incident rate ratio (IRR) for any preventable AWE was 0.85 (CI 0.53, 1.4); for a serious preventable AWE the IRR was 0.54 (CI 0.19, 1.5).
Conclusion: Facilitated telephone communication between nurses and physicians using the SBAR approach can improve the quality of warfarin management for nursing home residents.

40. Comparative analysis of intravenous fluid preparation in the hospital pharmacy and at the ward.

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Objectives: To analyse the safety and the costs of translocating the preparation of intravenous fluids from the intensive care unit to the hospital pharmacy.

Methods: 215 preparations of amiodarone, noradrenaline or hydrocortisone from two different intensive care wards and from the pharmacy were analysed by HPLC for the respective drug concentration. Production at the wards was manual, whereas production at the pharmacy was automated and generated ready-to-use syringes. Employer's staff costs of the production of intravenous fluids was analysed comparatively for preparation at the ward vs. preparation within the hospital pharmacy.

Results: The analysis of drug concentrations in preparations from the ward and from the pharmacy showed that an acceptable deviation of less than 5% from the nominal concentration was achieved in 52% of the ward samples and 83% of the pharmacy samples. A deviation between 5 and 15% was achieved in 34% and 17%, respectively, and 13% of the ward samples showed a deviation between 15 and 55% of the nominal value. Analysis of the costs showed that production at the pharmacy is cost-saving if formulations are prepared batch-wise in sizes of more than four units.

Conclusion: Production of intravenous fluids at the hospital pharmacy instead of at the ward is safer, because the concentrations show less deviation from the declared value. It is also cost-saving if production is batch-wise. This necessitates an adequate shelf life of the ready-to-use intravenous fluid.

Nephrology

41. An assessment of different body weights and serum creatinine values used to estimate creatinine clearance.

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Background: The Cockcroft-Gault (CG) equation is used clinically to estimate creatinine clearance(CrCl). There are a variety of ways to adjust the variables in the equation to estimate the CrCl.

Objectives: To establish the body weight and serum creatinine (SCr) values which most accurately estimate the CrCl compared to 24 hour urine collection CrCl determination.

Methods: A systematic literature search of PubMed and MEDLINE was conducted from inception to June 2009. Publications were included in this meta-analysis if they (1) were published in full in the English language, (2) used 24 hour urine collections as the means to calculate CrCl, (3) reported CrCl values as mean and standard deviation and either (4)used multiple body weights (Total body weight (TBW), Ideal body weight (IBW), Lean body mass (LBM), Adjusted body weight (ABW) and No body weight (NBW)) in the CG equation, or (5) utilized SCr rounding in patients with low SCr . All statistical analyses were completed using RevMan (5.0.15).

Results: Twelve studies were included. TBW, IBW and LBM overestimated CrCl (mean difference (MD) 11.80 ml/min 95% CI -12.88, 36.48; MD 39.82 ml/min 95% CI 13.08, 66.55; MD 8.22 ml/min 95% CI -6.39, 22.83 respectively). ABW underestimated CrCl whether a correction factor of 0.3 or 0.4 was used (MD -15.4 ml/min 95% CI -31.66, 0.68; MD -24.23 ml/min 95% CI -45.95, -2.50 respectively). NBW most accurately estimated CrCl (MD 0.00 ml/min 95% CI -7.82, 7.83). Use of actual SCr underestimated CrCl whereas rounded SCr overestimated CrCl (MD -2.01 ml/min 95% CI -16.50, 12.49; MD 21.83 ml/min 95%CI 10.01, 33.66 respectively).

Conclusion: NBW and use of actual SCr most precisely estimated CrCl using the CG equation compared to 24 hour measured CrCl.

42. Evaluation of a new method of estimating kidney function for dosing antimicrobials.

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Objective: To determine if a difference exists when making antimicrobial dosage adjustments in patients with CKD based upon estimation of GFR using the CKD-EPI and CG equations.

Methods: A database of 409 patients with CKD admitted to a tertiary care facility was used. GFR was calculated using both the CKD-EPI equation(s) and the CG equation and compared using correlation and Bland-Altman methodology. Dosage discordance rates of antimicrobials were determined.

Results: Average GFR for all patients using the CG and CKD-EPI equations was 34.8 ± 12 mL/min and 39.9 ± 13 mL/min (5.09 (95% CI 4.60–5.59), $p<0.001$), respectively. The correlation coefficient between the two estimations was high ($r = 0.91$). The Bland-Altman plot yielded limits of agreement of 15.3 and -5.1, thus the CKD-EPI estimation may range from 5.1 mL/min below to 15.3 mL/min above the CG estimation for 95% of the cases. A discordance rate of 15 – 25% existed among the recommended dosing adjustments of the selected antimicrobials when comparing the CG and CKD-EPI estimations.

Conclusions: This analysis demonstrated statistically significant differences between the CG and CKD-EPI equations, with the two equations resulting in different dosing recommendations in 15 – 25% of patients. The clinical significance of these differences is uncertain in the absence of data regarding clinical outcomes that would result from the use of the discordant doses.

43. Clinical outcomes associated with two Darbepoetin Alfa dosing strategies in hospitalized patients with anemia of chronic kidney disease requiring hemodialysis.

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Objectives: To assess two different darbepoetin alfa dosing strategies, traditional vs. aggressive, and their effects on hemoglobin (hgb) values during hospitalization and up to two months after discharge. Secondary objectives looked at adverse events and cost.

Methods: A retrospective chart review was conducted on hemodialysis patients and categorized into one of two treatment groups: Group A included patients initiated on darbepoetin (equivalent to outpatient epoetin regimen with an acceptable dose increase of 25%) and titrated per standard of care as defined by no more than 25% increase within a one week period, and Group B (aggressive management) included patients initiated on high dose darbepoetin (defined as greater than a 25% increase over previous outpatient dose; dose increase sooner than 1 week after first dose; and doses more frequently than once per week). Additional outpatient data was collected up to two months post-discharge

Results: The mean Hgb on admission was 12.5 and 11.8 for group A and B, respectively, 11.3 and 10.2 at discharge, 11.7 and 11.5 at 30 days after discharge, and 11.9 and 13.4 at 60 days after discharge. The difference at 60 days follow-up between the two cohorts was statistically significant (p 0.018). The percentage of patients in group A and group B with Hg values greater than 13 at 30 days post-discharge were 19% and 23%, respectively; and at 60 days postdischarge, 20% and 73%, respectively ($p=0.002$).

Conclusion: Data from this retrospective cohort study suggest that hospitalized hemodialysis patients can be maintained in a fiscally responsible manner on equivalent outpatient darbepoetin doses and achieve therapeutic hemoglobin concentrations within 30 days postdischarge. Aggressive increases or the practice of "bolusing" patients does not mitigate their hemoglobin decline during hospitalization and may lead to hemoglobin concentrations above 13 mg/dL, which have been associated with adverse events.

44. Measured creatinine clearance versus the modification of diet in renal disease and Cockcroft-Gault equations for renal function assessment and drug dosing recommendations.

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Objectives: This study sought to determine which equation, Modification of Diet in Renal Disease (MDRD) or Cockcroft-Gault, most closely estimates measured creatinine clearance (CrCl); identify

which body weight provides the best CrCl estimate when incorporated into the Cockcroft-Gault equation; and determine whether the Cockcroft-Gault and MDRD equations produce differing dosing recommendations.
Methods: Twenty-four hour urine samples measured CrCl for 73 patients. Pearson's correlation coefficient was performed to assess the strength of association between measured and estimated CrCl, whereas a multivariate linear regression model adjusting for demographics, medical history, and the various estimation equations was used find the best predictor of measured CrCl. based on the renal function estimated by each equation, dosing recommendations were simulated and compared.
Results: Measured CrCl was more closely associated with aggregate CrCl (r=0.757; defined as using actual body weight for patients weighing less than their ideal body weight [IBW], adjusted body weight for obese patients, and IBW for all others) than with the MDRD equation (r=0.533) or the Cockcroft-Gault equation using ideal, adjusted or actual body weight alone (r=0.697, 0.751, and 0.743, respectively). The regression model demonstrated that the aggregate CrCl (p=0.024) is the best predictor of measured CrCl. Comparing dosing recommendations based on MDRD and Cockcroft-Gault (using aggregate weight), differences were detected for several medications, with MDRD more often resulting in higher or more frequent doses.
Conclusion: Guidelines state that either the MDRD or Cockcroft-Gault equation may be used to adjust doses of renally cleared medications, however these results indicate that the Cockcroft-Gault equation using aggregate weight provides the best estimate of measured CrCl. Moreover, this study indicates that important dosing differences exist between the equations. Therefore, pharmacists should continue to use the Cockcroft-Gault equation, using aggregate weight, to recommend dose adjustments for renally cleared medications.

45E. Effect of oral cromolyn sodium on CKD-associated pruritus and serum tryptase level: A double-blind placebo-controlled study.
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Objective: Generalized pruritus is a significant complication in end stage renal disease patients. The mechanism is unknown and most treatments are ineffective. This study is the first clinical trial designed to evaluate the effect of cromolyn sodium (CS) on renal itch.
Methods: Sixty two hemodialysis (HD) patients with pruritus were enrolled into the study, and were randomly assigned to receive CS or placebo (135 mg three times daily) for eight weeks. Patients were asked to record the severity of their pruritus on each dialysis session on a visual analogue scale (VAS) during the 8 weeks of treatment and four weeks following discontinuation of treatment. Serum tryptase levels were determined at baseline, after eigh weeks of treatment and four weeks after discontinuation of treatment.
Results: Data were analyzed in 21 patients in the CS group and 19 patients in the placebo group that completed the study. A significant difference was seen in the severity of pruritus between the two groups during the period of study. Level of pruritus decreased from 8.48±2.2 to 0.9±1.8 after eight weeks of treatment with CS. Geometric mean of serum tryptase at baseline and eight weeks after treatment were 21.3 and 19.5 ng/ml for the CS group, and 18.03 and 18.2 for the placebo group respectively. Although the geometric mean of tryptase had decreased in the CS group, this decrease was not statistically significant (p=0.214).
Conclusion: CS can significantly reduce the severity of pruritus in HD patients, but this effect is not due to a decrease in serum tryptase level.
Will soon be published in Nephrology Dialysis Transplantation

46E. Recombinant hirudin (lepirudin) use in patients with renal impairment and heparin-induced thrombocytopenia (HIT) type 2.
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Objectives: To describe the outcomes of lepirudin therapy in patients with HIT type 2 and severe renal impairment (SRI) who received lepirudin per St. Joseph Mercy Health System's (SJMHS) lepirudin dosing guideline and to evaluate the efficacy and safety of the guideline in patients with HIT type 2 with and without severe renal impairment
Methods: Medical records of patients with suspected/documented HIT type 2 who received lepirudin and met predefined inclusion/exclusion criteria were retrospectively reviewed. The aPTT values within the first 24 hours after lepirudin initiation, occurrence of major bleeding events (MBEs) and thromboembolic complications (TECs) during lepirudin therapy, and inpatient mortality were evaluated.
Results: Ninety-five patients were included in the study. Nineteen had severe renal impairment and 76 had normal renal function (NRF) to moderate renal impairment (MRI). The mean time to first documented therapeutic aPTT was 12.3 hours (SD, 11.6; median, 8.1) in the SRI group. A therapeutic aPTT within the first 8 hours of lepirudin therapy was found in 42.1% and 75.0% of patients with SRI and patients with NRF-MRI, respectively (p=0.011). MBEs in the SRI group were 31.6% compared to 28.9% in the NRF-MRI group (p=0.786). Rate of TECs in patients with SRI was 10.5% compared to 5.3% in the NRF-MRI group (p=0.596). Mortality in the SRI group was 52.6% compared to 18.4% in the NRF-MRI group (p=0.006).
Conclusion: This study found that severe renal impairment patients had sub-optimal monitoring and more sub-therapeutic aPTTs compared to patients without severe renal impairment. Although there was no statistically significant difference in major bleeding events and thromboembolic complications between the two groups, a significantly higher mortality rate was seen in the severe renal impairment group. Lepirudin dosing in severe renal impairment patients requires further study. Improvements in monitoring are warranted for all HIT type 2 patients receiving lepirudin at SJMHS.
Presented at Great Lakes Pharmacy Resident Conference, West Lafayette, IN, April 29 - May 1, 2009.

Oncology

47. An evaluation of adverse interactions of 5-fluorouracil and capecitabine with warfarin.
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Objective: The purpose of this study was to evaluate the differences between the drug-drug interactions of capecitabine and 5-fluorouracil with therapeutic doses of warfarin.
Methods: This was a single-center, retrospective cohort chart review of patients receiving warfarin and either 5-fluorouracil or capecitabine concomitantly from January 2004 through May 2008. Patients were eligible for the study if the target INR for warfarin therapy was at therapeutic range. Patients were excluded if warfarin was being used for primary prophylaxis or central catheter patency. The primary outcome of the study was mean change in INR from baseline.
Results: Twenty-four eligible patients were identified for the analysis. Out of these, 15 patients (5-fluorouracil N=9 and capecitabine N=6) were on warfarin before receiving fluoropyrimidines-based chemotherapy. There were no differences in the average weekly warfarin dose and baseline INR of the 5-fluorouracil and capecitabine groups. The mean changes in INR for patients on warfarin before administration of the fluoropyrimidines were 4.62 for 5-fluorouracil compared with 5.11 for the capecitabine group (P=0.87). The capecitabine group had higher proportions of patients achieving an INR of >3 while on warfarin (83% vs. 56%; P=0.58). Within ninety days of concurrently receiving chemotherapy with warfarin, no significant difference in bleeding events was reported.
Conclusions: The study suggests that there is no significant difference in INR elevation in 5-fluorouracil compared with capecitabine. Practitioners should avoid changing 5-fluorouracil to capecitabine or vice versa, primarily out of concern of drug-drug interaction with warfarin.

Pediatrics

48E. Omalizumab Reduces Asthma Exacerbations in Children (6-<12 Years) With Moderate-to-Severe Allergic (IgE-Mediated) Asthma Irrespective of Baseline LABA Use.

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Objectives: Many children have inadequately controlled allergic asthma despite optimized treatment. We assessed the efficacy of omalizumab (OMA) in children with allergic (IgE-mediated) asthma in long-acting β_2-agonist (LABA) users and non-LABA users at baseline.

Methods: A 52-week, multicentre, double-blind study was conducted in children with inadequately controlled moderate-to-severe allergic (IgE-mediated) asthma. Children on optimized asthma care (fluticasone ≥200 µg/day or equivalent with or without other controller medications) were randomized (2:1) to subcutaneous OMA (75–375 mg q4wk or q2wk) or placebo (PBO). The primary endpoint was the rate of asthma exacerbations at Week 24. Exacerbation rates by LABA use at baseline are also presented.

Results: 627 patients were randomized, 576 were evaluated for efficacy (OMA, n=384; PBO, n=192); 66% (n=381) were LABA users at baseline. Exacerbation rates were reduced with OMA vs. PBO at Week 24 in all populations and further reduced at Week 52 (see table).

Conclusion: OMA reduced exacerbations in children with moderate-to-severe allergic (IgE-mediated) asthma; efficacy is similar irrespective of baseline LABA use.

Exacerbation rate ratio,

OMA:PBO (95% CI)	Week 24	Week 52
Overall	0.69 (0.53, 0.90)*	0.57 (0.45, 0.73)**
LABA users	0.75 (0.54, 1.04)	0.56 (0.42, 0.74)**
Non-LABA users	0.55 (0.35, 0.86)*	0.58 (0.38, 0.88)*

*p<0.05; **p<0.001

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Pharmacoeconomics/Outcomes

49. Analysis of out-of-pocket expenditures of targeted oncologics in Medicare Part D-2009.

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Objectives: The primary goal of the study is to outline costs for Medicare enrollees in Tennessee using targeted oral oncology drugs where benefit plan design features such as monthly premiums, deductibles and cost sharing can have a great effect on enrollees' out-of-pocket expenses. These drugs were chosen due to the potentially significant effect on a Medicare Part D beneficiary's out-of-pocket expenses. The drugs for the study were identified based on the following characteristics: 1) oral dosage form, 2) cost greater than $500 per month, 3) unique mechanism of action, 4) spectrum of oncologic conditions treated and 4) identification in prior studies.

Methods: An analytic model was used to evaluate the impact of monthly premiums, deductibles, cost sharing and prior authorization on out-of-pocket costs. Bivariate regression analysis was used to predict the significance of each of the aforementioned parameters on patients' out-of-pocket expenses. Further analysis predicts to what degree each parameter affects out-of-pocket expenses.

Results: From the regression results, the parameter most strongly associated with out-of-pocket expenses is monthly premiums, R-square 81.58%, followed by cost sharing, deductibles and prior authorization. For every $1 increase in monthly premium, out-of-pocket expenses increase by $14.29 (p<.001). When evaluated at the mean of monthly premiums, this parameter adds $639.33 to the adjusted mean of out-of-pocket expenses.

Conclusion: This analysis shows that plan design and drug utilization management are responsible for considerable variations in beneficiaries' out-of-pocket costs for the nine study drugs across the forty-eight Medicare Part D plans in Tennessee. The potential exists for decreased compliance and worse outcomes as patients' out-of-pocket expenses increase.

50. Cost-effectiveness of current treatment options in treatment-resistant HIV/AIDS patients in the United States.

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Objectives: To perform a comprehensive economic evaluation of all pharmaceutical options in treatment-experienced HIV/AIDS patients in the United States, using the efficiency frontier (EF) approach.

Methods: Ten published RCTs were identified for the target population (POWER 1&2, RESIST 1&2, MOTIVATE 1&2, DUET 1&2, BENCHMRK 1&2), from which we extracted baseline characteristics, percentage of patients with viral load less than 50 copies/mL at week 48 (response rates), enfuvirtide (ENF) use as comedication, and its impact on response and all antiretroviral therapies used. Unit drug costs were Average Wholesale Prices obtained from the 13th Annual HIV Drug Guide. The results of all treatment arms (+/– ENF) were plotted on a coordinate system with annual drug costs per patient ('cost') on the horizontal axis and response rates over one year ('value') on the vertical axis. The latter was adjusted for baseline characteristics using logistic regression on patient level data from DUET. Uncertainty analysis was performed using a probability density approach with 1000 simulations determining the probability that a given option falls on the efficiency frontier (i.e., offers the best value/cost).

Results: Twenty-six value/cost points were created representing all options. Drug costs per year per patient varied between $33,252 and $82,100 and response rates varied between 8.4% and 69.3% in the base case. Etravirine combined with darunavir/r and optimized background regimen (OBR) were most likely to fall on the EF (89.1% chance), followed by raltegravir+darunavir/r + OBR (20.3%). The last line segment of the frontier had a slope of $2,535.60 (95% CI: $1497.30–$4029.60) per extra percentage of response.

Conclusion: Constructing an EF plot was feasible using adjustment for baseline characteristics. Regimens containing etravirine and darunavir/r are most likely to be economically efficient. Longer-term evaluations including all health care costs could add valuable information but would require many assumptions given the limited available data for the 26 compared strategies.

Pharmacoepidemiology

51. Evaluating adverse drug events (ADEs) leading to emergency care.

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Objectives: The objective of this study was to analyze the details concerning the emergency care of community-based outpatients seeking treatment for possible ADEs.

Methods: A pharmacist investigator retrospectively reviewed the medical records of outpatients presenting to the emergency department (ED) of a community hospital from January 2007 through June 2009 and identified patients with ADEs by ICD-9-CM codes. The same investigator evaluated all study data.

Results: Three hundred seventeen patients, 198 females and 119 males, aged one month to 96 years, presented for ED care. ADE-related chief complaints were categorized as dermatologic (138), neurologic (51), gastrointestinal (27), cardiovascular (25), endocrine (23), respiratory (18), psychiatric (12), and hematologic (11). Ninety-three patients presented with rash. Patients primarily reported ADEs to antibiotics (94), anti-inflammatory agents (28), analgesics (28), anticoagulants (15), and anticonvulsants (6). Amoxicillin accounted for the single highest number of ADEs. Triage nurses ranked patients' clinical conditions as resuscitation (1), emergency (14), urgent (217), less urgent (78), nonurgent (6), and not evaluated (1). Onset of ADEs was categorized by time since the last dose as fast, less than 15

minutes (4); moderate, 15 minutes to 3 hours (61); or slow, more than 3 hours (252). Using standardized definitions, investigators classified ADEs by causation as confirmed (1), likely (85), possible (230), unlikely (1); by severity as negligible (20), moderate (265), or severe (32); and by outcome as minor (208), serious discomfort (106) and death (3). Medical evaluations utilized laboratory and/or radiological examinations in 43.9% of 189 patients. Treatments varied widely with admitting clinical conditions.
Conclusion: Outpatients experienced a wide variety of ADEs from commonly prescribed medications, documenting the need for continued pharmacovigilance and follow-up.

Pharmacogenomics/Pharmacogenetics

52. Association between angiotensinogen genotype and aldosterone levels in heart failure.
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Objectives: Aldosterone contributes to heart failure by promoting sodium reabsorption and cardiac remodeling. There are common polymorphisms in the angiotensinogen (*AGT*) gene that have been associated with angiotensinogen and aldosterone concentrations in hypertension. We sought to determine whether *AGT* genotype is associated with aldosterone concentrations in patients with heart failure.
Methods: Venous blood samples were obtained between 0800 and 1300 from 127 aldosterone antagonist-naïve patients with heart failure and left ventricular systolic dysfunction. The *AGT* c.-20A>C, c.-6A>G, rs2148582 (C/T), p.T207M, and p.M268T genotypes were determined by PCR and capillary sequencing. Serum aldosterone was determined by radioimmunoassay and compared between *AGT* genotype groups.
Results: Median (IQR) aldosterone concentrations differed significantly among genotype groups, with lower concentrations in homozygotes for the -20C/-6A/268T haplotype (p=0.026) and a trend toward higher concentrations among patients with the 207M/rs2148582T allele (p=0.057) compared to those with other genotypes. Heart failure severity and drug therapy were similar among genotype groups; however, potassium levels tended to be lower among 207M/rs2148582T carriers (p=0.051).

Serum measure	207M/ rs2148582T carriers (n=6)	-20CC/ -6AA/268TT carriers (n=5)	Others (n=116)
Aldosterone (pg/mL)	216 (154–255)	58 (47–71)	106 (68–162)
Potassium (mEq/L)	3.7 (3.6–3.8)	4.6 (4.2–4.8)	4.3 (4.0–4.5)

Conclusion: Aldosterone concentrations differed among heart failure patients with varying *AGT* genotypes. If confirmed, our findings could have implications for the pharmacologic management of heart failure, including individualized use of aldosterone antagonists based on genotype.

Pharmacokinetics/Pharmacodynamics

53. Fixed-Dose Combination Tablets of Saxagliptin and Metformin Extended Release (XR) are Bioequivalent to the Same Strengths of Concomitantly Administered Individual Tablets of Saxagliptin and Metformin XR.
David Boulton, Ph.D., Weijiang Zhang, Ph.D., Ming Chang, M.S., Li Li, Ph.D., Angela Tang, Pharm D., Cynthia Yones, R.N., Ernst U. Frevert, M.D., Vijay V. Upreti, Ph.D., Su Nam, M.D., Ph.D., Xiaohui Xu, Ph.D., Frank P. LaCreta, Ph.D., Chirag G. Patel, Ph.D.; Bristol-Myers Squibb Co. R&D, Princeton, NJ
Objectives: Saxagliptin/metformin XR fixed-dose combination (FDC) tablets offer potential for increased patient convenience and compliance compared with individual tablets. Two bioequivalence studies assessed: the fed-state bioequivalence of FDCs at doses of 5-mg saxagliptin/500-mg metformin XR (5/500) [Study 1] and 5-mg saxagliptin/1000-mg metformin XR (5/1000) [Study 2] to the same strengths of concomitantly administered individual tablets. The effect of food on the pharmacokinetics of the FDCs was also investigated.
Methods: These were single-dose, open-label, randomized, 3-period, 3-treatment, crossover studies in healthy subjects (n=24 in each study). The treatments were: an FDC tablet in the fed state and fasted state on separate occasions, and the same strength tablets of saxagliptin and metformin coadministered in the fed state. Safety and tolerability of each treatment were evaluated.
Results: One subject withdrew from Study 1 as a result of an adverse event (mild fever/sore throat during washout); all other subjects completed the study. For both studies, saxagliptin and metformin in the FDCs were bioequivalent to the individual components, as the limits of the 90% confidence interval of the ratio of adjusted geometric means for all key pharmacokinetic parameters were contained within 0.8, 1.25. Compared to the fasted state, food did not have a meaningful effect on the pharmacokinetics of saxagliptin and metformin XR when administered as FDCs. Coadministration of saxagliptin and metformin XR was generally safe and well tolerated as the FDCs or as individual tablets.
Conclusion: 5/500 and 5/1000 FDCs were bioequivalent to individual tablets of saxagliptin and metformin of the same strengths. Additionally, food had little effect on the pharmacokinetics of saxagliptin and metformin administered in the FDCs. No unexpected safety concerns were observed with saxagliptin/metformin XR administration. The tolerability of the FDC of saxagliptin/metformin XR was comparable to that of the coadministered individual components.

54. Influence of pregnancy, race and oral contraceptive use on azithromycin pharmacokinetics in women of child bearing potential.
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Objectives: Azithromycin is frequently prescribed for pre-menopausal women, including during pregnancy. This study determined azithromycin pharmacokinetics (PK) in pregnant and nonpregnant women and identified covariates contributing to PK variability.
Methods: Plasma samples were collected using a sparse sampling strategy in pregnant, 12-40 weeks gestational age, and nonpregnant women of child bearing potential receiving oral azithromycin for treatment of infection. PK data from 12 healthy women with extensive sampling were also included. Plasma samples were assayed for azithromycin by HPLC. Population PK data were analyzed by nonlinear mixed effects modeling.
Results: PK analysis included 53 pregnant and 25 nonpregnant women, ages 18-49 years and weights 45 to 178 kg. A 2-compartment model with first-order absorption described the PKs of azithromycin. Mean (relative SE) population PK parameters [reference subject: non-pregnant woman not receiving oral contraceptives with a lean body weight (LBW) of 50kg] were CL/F 206 (7%) L/hr, Q/F 335 (27%) L/hr, Vc/F 1130 (11%) L and Vss/F 5560 (27%) L. Pregnancy status in white (Hispanic and non-Hispanic) and Asian women and oral contraceptive use significantly ($p<0.001$) reduced reference CL/F by 25–35%. Pregnancy did not alter CL/F in women of African American race. Mean (95% confidence interval) individual Bayesian estimates of azithromycin CL/F were 186 (158–193) L/hr in non-pregnant women of any race not receiving oral contraceptives, 131 (116–156) L/hr in nonpregnant women receiving oral contraceptives, 193 (170–202) L/hour in pregnant women of African American race and 133 (127–146) L/hour in pregnant women of white or Asian race.
Conclusion: The similar effects of pregnancy (except African Americans) and oral contraceptives on azithromycin CL/F suggest a common estrogen or progesterone mediated mechanism. The limited number of nonpregnant African American women prevented assessing whether the effect of oral contraceptives was also race specific. The relevance of higher maternal and fetal azithromycin exposure in pregnant white or Asian women requires further study. (Support: FDA Office of Women's Health)

55. Fixed-dose Combination Tablets of Saxagliptin and Metformin Immediate Release (IR) are Bioequivalent to the Same Strengths of Concomitantly Administered Individual Tablets of Saxagliptin and Metformin IR in the Fed and Fasted States.
David Boulton, Ph.D., Ming Chang, M.S., Li Li, Ph.D., Donette

Quamina-Edghill, M.S., Bonnie Hsiang, M.S., Su Nam, M.D., Ph.D., Xiaohui Xu, Ph.D., Ernst U. Frevert, MD, Frank P. LaCreta, Ph.D., Vijay V. Upreti, Ph.D.; Bristol-Myers Squibb Co. R&D, Princeton, NJ
Objectives: Saxagliptin/metformin IR fixed-dose combination (FDC) tablets offer potential for increased patient convenience, compliance, and adherence compared with individual tablets for patients requiring dual oral antidiabetic therapy. Two bioequivalence studies assessed the fed- and fasted-state bioequivalence of FDCs at doses of 2.5 mg saxagliptin/500 mg metformin IR (2.5/500) [Study 1] and 2.5 mg saxagliptin/1000 mg of metformin IR (2.5/1000) [Study 2] with the same strengths of concomitantly administered individual tablets.
Methods: These were single-dose, open-label, randomized, 4-period, 4-treatment crossover studies in healthy subjects (n=24 in each study). The treatments included an FDC tablet in the fed and fasted state on separate occasions, and the same strength individual saxagliptin and metformin tablets coadministered in the fed and fasted state on separate occasions. The pharmacokinetics, safety, and tolerability of each treatment were evaluated.
Results: All subjects completed Study 1. Eighteen subjects completed Study 2. Two subjects withdrew as a result of an adverse event during a washout period (1 ear pain, 1 sore throat); 4 withdrew for other reasons. In both studies, saxagliptin and metformin as the FDCs were bioequivalent to the individual components in the fed and fasted states; the limits of the 90% confidence interval of the ratio of adjusted geometric means for all key pharmacokinetic parameters (C_{max}, $AUC_{0\text{-}T}$, and AUC_{inf}) were contained within the predefined 0.8 to 1.25 bioequivalence criteria. Coadministration of saxagliptin and metformin IR was generally safe and well tolerated as the FDCs or as individual tablets.
Conclusion: 2.5/500 and 2.5/1000 FDCs were bioequivalent to individual tablets of saxagliptin and metformin of the same strengths in both the fed and fasted state. No unexpected safety concerns were observed with saxagliptin/metformin IR administration. The tolerability of the FDC of saxagliptin/metformin IR was comparable to that of the coadministered individual components.

56E. Influence of Dosing Interval on Pharmacodynamic Susceptibility Profiles for Ciprofloxacin against Pseudomonas aeruginosa.
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Objectives: The objective of this study is to evaluate the influence of dosing interval on pharmacodynamic attainment rates for ciprofloxacin against *Pseudomonas aeruginosa.*
Methods: Monte Carlo simulation was developed and evaluated using Stata 10.2 (Stata Corporation, College Station, Texas). Monte Carlo simulation allows inclusion of variability into the analysis when pharmacokinetic and microbiologic data are integrated. One million random free AUC:MIC values were calculated for each ciprofloxacin dosing interval. Probability distributions were plotted and descriptive statistics used to compare the dosing interval.
Results: The results of ciprofloxacin 400 mg intravenously every 12 hours produced AUC:MIC ratios ≥ 90, ≥ 125; ≥ 175; and ≥ 250 in 42%, 29%, 16%, and 8% respectively. The results of ciprofloxacin 400 mg intravenously every 8 hours produced AUC:MIC ratios ≥ 90, ≥ 125; ≥ 175; and ≥ 250 in 46%, 39%, 27%, and 14% respectively.
Conclusion: Results from our study demonstrate that ciprofloxacin 400 mg every eigh hours produces higher PD target rates as compared to ciprofloxacin 400 mg every 12 hours. However, neither dosing interval was able to produce optimal pharmacodynamic susceptibility rates. Further research is needed to be able to translate these findings into optimization of anti-infective dosing for PA infections.
Presented at Presented at South Carolina Society of Health-Systems Pharmacist Meeting, Myrtle Beach, South Carolina March 12-14, 2009.

57. Stability and in vitro dissolution of D-Cycloserine capsules compounded to a strength of 50 mg.
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Objectives: To compound the 50 mg D-Cycloserine capsules for our future clinical studies for the treatment of phobia. Also, to carry out their dissolution of these compounded capsules as per the USP guidelines.
Methods: We proposed the use of a new exposure treatment protocol and the use of Virtual Reality. The effect of D-Cycloserine in a dose 50 mg on fear reduction using this protocol is unknown and represents the main objective of the double blind placebo controlled clinical trial. Seromycin (D-Cycloserine) is available as a 250 mg capsule and was compounded to the nominal strength of 50 mg per capsule using standard compounding techniques. Three capsules were randomly withdrawn from this batch of compounded capsules and were assayed for active by a novel in-house HPLC procedure. It is very important to monitor the stability of these reformulated capsules. These capsules were then put under stability and were analysed for the active content. The in vitro dissolution was carried out at 37°C using Distek Dissolution System 2100C according to the USP 32 guidelines. The samples were withdrawn up to 30 minutes and analysed by the HPLC method.
Results: The mean percent recovery of D-Cycloserine from the compounded capsules was 100.3 ± 1.4. The stability of the reformulated capsules has been done until nine months and each capsule contain at least 90% of the anticipated amount and thus are stable for nine months at room temperature. The in vitro dissolution illustrates that all the D-Cycloserine is released from the capsules in ten minutes.
Conclusion: An acceptable recovery of DCS from the capsules was observed using the HPLC method. A fast release of D-Cycloserine was perceived from the capsules.

Pulmonary

58E. Practice Patterns in the Prescription of Oral Corticosteroid Burst Therapy in the Outpatient Management of Acute Asthma Exacerbations.
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Objectives: The use of a short course of oral corticosteroids (OCS), or steroid burst, is standard practice in outpatient management of acute asthma exacerbations. Although there are published guidelines on the use of OCS in asthma exacerbations, actual practice patterns in this clinical setting are unknown. This study was designed to evaluate the pattern of OCS administration and typical total OCS burst doses used in different physician groups.
Methods: A Web-based survey was administered to pulmonologists (n=150), allergists (150), primary care physicians (155), and pediatricians (150) to assess the physician's typical pattern of OCS administration and total burst dose used in treating an outpatient asthma exacerbation.
Results: Although there was no dominant pattern of OCS prescribing, the most common pattern (39%) was with a fixed, single daily dose with no taper. The total dose in prednisone equivalents ranged from 143 to 220 mg and the treatment duration ranged from 5.0 to 8.2 days among physician groups treating patients 12 years and older. The distribution of the total burst dose varied widely in all physician groups; the dose for physicians treating patients 12 years or older ranged from 5 to 600 mg per burst (median: 160, IQR: 100–280).
Conclusion: Although there are published guidelines on the use of OCS in the outpatient management of asthma exacerbations, this analysis indicates that there is wide practice variation. Further studies are needed to explore outcomes in relation to practice pattern to determine optimal care.
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CLINICAL PHARMACY FORUM

ADR/Drug Interactions

59. Adverse drug reactions with high-dose iron sucrose: a retrospective review.

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Objectives: Intravenous iron products provide benefit for patients with iron deficiency anemia and functional iron deficiency related to malignancy or chronic kidney disease. Higher dose administration has been limited by the incidence of adverse drug events. Our adverse drug reaction service includes an evaluation of medications frequently related to intrahospital events. The purpose of this retrospective analysis is to determine the incidence of adverse drug reactions with high-dose iron sucrose infusions.

Methods: Patients receiving iron sucrose at a dose greater than 200mg per infusion between May 2008 and May 2009 were identified. Parameters evaluated included indication for intravenous iron, dose per infusion, and reaction to medication administration.

Results: Thirty eligible patients were identified as receiving 54 doses of iron sucrose. A majority of infusions were related to iron deficiency anemia (67%), with the remaining related to chronic kidney disease (10%), malignancy (10%), and blood loss (13%). Overall, ten adverse drug events were noted as possibly related to the infusion (10/54, 18.5%), with five events associated with 500 mg and 5 with the 300 mg dosages. There were no events identified with the 400 mg infusion. The most common reaction noted was chest pain/tightness (5/10), followed by rash/pruritus (3/10), and swelling of the face or extremities (2/10). One serious event occurred, requiring prolonged hospitalization.

Conclusion: High-dose iron sucrose infusion was associated with a considerable incidence of adverse events in our institution. Patient and provider education will be continued regarding the nature and management of these events.

Adult Medicine

60. Accuracy of the Initial Medication History in Acutely Injured Patients.

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Objectives: To determine the reliability of the admission physician-elicited medication history by comparing initial data with medication histories taken subsequently by the nurse and clinical pharmacist.

Methods: A prospective cohort study of conscious trauma patients admitted through emergency department to the trauma unit from January 2009 through September 2009. Medication histories (taken by admitting physician and nurse, and then validated by a Clinical Pharmacist) included prescribed medications, over-the-counter drugs and complementary alternative remedies

Results: The study group consisted of 100 patients (97 men, 3 women). Medication histories taken by the physician were accurate for 57 patients (57%), inaccurate for 17 patients (17%), incomplete for 7 patients (7%), and not taken for 19 patients (19%). Medication histories taken by the nurse were accurate for 66 patients (66%), inaccurate for 11 patients (11%), incomplete for 8 patients (8%) and not taken for 15 patients (15%). Drugs most often involved included anti-hypertensive, anti-convulsive and oral hypoglycemic agents.

Conclusion: Medication histories are often omitted or incomplete at the time of initial presentation of a conscious acutely injured patient. When obtained, the accuracy of cited medications and their dosages was low and ranged from 57% (physicians) to 66% (nurses), which potentially compromises optimal patient care. Early involvement of a Clinical Pharmacist is likely to enhance accuracy of medication histories and improve care of the injured patient. Larger studies are needed to evaluate the full potential impact of the Clinical Pharmacist in this patient setting.

61. Management of hyperglycemia in hospitalized patients.

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Objectives: Hyperglycemia is a common, serious, and costly health care problem in hospitalized patients. The use of traditional sliding scale insulin (SSI) as sole treatment for hyperglycemia is associated with poor glycemic control. In addition, increasing evidence indicates that the development of hyperglycemia during an acute illness is a marker for poor clinical outcomes. The purpose of this pilot study was to determine differences in glycemic control in non-ICU patients admitted with hyperglycemia and receiving insulin therapy.

Methods: Medical records of all non-ICU patients with hyperglycemia (venous blood glucose ≥ 180 mg/dL) admitted to a medical service at a regional 457-bed, not-for-profit medical center during an eight consecutive week period were retrospectively reviewed. Patients' medical history, venous and capillary blood glucose values, hospital course, and medications were collected. Patients admitted for DKA/HHS, or gestational diabetes were excluded. SPSS 15.0 was used for retrospective analysis involving descriptive and inferential statistics.

Results: A total of 46 patients were identified: 20 received basal insulin and 26 patients received SSI. Admission blood glucose was higher in patients receiving basal insulin when compared with patients receiving SSI (212 vs. 159 mg/dL, p=0.002). No change was observed in mean capillary blood glucose (MCBG) values from admission to day 5 in patients receiving SSI alone (159 vs. 159, p=NS). A total of five hypoglycemic events occurred in the basal insulin group compared with two events in the sliding-scale insulin group (p=NS).

Conclusion: Patients receiving basal insulin were more likely to have an observable decrease in their MCBG values during their hospitalization when compared to sliding-scale insulin alone. Additionally, patients receiving basal insulin were more likely to have received basal insulin before admission and received more insulin during their hospitalization. Use of basal insulin did not significantly increase the rate of hypoglycemia.

Ambulatory Care

62. Utilizing Students in Home Based Primary Care to Maximize Patient Care in Veterans.

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Introduction: Home based primary care (HBPC) is a physician-supervised multidisciplinary team that works collaboratively to provide primary care home services to Veterans in which clinic-based care is not feasible. Generally teams consist of physicians, pharmacists, nurses, social workers, and dietitians. Unlike most programs which have full-time pharmacist devoted to HBPC, Veteran's Affairs San Diego Health Care System (VASDHS) pharmacy staffing requirements only permitted 1.5 hours of pharmacist-designated time per week.

Objectives: Due to the complex medication regimens in elderly patients, there is potential for medication-related errors. In July 2008, pharmacy students were incorporated into VASDHS' HBPC team to assist with integrating medication education with each home visit in hopes of improving the quality of care for the patient.

Methods: Under a pharmacist's supervision, students were responsible for performing initial assessments of medication regimens and identifying any patient-specific medication issues, including assessment of medication appropriateness, drug pharmacokinetic and pharmacodynamic age-related changes, side effects, drug interactions, and compliance. While on home visits with supervising registered nurses (RN), the pharmacy student provided his medication expertise to Veterans, thus reducing possible adverse drug events and improving medication compliance.

Results: Before pharmacy student involvement, the HBPC team was uncertain about the student's impact with Veterans. Following the implementation of this practice, a substantial number of critical interventions have been made. This in turn established the pharmacy student's credibility as an important part of the HBPC team and a permanent student rotation at VASDHS. Moreover, a full-time pharmacist is now working directly with the HBPC team and pharmacy students.

Conclusion: Pharmacy student involvement in HBPC not only demonstrated an enhancement in patient care, but also contributed to justification of a full-time HBPC pharmacist. Future goals of the

pharmacy service include: expansion of the program, more student involvement, and analysis of pharmacy interventions made.

63. Implementation of a Tele-Health Lipid Clinic to achieve LDL goal among Veterans with Ischemic Heart Disease and Diabetes Mellitus.

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Background: The Veterans Health Administration (VHA) utilizes Care Coordination Home Tele-health (CCHT) programs to provide health care services for chronic disease states to the veteran population as another tool targeting patients that have limited access for direct face to face visits. . Nationally, these programs are intended for the 2–3% of patients that require numerous clinic visits and account for 30% of costs. The implementation of these programs has shown in many studies to reduce the number of hospital admissions.

Objectives: Development of a Lipid Tele-health Clinic (LTHC) at the VA San Diego Healthcare System (VASDHS) was to compliment the already established ambulatory lipid clinics and to better achieve lipid goals leading to better outcomes for veterans with Ischemic Heart Disease (IHD) and/or Diabetes Mellitus (DM).

Methods: The Tele-Health Lipid Clinic proposal was submitted to the Pharmacy and Therapeutics Committee and the Medical Executive Committee (MEC) and approved for ambulatory care clinical pharmacists who already had prescribing privileges in cholesterol management to treat IHD and DM patients to LDL goal. The lipid clinic is telephone based and pharmacist providers have full prescribing privileges to initiate and adjust therapy. All providers in clinic have been trained and have been managing patients in the already established ambulatory lipid clinics. A treatment algorithm was developed and approved by the MEC.

Results: LTHC was initiated as of August 2009. Four hundred and ninety-nine patients have been screened and 263 patients have met criteria for clinic enrollment.

Conclusion: The clinic is now part of the numerous primary clinics at VASDHS. Training of other pharmacists and possible dissemination will be a long term goal. Future direction will be to conduct research analysis to determine effectiveness of program, expansion to other veterans that need lipid management and to encompass other chronic diseases such as hypertension.

64. Development and implementation of a safety-net diabetes intensive care program.

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Objective: To describe the development and implementation of a clinical pharmacist-led Diabetes Intensive Care Program (DICP) in the safety-net

Methods: VCU School of Pharmacy faculty initiated a DICP at CrossOver Health Center (COHC), a free clinic, in January 2009. The purpose of the DICP, adapted from Wagner's Chronic Care Model, is to meet the community need for managing diabetes, enhance opportunity for scholarship, and better track the impact of diabetes interventions. COHC provides a free medical home to low-income ethnically diverse patients, 30–40% of whom have diabetes. The clinic leadership identified the need for enhanced diabetes disease state management. The DICP, guided by a collaborative practice agreement, is unique because the pharmacist is the team leader and the Chronic Care Model framework is being utilized in the free clinic setting. The DICP targets Type 2 Diabetes patients that are newly diagnosed or have an A1C > 8.5%. Core model components include coordinated care, planned visits, individualized self-management sessions and goal setting, group education, patient-centered care, evidence-based interventions, telephone follow-up, and documentation of outcomes. Outcomes include provider and staff perception of the diabetes program, patient satisfaction, cardiovascular and diabetes risk factor control, and unplanned medical visits.

Results: The pharmacist-led DICP model has been developed and implemented at COHC. Over fifty patients have been referred from the collaborating physicians and nurse practitioner responsible for laboratory review. A community engagement grant has been awarded to the VCU School of Pharmacy and COHC team to support evaluation of the model.

Conclusion: The pharmacist-led DICP based upon the Chronic Care Model has been developed and accepted by the leadership team at COHC. All patients with Type 2 Diabetes that are newly diagnosed or have an A1C > 8.5% are now referred to the DICP. Outcomes data is currently being collected.

65. A pharmacists' role in patient compliance with an Electronic Medication Management Assistant (EMMA) in a Warrior Transition Unit (WTU).

J. Ashley Gunter, Pharm.D., Traci Brooks, Pharm.D., Ashley Hopper, Pharm.D.; Womack Army Medical Center, Fort Bragg, NC

Background: There are many barriers to patient compliance within a Warrior Transition Unit (WTU). Many patients have traumatic brain injury (TBI), post traumatic stress disorder (PTSD) and comorbid conditions leading to polypharmacy at a young age. Patients on narcotics or antipsychotic medications are classified as high risk. While the primary compliance issue in the TBI population is memory deficits, the concern in the high risk population is the potential abuse of the medications. The Electronic Medication Management Assistant (EMMA) is a compliance aid that has been made available to active duty soldiers in WTUs. EMMA delivers medications in unit doses according to directions prescribed by the physician. EMMA alerts patients by both auditory and visual cues when it is time to take their medications.

Objectives: The primary outcome of this presentation is to discuss ways in which pharmacists can improve patient compliance in WTUs utilizing EMMA.

Methods: Ten EMMA units were received by the pharmacy at Fort Bragg, North Carolina. Clinical pharmacists in the WTU help determine which patients would benefit the most from EMMA. A random sample of patients with TBI, high risk patients and non-compliant patients were selected to receive EMMA. The clinical pharmacists were tasked with educating both providers and patients about EMMA and assisting with the initial set-up of the unit in the patient's home. Clinical pharmacists then used data compiled by EMMA to determine if its use improved patient adherence.

Results: EMMA use has provided an additional role for clinical pharmacists to be involved in patient care in WTUs. Clinical pharmacists are involved in determining whether patients meet criteria for the device, patient education, and monitoring adherence.

Conclusions: Clinical pharmacists have helped improve patient compliance with medication use by using EMMA in a WTU population.

66. Innovative Trial of Stand Alone Clinical Pharmacy Services Community Practice.

Maria Teresa Ambrosini, Pharm.D.; Self Consultant, Breezy Point, NY

Objectives: To assess the demand and the public's interest in medication consultations.

Methods: Mailings by postcard offering medication consultations (1330 postcards) and office walk-in visits between March 2009 and November 2009.

Results: A total of four encounters occurred between March 2009 and November 2009. One patient consultation, one patient inquiry OTC product related, two services inquires.

Conclusion: The demand and interest in medication consultations was not enough to continue offering services. The public's perception, lack of better knowledge of the service, signage and advertising may be reasons for the low response.

67. IMPACT of process changes on cholesterol levels in a pharmacist-managed lipid clinic.

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Background: Langley Air Force Base has had a Pharmacist-Managed Lipid Clinic in place for several years. For the past three years, the clinic operated using a Group Medical Appointment (GMA) format.

Because of personnel changes, a new clinic structure was implemented. The GMA was replaced by individual, scheduled, appointments.
Objectives: The purpose of this study was to determine the effect of changes to the structure and processes of the clinic on patients' cholesterol levels and LDL-C goal attainment. Additionally, medication adherence tendencies, and knowledge and confidence in treating hyperlipidemia were assessed.
Methods: At the patient's first appointment after the format change date, a ten question pre test was administered to determine baseline knowledge of their disease state. An eleventh question asked their confidence in treating hyperlipidemia. An intense one-on-one educational session with the clinical pharmacist was then conducted. At the next routine appointment, the post-test was given and changes in scores were determined. The pre-post test also had a section which looked at medication adherence using the Modified Morisky Score. Lipid values from before and after the format change were obtained using the patient's medical record.
Results: Average LDL-C, TC, & TG levels all decreased in the post change timeframe, while the average HDL-C level increased. LDL-C goal attainment increased from 61% to 78%. Post test scores showed an increase in hyperlipidemia disease self-management knowledge. The confidence scores improved in the post-tests while the Modified Morisky scores showed minimal changes.
Conclusion: The process changes implemented in the clinic showed positive results. Lipid values for all measures improved. More patients achieved their LDL-C treatment goal and confidence in their ability to treat hyperlipidemia increased. While the adherence scores showed no change, the positive trends for the rest of the measures illustrate that the changes made had an affirmative impact on the humanistic and clinical outcomes.

Cardiovascular

68. How can we transition patients from intravenous to oral antihypertensives in the intensive care unit?.
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Objectives: Standard treatment of postoperative hypertension in the intensive care unit (ICU) consists of intravenous (IV) vasodilators followed by rapid transition to oral antihypertensive agents; however data on the optimal transition agents are limited. The goal of this evaluation is to assess the safety and efficacy of combination oral therapy in weaning from IV vasodilators.
Methods: Postoperative cardiac surgery patients (n=31) receiving clevidipine were evaluated from April to August 2009. Patients were rapidly weaned off of IV clevidipine and transitioned to oral medications at the discretion of a multidisciplinary team. Data on the dose of oral agents utilized, utilization of other IV medications (including resumption of IV clevidipine), blood pressure and adverse events were collected and analyzed for the most appropriate transitioning agent(s).
Results: Over half of the patients analyzed (52%) did not receive oral antihypertensive medications before discontinuation of clevidipine. Of the remaining patients receiving antihypertensives, most received beta blockers as their first oral medication (n=13). Additional medications used include angiotensin receptor blockers (n=3), angiotensin converting enzyme inhibitors (n=3) and calcium channel blockers (n=3). Median time from administration of the first oral medication to discontinuation of IV clevidipine was 8.4 hours (range 0.5–37 hours). More than one antihypertensive was utilized in the most of patients (mean 1.67, range 0–4). No patients required resumption of IV clevidipine. There were no adverse events noted during the transition period.
Conclusion: Transition from intravenous to oral therapy for blood pressure control is important for minimizing costs, and for facilitating ICU discharge. Patients who require continuous infusions of IV clevidipine will likely require combination oral therapy utilizing medications with different mechanisms of action.

69. Multi-site evaluation of adult hospital patients with Acute Decompensated Heart Failure (ADHF) receiving nesiritide compared with loop diuretics.
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Objectives: To identify inappropriate use of nesiritide with a focus on prescribing and administration at three different hospitals. The secondary objective was to determine if loop diuretics were being optimized in patients with acute decompensated heart failure before nesiritide was initiated.
Methods: A retrospective chart review was conducted at three community hospitals for patients who received at least one dose of nesiritide between January 2009 and October 2009.
Results: Forty-two cases in 39 patients were reviewed. Of patients receiving nesiritide, 100% (n=39) received it for dyspnea at rest or with minimal activity associated with congestive heart failure. In 76% (n=32) of cases, patients had baseline BNP level greater than 500 pg/dL, and in 14% (N=6) of cases, patients had baseline BNP level of less than 500 pg/dL. In 86% (n=36) of the cases, patients received intravenous furosemide before the start of nesiritide, most of whom (64%, n=23) received an initial dose of furosemide less than 80 mg. A total of 17% (n=8) of nesiritide doses were continuously infused for longer than 48 hours.
Conclusion: Current guidelines indicate initial treatment of persistent dyspnea in ADHF with loop diuretics (grade B) and increasing the dosage of loop diuretics (grade C) for nonresponders. The use of nesiritide and intravenous vasodilators for patients nonresponsive to initial loop diuretics also have a grade C recommendation. Although, loop diuretics have stronger evidence toward its use as first line therapy, nesiritide was being used as first line therapy for all cases evaluated (n=42). Loop diuretics, on the other hand, were not fully titrated to higher doses before nesiritide administration. Health care provider education is currently under way. Its impact on increasing the use of and optimizing the dosing of loop diuretics will be the focus of further research.

70. Design and implementation of a pharmacist-managed 24-hour ambulatory blood pressure monitoring service in an outpatient cardiology clinic.
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Objectives: The recognition and demonstrable value of ambulatory blood pressure monitoring (ABPM) in the diagnosis and treatment of hypertension continues to grow. Clinical pharmacists are uniquely positioned to utilize ABPM in providing optimal pharmaceutical care to patients requiring this service.
Purpose: Describe the development of a pharmacist managed 24-hour ABPM service in an outpatient cardiology clinic.
Methods: A review of all patients consulted for 24-hour ABPM for 18 months was conducted. Patient demographics, evidence of target organ damage, indication for ABPM, baseline blood pressure measurements and antihypertensive regimen, ABPM findings, therapeutic recommendations and provider acceptance were collected.
Results: Of 95 consults for ABPM, 78 were performed, with 71 having results considered valid and complete (i.e. less than 20% of measurements excluded from analysis). Patients were 71 years on average, mostly men (98%), with the following comorbidities and/or evidence of target organ damage: hypertension (88%), dyslipidemia (84%), coronary artery disease (49%), diabetes mellitus (22%), left ventricular hypertrophy (12%), chronic kidney disease (12%), and others (25%). Indications for referral included evaluation of a clinically significant white coat effect (n=33), labile hypertension (n=13), drug-induced orthostatic hypotension or hypotensive symptoms (n=7), possible white coat hypertension (n=6), suspected masked hypertension (n=4), resistant hypertension (n=4), and follow-up session (n=4). Overall 24-hour BP for the cohort was 129/73 mm Hg, awake BP was 132/74 mm Hg, and asleep BP was 122/67 mm Hg. Thirty-eight percent of patients were classified as dippers, 12% as extreme dippers, 31% as nondippers, and 18% as reverse dippers. Medication changes (initiation (n=12), discontinuation (n=13), change in dose/schedule (n=28)) were recommended in 47 patients with 98% accepted for implementation.
Conclusion: A wide variety of indications prompted referral for 24hr

ABPM which was performed by clinical pharmacists with nearly all recommendations accepted. Successful implementation of this service demonstrates a unique clinical pharmacy opportunity.

Clinical Administration

71. Documenting value added clinical pharmacy services in a small rural hospital.

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Objectives: Many larger health systems use commercially available software such as Clinitrends or Pendragon to document clinical pharmacy interventions. These programs may be cost-prohibitive for smaller, rural hospitals. We wanted to obtain a cost-effective program to document clinical pharmacy interventions and provide an estimate of value-added clinical pharmacy services provided by pharmacists at our facility. We decided to use an in-house software program that was already part of our order-entry software.

Methods: Our pharmacy software included a module that allowed patient-specific or order-specific documentation of clinical interventions. The following clinical intervention codes were created: adverse drug event (ADE), antibiotic recommendation (AR), creatinine clearance (CRCL), culture and sensitivity (CSCK), dosage adjustment (DOSAJ), drug-allergy interaction (DAINT), drug-drug interaction (DDINT), drug-disease interaction (DXINT), drug-food interaction (DFINT), height/weight (HT/WT), identify home meds, (IDENT), illegible order clarification (LEGIB), incomplete order clarification (INCOM), medication record reconciliation (MRF), own medication order clarification (OWNME), iv to po conversion (IV>PO), medication variance (MVR), non-formulary clarification (NONFO), kinetics consultation (KINET), poly-pharmacy consultation (DUPLI), side-effect identification/monitor/intervention (SIDEF), therapeutic substitution (THERA) and TPN consult (TPN).

Results: Both cost-avoidance savings and value-added services provided are components of clinical pharmacy services. We focused exclusively on value-added services. We subjectively set the value for pharmacist interventions at $60.00 per hour with 5-minute increments for calculating the value of a clinical intervention. We did not include additional cost-savings (i.e., decreased length of stay, decreased cost of medications, decreased cost of nursing, medical, or pharmacy time because of the clinical intervention). During the first three-fourths of 2009 (January through September), pharmacy services documented 2708 clinical interventions. We estimated a total of $20,865.00 from the documented clinical pharmacy interventions.

Conclusion: Expensive commercial software may be cost-prohibitive to smaller, rural hospitals. Innovative systems for documenting the value of clinical interventions must be created.

72E. Protected professional practice evaluation: a continuous quality improvement process.

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Objectives: To develop and implement a non-punitive, confidential, and protected peer review process for clinical pharmacists (CPs) who have advanced practice privileges.

Methods: The Professional Practice Evaluation Committee (PPEC) was to formulate policies and procedures for conducting peer reviews consistent with VA Directive 2008-004. The committee consisted of five CPs; none held a management or administrative position. Cases were identified from notes authored by CPs in the computerized patient record system. Peers reviewed each case using performance indicators developed by the PPEC and judged the quality of the CP's care: level 1 - most experienced, competent practitioners would have handled the case similarly in all respects; level 2 - most experienced, competent practitioners might have handled the case differently; level 3 - most experienced, competent practitioners would have handled the case differently. Each practitioner received a feedback report summarizing the peer review findings and recommendations for self-development. General findings were discussed during CP group meetings. Data collected during this process is protected from legal discovery and shared with management only in aggregate.

Results: All CPs (n = 28) participated in the peer review process. A total of 250 patient cases were reviewed through October 2009, with 236 cases (94.4%) judged level 1, 14 cases (5.6%) level 2, and none level 3.

Results of Protected Practice Evaluations by Quarter

Parameter	Jan-Mar 2009	Apr-Jun 2009	Jul-Sep 2009
Number of reviews	87	83	80
Level 2 (Initial)	11	6	3*
Level 2 (Final after PPEC review)	8	5	1*

*Difference Jan-Mar vs. Jul-Sep statistically significant ($p<0.05$) using χ^2 test.

Conclusion: Protected practice evaluation engages clinical pharmacists in continuous quality improvement and generates data regarding practice-wide as well as individual practitioner performance. This process can be easily adapted to other health systems that employ clinical pharmacists with advanced clinical privileges.

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73. Initiation of clinical pharmacy service into a warrior transition clinic at an army medical treatment facility.

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Background: On October 7, 2007, the Department of the Army established 32 Warrior Transition Units (WTU) at instillations across the country to streamline care of wounded soldiers. Previously, active duty soldiers would remain with their parent unit during complex treatment plans or attached to Medical Hold Companies overseen by the Army Medical Command, whereas reserve soldiers were attached to Medical Hold-Over Companies overseen by the Army Installation Management Command. The WTU mission is to facilitate the healing and rehabilitation of soldiers, return them to duty when possible, or prepare them for a successful life as a veteran in their community. The WTU is staffed by Active Duty Soldiers, National Guard Soldiers, Army Reserve Soldiers, and Civilian personnel. The Medical Command, or "Triad of Support," originally consisted of a Primary Care Manager (physician); a Nurse Case Manager; and a squad leader.

Objective: The primary outcome of this presentation is to successfully implement a clinical pharmacy service for a Warrior Transition Unit at an Army Medical Treatment Facility.

Methods: In March of 2009, Womack Army Medical Center (WAMC) department of pharmacy initiated a consult service for providers to utilize clinical pharmacists. The clinical pharmacists were available to assist with medication management, reconciliation of complex medication regimens, and pain management. Summer of 2009 brought two full-time clinical pharmacists to support WAMC's WTU. The addition of full-time clinical pharmacy support will enable more services to be provided to the Wounded Warriors throughout their transition.

Results: Two clinical pharmacists have assigned to WAMC's WTU and are implementing programs and services at this time.

Conclusion: Additional services provided by WTU clinical pharmacists to be presented at ACCP 2010 Spring Practice and Research Forum.

74. Implementation of clinical pharmacy services in a community hospital: converting from a product to patient centered model.

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Objectives: Strategic evaluation and implementation of clinical pharmacy services in a 390-bed community-based teaching hospital.

Methods: A SWOT (strengths, weaknesses, opportunities, threats) assessment of the pharmacy department was performed and baseline measurements were taken including documented clinical interventions, the combined employee engagement index (measuring retention, referral and job satisfaction), physician satisfaction survey results, and pharmaceutical supply expense trending. A three year strategic plan was developed and implemented to transform pharmaceutical services from a product to patient centered model with a commitment by the Pharmacy Director of $1.5 million in drug

savings and an additional $800,000 in documented cost avoidance in return for adding more pharmacy staff at the cost of $1.1 million.
Results: Six clinical service lines are deployed in Critical care, Internal Medicine, Cardiology, Oncology, Renal-Neurology, and Emergency Department. The employee engagement index improved by 26%. Medical staff satisfaction doubled from 24th to 41st percentile in the first year. There was a -2.43% growth in pharmaceutical expense in 2008 ($1.486 million in savings). More than 20,000 interventions have been documented since implementing the clinical model, with an estimated 2.8 million dollars in costs avoided.
Conclusion: With a strategic plan, implementation of clinical pharmacy services in a community teaching hospital has resulted in substantial improvements in quality of patient care, employee and medical staff satisfaction, and cost savings.

Community Pharmacy Practice

75E. Ask your pharmacist safe sleep program to reduce the risk of SIDS.
Hanan Kallash, M.S., Shavon Artis, MPH; Eunice Kennedy Shriver National Institute of Child Health and Development, Baltimore, MD
Objectives: To describe the National Institute of Child Health and Development Continuing Education for Pharmacists. To review the components of the program, epidemiology, etiology of SIDS, inequities in diverse population, evidence based practice. To discuss opportunities for client point of contact- over the counter medications, pacifiers, formula, prenatal vitamins, vitamin D supplements The goal of the program is to increase the capacity of the pharmacist professional to educate families and caregivers about ways to reduce risk factors associated with SIDS.
Methods: Literature review and focus groups studies indicate that patients are willing and open to receiving information from their pharmacists regarding issues related to health promotion. Hodgson and Wong found that 61% of mothers of young children were visiting the pharmacist at least once a month, 22% stated they received advice. 87% percent reported the suggestions to be helpful or very helpful. The Eunice Kennedy Shriver NICHD at NIH in collaboration national pharmacist organizations developed a CE program on Sudden Infant Death Syndrome (SIDS) risk reduction and infant sleep safety for Pharmacists. This is an innovative initiative to saturate the health care field with Safe Sleep information for babies. Mailings were conducted to associations and boards for scheduling sessions.
Results: The CE has been disseminated to all the national Pharmacist organizations, as well as regional and local groups. (123 total, 3 times in 2009). Feedback indicates strong support to the openness and appropriateness of pharmacists in promoting the Back to Sleep messaging to expecting families, possible grandparents, childcare providers and the general population and expanding materials to include OTC information for infants that might impact arousability.
Conclusion: By reaching out to pharmacist we can expand the number of health care professionals disseminating the Safe Sleep recommendations in a consistent and appropriate manner ultimately reducing the number of sleep related and SIDS deaths in our communities.
Presented at National Institute of Health Pharmacotherapy Symposium meeting in April 2008. Ohio State Pharmacy Association Mid Year Meeting, Nov 8 2009

Critical Care

76. Assessment of pharmacist training for code blue participation.
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Objectives: Evidence clearly shows the beneficial effects of pharmacist participation in CPR teams including reductions in mortality. Services often provided by the pharmacist include verifying correctness of doses, preparing intravenous admixtures, calculating infusion rates, providing compatibility information and general drug information, performing CPR, documenting nursing and provider interventions, and preparing and programming pump devices. While literature supports the participation of pharmacists on CPR teams, little is published regarding their ideal training. ACLS classes are the gold standard for training members of such teams but may be inadequate for appropriate training of pharmacists. ACLS classes do not review several of the above-mentioned key areas of pharmacist responsibilities during code situations. A Code Blue Pharmacotherapy course was instituted at Duke University Hospital in August 2007. All pharmacists were required to participate in this course either at time of hiring or in conjunction with BLS renewal, facilitating a roll out over approximately two years. The course consists of didactic lecture on the pharmacotherapy and pharmacology of code medications, hands-on manipulation and experience with code carts and medication admixtures, and review of several case-based clinical scenarios. All participants are required to pass a post-test upon completion.
Methods: An IRB-approved survey was created to assess satisfaction and clinical confidence after completion of the Code Blue Pharmacotherapy course. The survey addressed pharmacist confidence with regards to ability to make specific medication recommendations, calculate appropriate doses, and prepare admixtures. Additionally pharmacists were asked to appraise increased comfort and understanding of the role of a pharmacist as a member of a code team.
Results: Final results are pending.
Conclusions: Final conclusions are pending.

77. Medication adherence to advanced cardiac life support (ACLS) guidelines in an academic medical center.
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Objectives: The American Heart Association developed ACLS Guidelines for management of cardiac arrest. Studies have shown a lack of guideline adherence in the practice of cardiac resuscitation may negatively impact survival of in-hospital cardiac arrest. This study assessed adherence to ACLS medication guidelines, the impact of code team leader's experience and pharmacist presence.
Methods: In-house cardiac resuscitation records were reviewed (February 1 to August 1, 2008) for patients older than 18 years admitted to University of Maryland Medical Center. ACLS guideline adherence was assessed by use of medication, dose, and frequency. Team leader experience was determined by number of codes managed in the previous year and date of last ACLS course. The impact of pharmacists on guideline adherence was assessed.
Results: Forty-one completed records were assessed. Patients received the correct medication 84.7% of the time. The correct dose of medication was administered 79.2% and at the correct interval 69.4% of the time. The highest rate of adherence was observed in codes which team leaders had responded to > 15 codes per year or had received their ACLS certification or renewal 6–12 months before the event. Pharmacists were present in 5 of the 41 (12.2%) events. Among these events, patients received the correct medication 92% of the time. The correct dose was given 83.3%, and at the correct interval 74% of the time.
Conclusion: Studies show a lack of ACLS guideline adherence can negatively impact the outcomes of cardiac arrests. This study suggests additional training may be warranted for ACLS team leaders and pharmacist attendance should be considered for all in-hospital arrests.

Drug Information

78. First vancomycin dosing nomogram constructed to achieved high trough concentration.
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Objectives: The use of a Vancomycin Dosing Nomogram is an alternative method proven to be more cost-effective than conventional dosing (15mg/kg of body weight every 12 hours or by pharmacokinetics equation) with reliability to achieve trough vancomycin serum concentration 5–15 mg/L and succeed in clinical response. Recent guidelines further recommend that trough be maintained at 15–20 mg/L for complicated infection. However, no published nomogram to date has been constructed to achieve optimal trough of 15–20 mg/L in Asian population. This study aims to create a nomogram targeted at

such high trough concentration.
Methods: The dosage needed to produce trough at 15–20 mg/L was calculated by specific formula, and was given according to the corresponding creatinine clearance and body weight in the nomogram. The specific formula chosen among six pharmacokinetics models (Matzke, Birt, Ambrose, Burton, Burton revised, Bauer models) was presented as the best precision and least bias models when comparing the observed concentration with the concentration predicted by the formula itself using Root Mean Square Error (RMSE) and Mean Error (ME).
Results: We retrospectively collected data from 44 patients during July 2008 to September 2009. While ranking the Precision (RMSE ranged from 8.59 to 12.51) and Bias (ME ranged from -2.2 to 3.42), the Ambrose formula had the best combination of the best precision and least bias for the patient population in our institution (RMSE=8.59 and ME=-1.33). Ambrose formula was then applied to generate a 500 mg or 1000 mg dosage every 12 to 6 hours in the present nomogram.
Conclusion: For deep-seated infections, larger dosage is required to achieve clinical efficacy. We present the first nomogram attaining high trough in consideration of renal function and weight, while saving time and labor on dosing and obtaining concentration. We plan for further studies to validate the safety and clinical outcome in this aggressive dosing nomogram.

Education/Training

79. Use of blogging to enhance clinical reflection during Introductory Pharmacy Practice Experiences.
Katie S. McClendon, Pharm.D.[1], James J. Pitcock, Pharm.D.[1], Margaret B. Pitcock, Pharm.D.[2]; (1)University of Mississippi School of Pharmacy, Jackson, MS; (2)VA Medical Center, Jackson, MS
Objectives: This study's objective was to evaluate student perceptions regarding the practicality, interest, and efficacy of blogging as an educational and reflective tool used by third-year students at the University of Mississippi during Introductory Pharmacy Practice Experiences (IPPEs) offered by three ambulatory care faculty members.
Methods: Two IPPE blogs were established using free Google software and set up such that only rotational students and their preceptors had access. Students were required to blog once weekly about something they experienced or learned. Students were asked to complete an electronic survey about their blogging experiences at the end of the academic year.
Results: Nineteen of 34 students completed the survey. On a 5 point scale, on average, the students felt that blogging made concepts clearer (3.32), was valuable to learning (3.05), enhanced learning outside rotation (3.63), and overall added to the rotational experience (3.47). Students reported reading and learning from other students' blogs part of the time or more (2.28 and 3.29, respectively). Most (78.9 %) stated clinical experience–based blogs (compared with knowledge-based) were what they learned from and read the most. Unfortunately, 78.9 % stated that they would not blog if the assignment were made optional.
Conclusion: Based on our survey, we feel that blogging enhanced student reflection and learning during IPPEs. By seeing what students perceive as valuable clinical experiences, it also allowed for improved preceptor interactions and feedback. By expanding this exercise to all IPPEs, students could possibly learn more about areas of clinical pharmacy that they may not have an opportunity to directly encounter. Since completion of the study, blogging was incorporated into the student portfolio.

80. Application of course content and development of patient education and counseling skills for first year pharmacy students in a non-prescription drug simulation lab.
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Objectives: , We describe the use of a simulation lab to complement our Non-Prescription Drugs/Counseling course in the training of pharmacy students in the advising, educating and counseling patients in the use of over-the-counter-medications (OTC).
Methods: First year pharmacy students participate in Non-Prescription Drugs/Counseling course that includes a simulation lab component. This course is taught during the first semester of our four year pharmacy curriculum. The didactic portion of the course is designed to acquaint students with non-prescription therapies including indications, mechanisms of action, possible adverse drug events, contraindications and exclusions for self-treatment for all the major classes of medications. The weekly lab simulation utilizes patient cases to reinforce lecture material and allows for application of counseling skills. Patient case scenarios allow students to play the role of the pharmacist, patient or evaluator for each concept addressed in lab.
Results: The evaluation component of the lab is performed by the student evaluator who assesses peers during the lab session. A summative evaluation involves either pharmacy faculty or students from the drama department as the patients and pharmacy faculty serve as evaluators. Additional assessment of the content and skills learned in this course are evaluated during the first Introductory Pharmacy Practice Experience (IPPE). Preceptors are asked to assess the knowledge and ability of pharmacy students to educate, advise and counsel patients during their IPPE.
Conclusion: The participation of students in the lab simulation portion of the course has been well received and has been perceived by both students and preceptors to be beneficial in preparing students for their first IPPE. Furthermore, the increased complexity and availability of non-prescription therapies and the importance of the pharmacist being involved and knowledgeable with these medications needs to be emphasized early in our pharmacy curriculums to improve the safety and appropriate use of these medications.

81. Didactic and experiential curriculum: recommendations from the strategic planning summit of pain and palliative care pharmacy.
M. Lynn McPherson, Pharm.D.[1], Chris M. Herndon, Pharm.D.[2]; (1)University of Maryland School of Pharmacy, Baltimore, MD; (2)Southern Illinois University Edwardsville, Edwardsville, IL
Objectives: The participation of pharmacists in the care of persons in pain or in need of palliative care has become essential as the complexity of medication regimens as well as our aging population grows. The Strategic Planning Summit for the Advancement of Pain and Palliative Care Pharmacy was convened to identify opportunities to improve the education of pharmacists on this topic at all facets of their professional career (i.e., professional degree program, post-graduate training, continuing education endeavors, and credentialing). Specific curricular objectives included recommendations for elective didactic, required didactic, elective experiential, and required experiential components.
Methods: Made possible by a generous grant from the Mayday Fund, the Strategic Planning Summit Advisory Board identified key stakeholder organizations which represent either pharmacists, or pain and palliative care professionals to invite to the summit. To prevent reaching consensus solely within the profession, organizations representing nursing and medicine professionals where additionally invited. The Summit was structured into six working groups to review currently available statements, programs, and guidelines and to develop interprofessional, pharmacist-directed recommendations. These working groups included: Standards and Assessment, Professional Degree Program Curriculum, Post-Graduate Education, Core Certificate Continuing Education, Intra-professional Certificate Continuing Education, and Credentialing.
Results: Seventy nine individuals representing twenty-five professional organizations participated in the Strategic Planning Summit. Curriculum workgroup recommendations will be presented in their entirety.
Conclusions: Pharmacists in all practice settings have an important role in the care provided to patients with pain and related symptoms. Increasing the educational opportunities available to pharmacists and pharmacy students will insure better patient care.

82. Impact of pharmacist documentation of core measures in congestive heart failure patients in a level II trauma, community teaching hospital.

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Objectives: To implement a process and measure the effect of pharmacist documentation on meeting the Center for Medicare Service's core measure of prescription of an angiotensin-converting enzyme inhibitor (ACE-I)/angiotensin receptor blockers (ARB) at discharge for heart failure (HF) patients.

Methods: With increased organizational importance placed on CMS-core measure adherence, the decision was made to have direct patient care (DPC) pharmacists monitor HF patients. A HF competency was developed and implemented to provide pharmacists with background knowledge of pathophysiology, guidelines, core measures, and documentation requirements. Additionally, changes in chart documentation were implemented to allow standardized information to be placed in drop down box format in an easily retrievable manner. Primary pharmacist responsibilities include: identifying HF patients, reviewing charts to determine ejection fraction, determining if patient qualifies for ACE-I/ARB, leaving a recommendation, if appropriate, and documenting interventions in the patient's medical record.

Results: HF competencies were developed and completed by DPC pharmacists by the beginning of August. In August, DPC pharmacists began leaving recommendations in patients' charts who qualified for ACE-I/ARB at discharge, but participation officially began on September 1, 2009. Electronic documentation changes were completed by the middle of September. After that time, DPC pharmacists discontinued documenting in the paper chart, and switched to the patients' electronic chart. After implementation, documentation of adherence to the core measure of ACE-I/ARB therapy at discharge increased 32.3% from 67.7% in June and July to 100% in August. Documentation has remained at 100% since implementation.

Conclusion: Implementation of pharmacist involvement in documentation of HF core measures has been successful to date.

83. Practice-site dependent competencies in a certificate program: recommendations from the strategic planning summit for pain and palliative care pharmacy.

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Objectives: The Strategic Planning Summit for the Advancement of Pain and Palliative Care Pharmacy was convened to identify opportunities to improve the education of pharmacists on this topic at all facets of their professional career (i.e., professional degree program, post-graduate training, continuing education endeavors, and credentialing). Specific curricular objectives included identifying core practice settings (i.e., ambulatory care, institutional, community, long term care, etc) and matching practice site specific learning objectives for a certificate program on PPC focused on individual practice settings.

Methods: Made possible by a generous grant from the Mayday Fund, the Strategic Planning Summit Advisory Board identified key stakeholder organizations which represent either pharmacists, or pain and palliative care professionals to invite to the summit. To prevent reaching consensus solely within the profession, organizations representing nursing and medicine professionals where additionally invited. The Summit was structured into six working groups to review currently available statements, programs, and guidelines and to develop interprofessional, pharmacist-directed recommendations. These working groups included: Standards and Assessment, Professional Degree Program Curriculum, Post-Graduate Education, Core Certificate Continuing Education, Intra-professional Certificate Continuing Education, and Credentialing.

Results: Seventy-nine individuals representing 25 professional organizations participated in the Strategic Planning Summit. Certificate intraprofessional education working group identified key areas of practice, as well as the corresponding learning objectives needed for each setting. These learning objectives, in conjunction with those identified as core for all pharmacy professionals, will make up the basis of the master educational program for pharmacists on PPC.

Conclusion: Pharmacists in all practice settings have an important role in the care provided to patients with pain and related symptoms. Increasing the educational opportunities available to pharmacists and pharmacy students will insure better patient care.

Endocrinology

84. Targeting hypoglycemic events to improve glycemic control: an interventional and educational approach.

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Objectives: Hospitals are increasingly proactive in targeting blood glucose management as a component of their safety and quality care goals. Hypoglycemic events have been reported in hospitalized patients with an incidence range of 1–20% depending on the blood glucose level and patient population studied. A five month study at a large academic medical center was undertaken to assess causative factors predisposing to hypoglycemic events, to provide prospective recommendations for patient's therapy, to increase recording of events in the hospital safety event system, and to educate patient's physicians on blood glucose management.

Methods: A computer database identified patients with a blood glucose level under 40 mg/dl. A clinical pharmacist assessed and documented the patient event and a study endocrinologist commented on the findings. When applicable, the pharmacist contacted the prescribing physician with drug management recommendations. A study physician contacted the prescribing physician team and provided the written event assessment for educational value. Hospital physicians were queried on the value and impact of the educational feedback. Data collected was analyzed for developing system improvements and automated computer alert notifications.

Results: One hundred fifty-seven hypoglycemic events were assessed with 88% of the events related to drug therapy. Non-ICU floors accounted for 82% of the patient events with 50% of the events occurring between midnight and 0700. Factors predisposing patients to hypoglycemia included: renal failure, weight < 60 Kg., and A1C < 7%. Causative factors included inappropriate insulin dosing and monitoring, diet changes without therapy modification, and drug administration errors. Therapy interventions affected 18% of the patients. Physicians responded favorably to the educational feedback process.

Conclusion: An educational program targeting hypoglycemic events facilitated prospective therapy interventions and follow-up physician education. The program increased glycemic control awareness within the institution and facilitated hospital quality care improvements.

85. Evaluation of a basal insulin therapeutic interchange program in two community hospitals.

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Objectives: This study evaluated glucose-related patient outcomes before and after the implementation of a medical staff–approved 1:1 therapeutic interchange from glargine insulin (Lantus) to insulin detemir (Levemir) in two acute care community hospitals.

Methods: Medical records of patients admitted before interchange implementation and after interchange implementation were retrospectively evaluated. Patient demographics, blood glucose, rates of hypoglycemia, and use of additional hypoglycemic agents were compared between the two periods.

Results: Twenty-five patients were assessed in the pre-interchange period, and 28 patients were assessed in the interchange period. Mean blood glucose was numerically lower on day two of hospitalization for patients during the pre-interchange period than for patients in the interchange period (176 mg/dL vs. 214 mg/dL respectively p=NS). The average glucose for the last 24 hours of hospitalization was numerically lower in the interchange period than in the pre-interchange period (186 mg/dL vs. 190 mg/dL, respectively; p=NS). There were more hypoglycemic events in the interchange period than in the pre-interchange period. There was no difference in the amount of basal insulin used between periods.

Conclusion: Interchanging basal glargine insulin with insulin detemir

in a 1:1 ratio at the time of hospital admission is safe and effective. The use of additional hypoglycemic agents was not required because of the interchange.

Family Medicine

86. Physician satisfaction with pharmacists in an inpatient family medicine service.

Bryan L. Love, Pharm.D., BCPS, Heather A. Kehr, Pharm.D., BCPS; Wingate University School of Pharmacy/Cabarrus Family Medicine Residency Program, Wingate, NC

Objectives: Patients in an inpatient setting often have complex medication regimens placing them at higher risk for adverse events or suboptimal outcomes. Benefits of team-based care including pharmacists have been previously documented, including reductions in adverse events, reduced medication costs, and improvements in length of stay/readmission. In January 2007, two pharmacy faculty members joined the inpatient family medicine service. The objective of this project was to assess resident and attending physician satisfaction of pharmacy faculty members' participation on an inpatient family medicine service.

Methods: In June 2009, physician team members of the inpatient family medicine service were asked to evaluate the services of two pharmacy faculty members by completing a survey. The physician satisfaction survey consisted of eight items and an area for comments. Survey questions focused on physician perceptions of pharmacists' clinical skills, knowledge, communication, education, research, and availability. Physicians were asked to score each item using the following 5-point Likert scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly Agree. A link to the electronic survey was provided by email, and individual physician responses were blinded from investigators. Descriptive statistics were used to compare survey data.

Results: Twenty-two resident physician and 25 attending physicians were surveyed. Twenty-one 21 surveys were returned for an overall response rate of 45%. One hundred percent of respondents selected either "Agree" or "Strongly Agree" for each survey question (median = 5.0). Comments were provided by all respondents and were generally positive.

Conclusion: Physicians' perception of pharmacy faculty involvement on an inpatient family medicine service was positive overall based upon survey responses.

87. Evaluation of pharmacist activities on an inpatient family medicine service.

Bryan L. Love, Pharm.D., BCPS, Heather A. Kehr, Pharm.D., BCPS; Wingate University School of Pharmacy/Cabarrus Family Medicine Residency Program, Wingate, NC

Objectives: Documentation of pharmacist clinical activities and interventions provides valuable information including justification for pharmacy resources and evaluation of ongoing educational initiatives. The broad range of patients encountered and medications utilized on an inpatient service provides increased opportunities for mutually beneficial collaboration between pharmacists and family medicine practitioners. The objective of this project was to identify and evaluate clinical activities, recommendations, and interventions made by pharmacy faculty members participating on an inpatient family medicine service.

Methods: Pharmacist activities, recommendations, and interventions were collected for 12 consecutive weeks and recorded using a standardized Excel worksheet. Interventions and clinical activities were categorized by type, and medications involved were categorized by therapeutic category. Recommendations were recorded as "Accepted," "Partially Accepted" or "Rejected."

Results: A total of 106 interventions were recorded and about 97% of interventions were either "Accepted" or "Partially Accepted" during the study timeframe. Most problems that elicited drug therapy recommendations were broadly classified into the following categories: dosage adjustment (24%), drug therapy omission (15%), abnormal laboratory/test result (12%), pharmacist consultation (9%), patient/family education (8%), and duration of therapy (8%). The most common therapeutic categories prompting pharmacist recommendation were antimicrobial (29%), anticoagulant (26%), cardiovascular (9%), and hypoglycemic (8%) medications. Nonpatient specific clinical activities were also documented, accounting for an additional 56 reports. Pharmacists' participation on rounds (n=36), educational presentation (n=12), drug information requests (n=5), and committee meetings (n=3) were the categories used.

Conclusion: Pharmacy faculty members provided a variety of clinical interventions and activities that were well received by the medical team. Analysis of the most common intervention types and medication classes requiring pharmacist intervention can be used to direct future educational efforts.

88. Heart health in high risk diabetes: role of combined clinical pharmacist and nutritionist intervention.

Jamie Messenger, Pharm.D., Kay Craven, MPH, RD, CDE, Sandra Hardee, B.S., Pharm.D., Susan M. Morrissey, M.A., Robert Newman, M.D., Doyle M. Cummings, B.S., Pharm.D., FCP, FCCP; East Carolina University, Brody School of Medicine, Greenville, NC

Objectives: Most patients with diabetes die prematurely from cardiovascular (CV) disease, on average 14 years earlier than the nondiabetic population. Previous data suggest that the traditional limited time visit with a primary care provider is inadequate to achieve improvements in CV risk, and new care strategies are needed. The objective was to examine the clinical impact of combining pharmacist and nutritionist care management for the subset of patients with diabetes in primary care with one or more clinical measures that are out of control.

Methods: Pilot cohort study conducted over 6 months in a family medicine practice at Brody School of Medicine, North Carolina. Ninety-eight adults with diabetes mellitus with out-of-control values for hemoglobin A1c and/or BP and LDL cholesterol were enrolled and observed for 6 months; mean age 56 ± 8 years; 75% African American; and 67% women. Pharmacist and nutritionist combined to provide office-based care management for n=49 adult subjects with diabetes identified by out-of-control values, whereas 49 similar randomly selected adult subjects with diabetes in the same practice received usual care from their regular primary care provider during the same period.

Results: Intervention patients had significantly greater improvement in mean HbA1c (−1.2 vs. +0.6), mean BP (−8/−4 vs. +6/+2 mm Hg), and mean LDL cholesterol (−28 vs. + 6 mg/dL) than did usual care patients; 87.8% of out-of-control diabetic subjects in the intervention group improved one or more cardiovascular risk factors.

Conclusion: Combined pharmacist and nutritionist care management appears to lead to substantial improvements in cardiovascular risk factors in the subset of out-of-control diabetic patients in an academic family medicine setting.

Health Services Research

89. Benchmarking attempt for restricted antimicrobial agents in lebanon.

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Objectives: To purpose of this study is to assess the willingness of Lebanese hospitals to share data on antimicrobial agents to benchmark at the National level and to identify the availability of restrictive policies, the agents under restriction and compare the consumption of restricted antimicrobials between University and Teaching Hospitals (TH) and Community and Governmental non-teaching Hospitals (NTH).

Methods: The Committee of hospital pharmacists mailed a survey to 120 Lebanese hospitals (Jan–June, 09). Data was collected on the availability of critical-care services, existence of policies restricting antimicrobial agents, monthly consumption of restricted antimicrobial agents and number of patient-days. Consumption data was standardized based on defined daily dose/1000 patient-days according to National Nosocomial Infections Surveillance System Report. The number of hospitals above the 90th percentile was compared using Fisher's exact test at $p<0.05$.

Results: Response rate was only 32% (38 of 120 hospitals) with only 21 hospitals providing patient-days; 7 TH and 14 NTH, all having intensive-care and oncology services and restrictive antimicrobial

policies. The pooled means were (59.8 versus 20.4) for carbapenems, (44.7 versus 19.3) for antipseudomonals, (141.1 versus 133.3) for 3rd generation cephalosporins , (73.5 versus 59.8) for quinolones, (54.1 versus 51) for glycopeptides and (20.7 versus 12.2) for Aminoglycosides; in TH and NT hospitals; respectively. There was no significant difference in the number of hospitals above the 90th percentile for all antibiotic categories; however, 1 TH and 2 NTH were noted to be above the 90th percentile for 3/6 antibiotic categories.
Conclusions: Most hospitals in Lebanon are resistant to revealing data on their antimicrobial use. The increased use of carbapenems and antipseudomonal agents in TH might be secondary to antimicrobial resistance related to the possible overutilization of antimicrobial agents. An awareness campaign for launching a national benchmarking program must be initiated to link drug utilization to resistance rate and identify best practices targeted at reducing inappropriate use.

Hematology/Anticoagulation

90. Practice change to include accountability for outcome measures.
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Objectives: Anticoagulation patient treatment and prevention VTE Core Measures were hardwired to improve patient care and safety.
Methods: Our multidisciplinary six sigma team examined current practice and outcomes to sustain core measures at 100% compliance. Changes included: redefining processes for five day overlap treatment, prophylaxis orders safety check by nurse or pharmacist at 12 hours if not completed by physician, VTE lab panel, mechanical prophylaxis and ambulation protocols added to existing treatment protocols, prophylaxis documentation record, preprinted treatment form for pharmacists, medication education and continued treatment at discharge documentation, and inspection focus to identify change needed to meet measures. Pharmacists are accountable for VTE Core Measures and document these when met.
Results: Measures are charted as being 'met' and included in hand-off processes. Prophylaxis compliance has risen significantly, especially in the medical patients and treatment measures are approaching 100% since the pharmacist is involved more with these measures. Electronic, on-going triggers to alert prescribers have been implemented and are being expanded. Patient outcomes are documented daily and lapses are dealt with immediately. As our patients are abstracted, data will be included to show our success or further opportunities for compliance.
Conclusions: The change to 'pay for performance' and TJC Core Measures program to improve patient survival and safety have offered a change in how pharmacists document the care we provide. Outcomes must be proven by documentation. The hardwiring processes were difficult to implement, but necessary for integration into the practices of all our providers and caregivers, especially the pharmacists.

91. Impact of a venous thromboembolism prophylaxis program on events and prophylaxis rates.
Bebbyn A. Schafer, Pharm.D.[1], April D. Miller, Pharm.D., BCPS[2], Chris Carter, Pharm.D.[1]; (1)Palmetto Health Richland, Columbia, SC; (2)South Carolina College of Pharmacy-USC Campus, Columbia, SC
Objectives: Venous thromboembolism (VTE) is a common hospital acquired-condition with significant morbidity and mortality. Thromboprophylaxis is a proven strategy to reduce VTE incidence, but the impact of strategies to improve prophylaxis rates is not well documented. This study was designed to determine the effect of a hospital-wide initiative to increase VTE prophylaxis use on both VTE events and VTE prophylaxis rates.
Methods: Nurses, pharmacists and physicians participated in training sessions to help increase VTE awareness and prophylaxis rates. A screening tool and order form for VTE prophylaxis was pilot tested and then implemented hospital-wide. To assess the impact of the initiative on VTE rates, all patients with discharge diagnosis codes corresponding with VTE six months before and six months after the initiative were identified. A randomized sample of 50 patients before and 50 patients after the initiative were examined for VTE risk factors and prophylaxis rates to determine the initiative's impact on thromboprophylaxis. This sample size provided 80% with a pre-specified alpha level of 0.05 to detect a 20% difference in prophylaxis rates.
Results: The rate of hospital-acquired VTE was 0.11% (15 VTEs/13,136 admissions) in the 6 months preceding the initiative and 0.17% (23 VTEs/13,870admissions) in the 6 months after the initiative (p=0.26). The initiative showed an increase in VTE prophylaxis of 28% (58% preinitiative and 86% postinitiative, p=0.004). Medical patients showed the largest increase in prophylaxis rates (43.3% to 81.8%).
Conclusion: The initiative produced a significant increase in VTE prophylaxis rates, but did not demonstrate a corresponding reduction in hospital acquired VTE rates. The low event rate of hospital acquired VTE observed in our study is the most likely reason for the lack of change in VTE rates, and these low rates are similar to previously published studies of patients receiving prophylaxis.

Medication Safety

92. Gloved fingertip sampling to comply with USP chapter 797.
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Objectives: Gloved fingertip sampling (GFS) is an integral part of ensuring that pharmacy personnel are aware of the microbiologicl bioburden on their gloves because touch contamination is believed to be the primary source of compounded sterile product (CSP) contamination. To comply with USP Chapter 797, we developed a policy, procedure, and process for GFS.
Methods: All compounding personnel received training and proved competency regarding aseptic technique, hand hygiene and garbing before initiating the GFS. GFS was performed immediately after performing hand hygiene, garbing, and immediately after donning sterile gloves but before sanitizing gloved hands with sterile 70% IPA. The reported action level was 0 colony-forming units (CFUs) and includes the number of CFUs on both gloves. Agar plates were pre-incubated at 30–35° C for at least 48 hours but not greater than 72 hours to ensure that the plates were free from contamination before use. The plates were incubated in an inverted position with the cover placed in a downward position and the media side upward at 30–35° C for at least 48 hours but no more than 72 hours to prevent drying of agar plate media.
Results: Six pharmacy technicians and four pharmacists completed the GFS process. Two of the pharmacy technician plates failed GFS. The results indicated a 20% initial fail rate for our facility. Retraining in aseptic technique competency, glove re-sanitization, hand hygiene and garbing and surface decontamination was performed for the individuals failing the GFS. These individuals passed a subsequent GFS.
Conclusion: Compliance with USP Chapter 797 is a challenge for facilities of every size. Our facility developed a policy, procedure and process to comply with several aspects of USP 797 and gloved fingertip sampling was one of the methods selected to increase adherence.

93. Analysis of medical prescriptions of albumin: tests in the hospitals of Mondovi
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Objectives: Albumin is a plasma protein essential for the regulation and maintenance of oncotic pressure. The high cost, limited availability, the considerable consumption and the introduction, about six months, of a detailed model for requests the albumin have led to undertake regular monitoring of prescriptions
Methods: To monitor the correct prescription of albumin, in the hospital wards of Mondovi, Ceva was done by compiling and analyzing the proper motivation. And then we have analyzed the requirements arrived at the pharmacy during the first half of 2009 to highlight any errors or uses not rational.

Results: During the first half of 2009 albumin prescriptions received at the pharmacy of amounted to 138 (79M, 59C) for a consumption of 769 vials (467M, 302C). In 44 prescriptions for a total of 253 vials of albumin, was omitted a statement of use with greater incidence for the Department of Internal Medicine Hospital of Ceva (20 prescriptions). The most used indication is the therapy after major surgery (19 prescriptions) with a total of 124 vials. Follow the nephrotic syndrome (17 prescriptions, 116 vials), the malabsorption syndrome (17 prescriptions, 99 vials) and liver cirrhosis (14 prescriptions, 64 vials). 12 prescriptions also reported a rate of albumin major to 2.5 mg/dl.
Conclusion: This analysis is an important starting point for a use more appropriate and informed of this important therapeutic resource, this action also shows how the Pharmacist can act on appropriate use of drugs by monitoring activities to be made treatments based on evidence effectiveness.

94. The polk county pharmacy collaborative: a survey of medication reconciliation practices.
Sally L. Haack, Pharm.D., Megan Friedrich, Pharm.D., Andrew Miesner, Pharm.D, Erik Maki, Pharm.D.; Drake University College of Pharmacy and Health Sciences, Des Moines, IA
Objectives: The study aimed to explore the current barriers to medication reconciliation from a health system pharmacist's perspective. If barriers are identified in this preliminary survey, steps can be taken to develop a process which will improve patient safety.
Methods: A 17-question survey was designed to collect information about the current medication reconciliation process at a local health system. It was electronically administered to pharmacists. The survey asked respondents to identify problems with medication reconciliation system and to offer suggestions for improving the communication process between health systems and community pharmacies.
Results: 75 pharmacists were identified and 32 of them (43%) completed the survey. The estimated time spent on medication reconciliation was 17 minutes per patient. Pharmacists responded that nearly 63% of admission medication reconciliation forms required at least one clarification and 76% of medication reconciliation forms had missing information. If they are unable to obtain a medication history from the patient, pharmacists indicated that they most frequently utilized the patient's community pharmacy (47.3%), followed by the patient's pill bottles/personal med list (24.2%), family (22.5%), and previous discharge summary (15%). Pharmacists suggested many improvements for the medication reconciliation process including: specific changes on medication reconciliation form, pharmacist presence in the emergency department, and dedicated efforts from all health care providers to maintain accuracy both within the health system and from community pharmacies.
Conclusion: Surveyed pharmacists identified many barriers in the current medication reconciliation system and provided potential solutions. Results from the survey will be used to guide revisions to the current medication reconciliation process with input from community pharmacists.

95E. Focus on the palliative cares in the Mondovi'-Ceva district of the ASL CN-1 of Piedmont.
Lucia Bagnasco, Brunetti Carlo, Bramardi Andreina,; Pharmaceutical Service A.S.L. CN-1 Mondovì-Ceva district,, Mondovi, Italy
Objectives: According to the national and regional law, the Sanitary District of the CN1 Local Health Service designates the Pharmaceutical Service to collect and preliminary evaluate the use of "off-label" protocols. Main attention has been given to the Palliative Care Sevice (PCS), the major user of "off-label" therapies due to the typology of patients belonging to this service.
Methods: The first phrase was a review of the of the research and analysis of scientific literature; The second phase of the research was an analysis of "off-label" protocols used in therapies on patients followed by PCS
Results: Initially we analyzed six different protocols: 1) naloxone for the constipation; 2) morphine for the suppression of the intractable cough; 3) haloperidol in a subcutaneous way the care of the nausea and vomit; 4) octreotide in the inoperable ileus occlusion; 6) scopolamine for the treatment of the deathrattle in the terminally phases of the illness. All these protocols are guaranteed from the scientific literature and from the Guide Lines for the Palliative Cares of the American College of Physician (January 2008). From the analysis it is clear that about the 40% of the patients were treated with unregistered protocols.
Conclusion: This study analyzed the "off-label" therapies used by PCS and evaluate the pertinence and reliability of these protocols. Because of the large utilization of "off-label" procedures, the analysis will be extended to every "off-label" therapy requested from the different units, in accordance to the regional law.
Presented at ESCP symposium 2009

96. An inpatient pharmacist-directed anticoagulation service targeting safe transition of care.
Jessica Schillig, Pharm.D., Scott Kaatz, D.O., Michael Hudson, M.D., Gregory Krol, M.D., Edward Szandzik, RPh, MBA, James S. Kalus, Pharm.D.; Henry Ford Hospital, Detroit, MI
Objectives: To evaluate the impact of an inpatient pharmacist-directed anticoagulation service (PDAS) on the safe use of warfarin as patients move from the inpatient to outpatient setting.
Methods: We performed a cluster-randomized trial of patients prescribed warfarin on general medical or cardiology inpatient floors. The PDAS provided care to all patients receiving warfarin on one medical and one cardiology floor. Two other similar floors served as controls. Patients admitted with an INR > 3 were excluded from the analysis. Endpoints were assessed 30 days after discharge. Efficacy/safety were measured by the composite endpoint of thromboembolism, major bleeding or INR ≥ 5. Transition of care communication effectiveness was assessed with a communication bundle. The communication bundle included: inpatient-to-outpatient provider contact, inpatient provider-to-anticoagulation clinic communication and patient follow up in the anticoagulation clinic within 5 days of discharge. Communication was considered effective if compliance with all components of the bundle occurred.
Results: This analysis included 420 patients (PDAS n = 215, Control n = 205, 23.2% medical, 76.8% cardiology, 29% new to warfarin). Communication bundle compliance occurred in 75% more patients in the PDAS group (p<0.001). Improvement with PDAS was noted among all components of the communication bundle. There was also a 38% reduction in the composite efficacy/safety endpoint in the PDAS group (p=0.056). This finding was driven by a reduction in rate of INR ≥ 5 through 30 days after discharge (p=0.038).
Conclusion: Implementation of a PDAS produces improvement in anticoagulant safety and transition of care.

Endpoints	PDAS	Control	p-value
Communication Bundle	77.6%	2.8%	<0.001
Outpatient Provider Communication	99.6%	12.4%	<0.001
AC Clinic Communication	98.8%	14.9%	<0.001
AC Clinic follow-up within 5 days	78.4%	66.4%	0.003
Composite Efficacy/Safety	10.2%	16.6%	0.056
INR ≥ 5	9.8%	16.6%	0.038
Major Bleeding	0.9%	0.5%	0.590
Thrombosis	0%	0%	

AC = anticoagulation

Oncology

97. Evaluation of clinical pharmacy services in an oncology outpatient setting.
Hyunjeong Im, Pharm.D., BCOP, Eugene Kim, B.S., Youngsoon Kim, B.S., Seonyoung Chung, M.S., Yongwon In, M.S., Kieho Sohn, Ph.D.; Samsung Medical Center, Department of Pharmacy, Seoul, South Korea
Objectives: This study was to evaluate current clinical pharmacy services in an Oncology outpatient setting by reviewing pharmacist's intervention documents and survey of patients and nurses.
Methods: Documents of pharmacists' interventions collected from August, 10, 2009 to October, 1, 2009 were analyzed. During study period, a survey was conducted asking effects of pharmacists' clinical services to registered nurses and patients who have been treated in outpatient care center. Questionnaires were prepared based on Patient Satisfaction Questionnaire (PSQ) developed in Southern Illinois University categorized by interpersonal manner, convenience, access to care, efficacy, continuity, technical quality, environment, and general satisfaction. Independent variables were questioned on a 5-

point Likert scale that ranged from strongly agree (5) to strongly disagree (1).
Results: Pharmacists modified prescriptions of 123 patients out of 1,308 patients and 138 clinical interventions were conducted. The major interventions included drug addition (39.1%), adjustment (35.5%), and discontinuation (8.7%). There were 74 supportive care issues addressed including stomatitis (14.9%), constipation/diarrhea (12.2%), nausea/vomiting (10.8%), abdominal pain (10.8%), cough (8.1%), and anorexia (8.1%). Seventeen nurses and 328 patients returned surveys. Comparing the percentage of respondents who answered 4 or more in each category, patients marked from 98.8% in interpersonal manner to 89.9% in continuity. All nurses answered four or more in general satisfaction/interpersonal manner, however, only 47.1% of nurses were satisfied with access to care category. According to supplemental questionnaire, the cause of low satisfaction of nurses in access to care category turned out difficulties in reaching pharmacist after their working hours.
Conclusion: Clinical pharmacists have critical roles in the management of cancer patients and their successful activities are reflected in the survey. This survey shows pharmacists' clinical services improved patients' medication use and satisfaction to treatment and raise the efficiency of nursing job. It is expected for pharmacists to expand and consolidate their roles in patient management in Oncology outpatient care center.

Psychiatry

98. The impact of a pharmacist assisted clinic upon medication adherence and quality of life in mental health patients.
Sarah A. Parnapy, Pharm.D.[1], Mitsi H. Lizer, Pharm.D., BCPP[1], Wallace Marsh, Ph.D.[1], Susan P. Bruce, Pharm.D.[2], Lakuma Mogili, M.D.[3]; (1)Shenandoah University - School of Pharmacy, Winchester, VA; (2)Northeastern Ohio Universities Colleges of Medicine & Pharmacy, Rootstown, OH; (3)Valley Behavioral Health Associates, Winchester, VA
Objective: The objective is to determine if a pharmacist assisted psychiatric clinic can improve adherence to medications, quality of life and hospital/ER admissions.
Methods: Subjects were referred by their mental health provider. Inclusion criteria included: greater than 18 years old, received at least one scheduled psychotropic medication and planned to remain at the clinic for the next six months. The following were collected at baseline, three and six months: medication history, metabolic parameters, Medication Adherence Rating Scale (MARS) and Brief Evaluation of Medication Influences and Beliefs Rating Scale (BEMIB). In addition, at baseline and six months, the World Health Organization Quality of Life (WHOQOL-BREF) was administered. Adherence aids, verbal and written education were provided on medications and disease states. Reports were sent to providers at each visit.
Results: A total of 27 patients have been enrolled so far. Fifteen subjects have completed the study, six have withdrawn from the study, and six are still active patients within the study. At baseline for the 15 completer subjects, the mean of the four domains of the WHOQOL-BREF were 20.9, 14.7, 9.7, and 29.2; while at six months these four domains were 26.2, 20.1, 9.2 and 30.1. The baseline MARS mean score was 7.7 and at six months it was 8.2. The baseline BEMID score was 33.8 and at six months it was 34.4. Pharmacists have made on average seven recommendations per patient for changes in prescription medication therapies and nonprescription therapies including diet and exercise regimens. Most of the recommendations were accepted by the patient and provider(s).
Conclusion: This pilot study has shown minimal improvement in patient quality of life and medication adherence measured by the three scales. However, patients have achieved significant benefits from the pharmacist's recommendations, such as decreasing the quantity of prescribed medications and side effect management.

Transplant/Immunology

99. Statewide medication access program for solid-organ transplant patients.
Marie Chisholm-Burns, Pharm.D., MPH[1], Charlene Garrett, BSM, CPhT[2], Kimberly Smith, CPhT[2], DeKeisha Knowles[2], Debbie Martin, RN[3], Christina Spivey, Ph.D.[1], Herbert McGinty, RPh[2]; (1)The University of Arizona College of Pharmacy, Tucson, AZ; (2)The University of Georgia College of Pharmacy; Medical College of Georgia, Augusta, GA; (3)Emory University, Atlanta, GA
Objectives: Many solid-organ transplant patients (SOT) lack sufficient prescription insurance coverage and financial resources to address their medication therapy requirements. There are some resources that make medications available free or at reduced costs to eligible patients who are unable to acquire necessary medications by other means. There are also prescription drug coverage plans for Medicare patients such as Medicare Part D. The mission of the Medication Access Program (MAP) is to increase medication access for SOT patients in need, with specific objectives including assisting these patients in enrolling in medication assistance programs and Medicare Part D and promoting awareness of medication access challenges among health care professionals.
Methods: MAP provided a team-based approach to facilitate medication access among SOT patients throughout the state of Georgia. MAP medication financial specialists guided patients and health care personnel through the application processes for pharmaceutical manufacturer assistance programs, foundations, and Medicare Part D. They also served as liaisons between the patient, physician, and medication suppliers. MAP personnel recorded the number of patients served and the average wholesale price (AWP) of medications supplied. Patients who used MAP's services as of September 2009 were asked to complete a patient satisfaction survey.
Results: From October 1999 to October 2009, MAP assisted 654 SOT patients to enroll in medication assistance programs and/or Medicare Part D, accounting for approximately $22,000,000 (AWP cost) of medications. Approximately 80% of the $22 million represents immunosuppressant medications, while the other 20% mostly represents that of cardiovascular, antimicrobial, and gastrointestinal medications. Patients (n=124) had a mean score of 4.88±0.4 (highest achievable survey score is 5) on the satisfaction survey, indicating that MAP provided a useful service to them.
Conclusion: MAP successfully assisted solid-organ transplant patients obtain needed medications. Patients were highly satisfied with the services provided by MAP.

Urology

100. Prospective human blood-CNS biodistribution and neurocognitive studies of a quaternary amine antimuscarinic agent for OAB: The SMART trial.
Christopher Dadas, Pharm.D.[1], *Michael G. Oefelein, M.D., FACS*[1], Gary G. Kay, Ph.D.[2], David R. Staskin, M.D.[3]; (1)Allergan, LLC, Irvine, CA; (2)Cognitive Research Corporation, St. Petersburg, FL; (3)Tufts University School of Medicine, Boston, MA
Objectives: Antimuscarinic treatment of overactive bladder (OAB) has been reported to cause impairment of CNS function. The specific aims of this study are: 1) to determine if trospium chloride (TrCl) crosses the human blood-brain-barrier (BBB) and 2) to determine if TrCl induces a significant memory effect.
Methods: An open-label, non-comparator, evaluation of TrCl ER propensity to penetrate the BBB at plasma steady state (Day 10). TrCl levels (time 0, 2, 5, 7, 12 and 24 hr post dose) in CSF and steady-state (day 10) peak and trough plasma levels (time 0, 5 and 24 hr) were measured in non-demented elderly (mini-mental state score > 25) volunteers (n=12) aged 65–75 years (NCT00863551). Pre-TrCl dose and day 10 post-TrCl dose testing {Hopkins Verbal Learning Test-Revised (HVLT-R)} were compared using a reliable change index (RCI) to assess a change in learning or memory.
Results: The primary outcome (TrCl concentration in human CSF at steady state peak plasma concentration 5 hours post dose) achieved undetectable TrCl concentration (<40 pg/ml) despite measureable peak plasma steady state values (C_{max} = 964 pg/mL, AUC=18,600 pg hour/mL). A total of 72 human CSF samples were evaluated, all of which fell below the BLQ (less than 40 pg/mL) for TrCl. The secondary end point (RCI pre- and 10 days postdose neurocognitive measurements HVLT-R: total recall = −1.5, and delayed recall −0.25) revealed no clinically meaningful net drug effect.

Conclusion: The SMART (Sanctura XR a Muscarinic Antagonist Resists Transport) Trial is the first study of CSF levels in subjects on an antimuscarinic agent. The quaternary amine TrCl is undetectable at multiple time points in CSF at day 10 steady-state peak plasma concentrations. No change in memory was identified. These pharmacologic and behavioral results support a lack of CNS penetration and clinical CNS safety of TrCl in a neurocognitively vulnerable elderly OAB population.

RESIDENTS AND FELLOWS RESEARCH IN PROGRESS

ADR/Drug Interactions

101. Use of proton pump inhibitors and prevalence of Clostridium difficile infection at a community hospital.

Jacqueline Gabbay, B.S., Pharm.D.[1], Maricelle Monteagudo-Chu, Pharm.D., BCPS[1], Steve Brooks, Ph.D.[2], Rizwanullah Hameed, M.D.[2], Henry Cohen, M.S., Pharm.D., FCCM, BCPP, CGP[1]; (1)Kingsbrook Jewish Medical Center/Arnold & Marie Schwartz College of Pharmacy and Health Sciences of Long Island University, Brooklyn, NY; (2)Kingsbrook Jewish Medical Center, Brooklyn, NY

Objectives: An arising prevalence has been noted with increased risk of *Clostridium difficile* associated diarrhea (CDAD) and the use of gastric acid suppressants, especially with proton pump inhibitors (PPIs). Our institution implemented stress ulcer and NSAID-induced gastropathy prophylaxis guidelines in hopes to reduce the incidence of CDAD. The primary objective of the study is to compare the prevalence of CDAD rates before and after implementation of the prophylaxis guidelines. The secondary objective is to identify other independent risk factors of CDAD.

Methods: The prevalence of CDAD rates before guideline implementation (October 2008 to March 2009) will be compared to the rates of CDAD after guideline implementation (October 2009 to March 2010). All inpatients with documented CDAD from both periods will be included in the analysis. Baseline demographics and CDAD prevalence rates will be compared using χ^2 or Fisher's exact test for categorical variables and *t*-test or Mann-Whitney *U*-test for continuous variables. Cox proportional-hazard regression analysis will be used to evaluate the association between gastric acid suppressant exposure and CDAD while controlling for other known risk factors for CDAD.

Results: Our preliminary data showed that there were 15 patients with documented CDAD before guideline implementation. The identified risk factors of CDAD in these patients included use of antibiotics within 8 weeks (n = 14; 93.3%); concomitant use of gastric acid suppressants (n = 14; 93.3%); hospital admission within 90 days (n = 7; 46.7%); and stay in a nursing home facility within 90 days (n = 3; 20%). Of those patients receiving gastric acid suppressants, 13 (92.9%) were on a PPI and one patient (7.1%) on histamine II receptor antagonist. Data after guideline implementation is pending.

Conclusion: Pending

Ambulatory Care

102. Assessment of clinical and humanistic outcomes of a managed care value-based medication management program for uncontrolled hypertension patients.

Jessica L. Varner, Pharm.D., Elizabeth E. Floyd, Pharm.D., Patricia A. Tabor, Pharm.D., Paul J. Godley, Pharm.D.; Scott and White Health Plan, Temple, TX

Objective: To evaluate outcome measures of a pharmacist managed medication management program focusing on the treatment of uncontrolled hypertension as compared to usual care.

Methods: This is a two-year study consisting of a prospective intervention group and retrospective matched control group. Patients are identified through screening of Scott & White Health Plan (SWHP) claims data and consist of members with a diagnosis of hypertension between 18 and 63 years old who are continuously enrolled in SWHP one year previous and through the period of the study. The intervention group participates in a medication management program that includes meeting monthly with a pharmacist, receiving physical assessment, monitoring of medications and labs, adjustment of therapy, and patient education. In addition, they receive copay waivers for selected antihypertensive medications. The control group receives standard medical care provided by their physicians. The primary outcome measure is reduction in blood pressure measurements. Additional outcome measures include: medication adherence, the percentage of subjects who attain goal blood pressure, the percentage of blood pressures within goal range, annual lab monitoring rates, and cardiovascular, cerebrovascular, and peripheral vascular events. Quality-of-life and satisfaction with care assessments are also measured and conducted at baseline and every six months to the conclusion of the study.

Results: Enrollment is ongoing until a target of 100 patients is reached in each group. To date, 66 patients have met inclusion criteria for the intervention group. Preliminary data will be reported at the time of presentation.

Conclusion: As this is research in progress, no conclusions can be made at this time.

103. Assessment of diabetes preventive care in a pharmacy-based member benefit medication management program.

Candace M. Kuhl, Pharm.D., Elisa Muska, Pharm.D., Yoona Kim, Pharm.D., Patricia A. Tabor, Pharm.D., Joyce Juan, Pharm.D., Paul J. Godley, Pharm.D.; Scott & White Health Plan, Temple, TX

Objectives: This study will assess whether patients enrolled in a community pharmacy-based diabetes medication management program have improved adherence to preventive care measures recommended by the American Diabetes Association (ADA) as compared to patients receiving standard medical care.

Methods: This two year study consists of a prospective intervention group and a retrospective, matched control group. Patients in the intervention group received copayment waivers for selected diabetes medications and supplies during participation in a pharmacist-led medication management program consisting of physical assessment, medication and laboratory monitoring, and patient education. Patients in the control group received standard medical care and did not receive the copayment waiver. Outcome measures included change in adherence to the following ADA preventive care practice recommendations: annual eye and foot exams, annual nephropathy screening, aspirin use in appropriate patients, and pneumococcal vaccinations.

Results: Preliminary data show that patients participating in a pharmacy-based member benefit medication management program have improved adherence to diabetes preventive care measures as compared to standard medical care alone. One- and two-year data from 234 total patients will be presented.

Conclusion: Improvement in adherence to diabetes preventive care measures will not only help reduce patient risk for developing microvascular complications secondary to diabetes, but may also help reduce health care expenditures.

104. Effectiveness of a pharmacy care management program for veterans with hypertension.

Andrew N. Schmelz, Pharm.D.,[1] Susan Bex, Pharm.D., BCPS,[2] Amy Boldt, Pharm.D.,[2] Sarah Binkley, Pharm.D.,[2] Stacy Bolf, Pharm.D., BCPS,[2] Cassandra Walston, Pharm.D., BCPS,[2] Darin Ramsey, Pharm.D., BCPS,[2] Alan J. Zillich, Pharm.D.[1]; (1)Purdue University, Indianapolis, IN; (2)Richard L. Roudebush VA Medical Center, Indianapolis, IN

Objectives: Hypertension remains an increasingly important public health issue, as more than two-thirds of hypertension patients do not achieve goal blood pressure. The objective of this study was to evaluate a care management program for patients with hypertension provided by clinical pharmacists at the Roudebush VA Medical Center (RVAMC).

Methods: A pre/post intervention design was used to evaluate the effectiveness of the pharmacist care management program. Pharmacists operate under an agreed upon scope of practice which allows them to meet individually with patients, adjust medications, and provide patient education. The primary outcome was systolic blood pressure (SBP) and diastolic blood pressure (DBP) at the final pharmacist care management visit compared to the initial pharmacist care management visit using paired *t*-tests. A secondary outcome evaluated the number of patients reaching blood pressure treatment

goals at the final compared to the initial pharmacist visits using McNemars test.
Results: A total of 573 patients were referred to the hypertension care management program during the one year study Patients were primarily men (97.7%) of older age (mean = 62.4 years) with several comorbid disease states, including diabetes (n=196, 34.2%) and chronic kidney disease (CKD; n=43, 7.5%). SBP decreased from 141.3 (±18.5) mm Hg at the initial pharmacy visit to 130.1 (±13.8) mm Hg at the final pharmacy visit, whereas DBP decreased from 79.1 (±12.2) to 74.1 (±10.3) mm Hg ($p<0.001$ for both comparisons). Three-quarters of patients reached blood pressure treatment goals at the final visit (n=431, 75.2%; $p\leq0.001$ compared with the initial visit).
Conclusion: Patients referred to the hypertension care management program at the RVAMC had a significant reduction in blood pressure, and most met their blood pressure treatment goals.

105. Implementation and reliability of a depression protocol in an outpatient internal medicine diabetes population.
Katherine R. Gerrald, Pharm.D., BCPS,[1] Betsy B. Shilliday, Pharm.D., CDE, CPP,[2] Timothy J. Ives, Pharm..D, MPH, BCPS, FCCP, CPP,[2] Robert M. Malone, Pharm.D., CDE, CPP[1]; (1) UNC Hospitals, Chapel Hill, NC; (2) University of North Carolina Eshelman School of Pharmacy, Chapel Hill, NC
Objectives: The prevalence of mood disorders increases with chronic illness. The presence of diabetes doubles the odds of comorbid depression. In addition, the connection between depression and medical nonadherence has been well established, and alleviating the burden of one disease may reduce morbidity from the other. Our objective is to describe a systematic approach to depression screening and follow-up of patients with diabetes and the postimplementation assessment of staff adherence to the screening and treatment algorithm.
Methods: In January 2007 we began using a validated tool for depression, the Patient Health Questionnaire (PHQ-2 and PHQ-9) to improve detection and control of undiagnosed illness. A once a year prompt to trigger PHQ screening was added to the patients clinic check-in documents. Monthly run charts were developed to follow rates of screening and evidence-based treatment algorithms were developed and adopted. Assessment of adherence to these algorithms was conducted by chart review of all patients with diabetes who had PHQ scores ≥3 from January 2007 to June 2009. Chart review included dictated clinic notes, phone calls and subsequent treatment decisions. Barriers to treatment and screening algorithm adherence and care delivery were determined by surveying providers, nurses and care assistants.
Results: Preliminary results show that the rate of patients screened for depression in the past year increased from 37% in January 2007 to 71% in October 2009. Of those patients screened a total of 76 patients had a PHQ score >10 indicating moderate to severe depression. The established protocol for follow up was followed appropriately in only 24 of the 76 patients. Data collection for the remainder of the patients screened, in addition to survey administration, is currently ongoing.
Conclusion: Research is currently ongoing.

Cardiovascular

106. Prescribing patterns of proton pump inhibitors in patients requiring clopidogrel post drug eluting stent.
Megan E. Musselman, Pharm.D., Adam J. Bursua, Pharm.D., Robert J. DiDomenico, Pharm.D., Adhir Shroff, M.D., Vicki L. Groo, Pharm.D.; University of Illinois at Chicago, Chicago, IL
Objectives: There is growing concern that concomitant use of clopidogrel and proton pump inhibitors (PPIs) may decrease the anti-platelet effects of clopidogrel and/or increase the risk of thrombosis after placement of a drug-eluting stent (DES). The proposed mechanism for this interaction involves interference of clopidogrel activation via cytochrome P450 inhibition associated with PPIs. The objective of our study is to determine the appropriateness of PPI prescribing in patients receiving clopidogrel following implantation of a DES at the University of Illinois Medical Center at Chicago (UIMCC).
Methods: A retrospective chart review of adult patients who received a DES beginning September 1, 2006 until September 1, 2008, plus one year follow-up will be conducted. Data collection includes baseline demographics, timing of PPI, indication of PPI, PPI prescribed, medical history, and concomitant medications.
Results: Preliminary data includes 50 patients age 61 ± 9.9 years who received an average of 1.6 ± 0.9 DES and 36% are female. The preliminary results of prescribing patterns at UIMCC are presented in Table 1. Lansoprazole was prescribed 50%, omeprazole 38%, and pantoprazole and esomeprazole 6% of the time. Data collection regarding adverse GI and cardiac events status post DES is in progress.
Table 1.

Timing	Indication				
PPI total	**16/50 (36%)**	**GERD**	**Gastritis**	**GI bleed**	**Unknown**
PPI at baseline	13/16 (81%)	5/13 (38%)	1/13 (8%)	2/13 (8%)	5/13 (38%)
PPI at time of DES	0/16 (0%)	n/a	n/a	n/a	n/a
PPI during 1 year f/u	3/16 (19%)	1/3 (33%)	n/a	1/3 (33%)	1/3 (33%)

Conclusion: A majority of PPIs in this patient population were prescribed appropriately; however, 46% of the patients did not have an indication recorded in their medical chart. Final conclusions are pending completion of data collection.

107. Evaluation of endothelial function using peripheral arterial tonometry in coronary artery disease patients treated for depression.
Kyle J. Ellis, Pharm.D.[1], Almasa Bass, Pharm.D.[1], Bryant Tran, Pharm.D.[1], Melissa Caughey, R.V.T.[2], George A. Stouffer, M.D.[2], Alan L. Hinderliter, M.D.[2], Craig R. Lee, Pharm.D., Ph.D.[1]; (1)Eshelman School of Pharmacy University of North Carolina Chapel Hill, Chapel Hill, NC; (2)School of Medicine, Division of Cardiology, UNC at Chapel Hill, Chapel Hill, NC
Objectives: Depression is associated with increased mortality and endothelial dysfunction in coronary artery disease (CAD) patients. Peripheral arterial tonometry (PAT) is an emerging, automated method which assesses endothelial function in the fingertip and can be conducted by pharmacists. However, the relationship between depression and PAT measures of endothelial function has not been evaluated in CAD patients.
Methods: Sixty-seven patients with ≥50% stenosis in ≥1 major epicardial coronary artery were studied 60 ± 27 (mean ±SD) days following cardiac catheterization after fasting overnight and withholding morning medications. Current depression was defined based on the presence of a depression diagnosis in the medical record and current treatment with an antidepressant. After induction of reactive hyperemia by suprasystolic forearm cuff occlusion for 5 minutes, digital pulse volume amplitude (PVA) was measured using the EndoPAT2000 device and expressed relative to baseline (PAT-ratio). All non-normally distributed data were log-transformed. Associations between depression, PAT-ratio and baseline PVA were evaluated by regression.
Results: Subjects were 58 ± 9 years old, 65.6% male and 80.6% white. Sixteen (23.9%) were currently receiving treatment for depression, 67% had undergone a recent revascularization and 37.3% had a prior myocardial infarction, while 56.7%, 79.1% and 92.5% were receiving ACE inhibitors, beta-blockers, and statins, respectively. CAD patients currently being treated for depression exhibited a significantly lower PAT-ratio (1.38 ± 0.73 vs. 2.03 ± 0.83, P=0.001) and higher baseline PVA (976 ± 432 vs. 632 ± 455, P=0.004) compared to CAD patients without depression, respectively. These differences remained statistically significant after adjusting for age, gender, race, and clinical factors ($P<0.005$).
Conclusion: CAD patients currently being treated for depression exhibit significantly lower PAT-ratio and higher baseline PVA compared to non-depressed CAD patients, consistent with the presence of endothelial dysfunction. Additional studies are needed to confirm these associations in larger populations, and prospectively evaluate the effect of antidepressant pharmacotherapy on PAT measures of endothelial function in CAD patients.

108. Warfarin prescribing in atrial fibrillation.
Kena J. Lanham, Pharm.D.[1], Douglas T. Steinke, Ph.D..[2], Jeffrey C. Talbert, Ph.D.[2], Steven P. Dunn, Pharm.D.[1], Ann M. Wiesner, Pharm.D.[3], Aimee G. Adams, Pharm.D.[1], Claude S. Elayi, M.D.[1], Tracy E. Macaulay, Pharm.D.[1]; (1)University of Kentucky HealthCare, Lexington, KY; (2)University of Kentucky College of

Pharmacy, Lexington, KY; (3)Virginia Commonwealth University, Richmond, VA

Objectives: This study determined the independent predictors of warfarin prescribing in patients with non-valvular atrial fibrillation with a $CHADS_2$ score greater than or equal to two.

Methods: Records of community-dwelling patients enrolled in Kentucky Medicaid from 2001-2005 and diagnosed with non-valvular atrial fibrillation were reviewed. Patients with other indications for warfarin, including hypercoagulation disorders and previous thromboembolism, were excluded. The primary objective was to determine independent factors which predict the use of warfarin in guideline eligible patients through a multivariate logistic regression analysis. Secondarily, the incidence of stroke outcomes, bleeding events, and overall mortality were evaluated. Diagnostic statistics will be performed to ensure the maximal Goodness of Fit of the model to the outcome.

Results: Data evaluation is ongoing. Seven thousand seven hundred sixty-seven patients were identified with a $CHADS_2$ score greater than or equal to two. Warfarin was prescribed to 30% of these subjects (n = 2327). Logistic regression is under way to determine difference in these two patient populations. Regression models are being formed to identify independent predictors of warfarin underuse.

Conclusion: A large proportion of patients with non-valvular atrial fibrillation with a $CHADS_2$ score greater than or equal to two do not receive warfarin, despite the benefits seen with anticoagulation in decreasing the risk of stroke.

109. The relationship between gender and mortality in Kentucky Medicaid heart failure patients.

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Objective: Gender disparities are evident in the management of acute coronary syndromes as well associated adverse clinical outcomes; however, no such data exists regarding heart failure (HF). The objective of this study is to determine if there is a gender based difference in mortality between men and women with systolic HF.

Methods: This is a retrospective, cohort study using the Kentucky Cabinet for Health and Family Services Medicaid database. All patients with systolic HF diagnosed between January 1, 2000 and December 31, 2007 were included. ICD-9, CPT codes and medication dispensing records were examined. The primary endpoint was mortality. Secondary endpoints include hospitalization and differences in prescribing of evidence based medication for the management of systolic HF.

Results: To date, medical records of 1249 patients have been examined. Among the 64 individuals that died during the study period, 42 were women. Women tended to be older at time of diagnosis (64.5 years vs. 59.7 years) and were more likely to have comorbid coronary artery disease, valvular diseases, hyperlipidemia, diabetes mellitus and depression.

Conclusions: While approximately 500 more records are pending review, there is a trend toward increased mortality among women with systolic HF compared to men. Further data analysis will include multivariate adjustment for age and other potential cofounders. If a difference is evident, results may be used to explore outcomes differences in non-Medicaid patient population to increase study generalizablity. Ultimately this data could guide education endeavors leading to improved health outcomes and decreased health care costs for the treatment of women with systolic HF. Because most records have already been analyzed, it is feasible that this project will be completed by date of presentation.

110. Utilization of P2Y12 testing and its impact on therapeutic decision making.

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Objectives: The primary objective is to describe how VerifyNow $P2Y_{12}$ testing is being utilized and how a positive test changes medication management. Secondary objectives are to determine if a specific treatment modality affects 90 day readmission rates for recurrent thrombosis or bleeding and describe which patients are most commonly tested.

Methods: A retrospective chart review conducted at a 411-bed community hospital in patients 18 years or older who received the clopidogrel resistance test from January 2008 to December 2009 and tested positive. Less than 50% inhibition of platelet reactive units (PRU) for the $P2Y_{12}$ receptor was considered a positive test. Patients were categorized based on clinical decisions due to a positive test. The categories include: no changes, increasing dose of clopidogrel, switching to an alternative agent for clopidogrel, adding another anticoagulant, multiple interventions, patients evaluated for surgery, and other. Information that will be collected includes: demographic information, primary admitting diagnosis, service ordering the test, date and time of test, result of test, changes in therapy after test results, and the dose, route, possible test interferences, and hospital readmissions at 90 days. This study has been approved by the hospital's IRB committee.

Results: To date, data has been collected for 27 positive tests. Cardiologists and neurologists ordered the test most frequently. No medication changes occurred in 15% of patients, clopidogrel dose was increased in 11%, clopidogrel was switched in 11%, additional agents were added in 7%, multiple modalities were utilized in 11%, and the test was used to evaluate the patient as a surgical candidate for 22%. The final 22% of patients were in the other category. Data collection continues.

Conclusion: To be made when data collection is complete, March 2010.

111. Observational data on the use of a heparin correlation for managing heparin nomograms.

Abigail E. Miller, Pharm.D., BCPS, Deborah Montague, Pharm.D., M.S., BCPS, AQ, Cardiology; University of North Carolina Hospitals, Chapel Hill, NC

Objectives: Heparin therapy is routinely monitored with the use of an aPTT. At UNC Hospitals, therapeutic ranges for anticoagulation have historically been monitored using aPTTs that have been correlated with the appropriate therapeutic anti-Xa range per the Antithrombotic and Thrombolytic Therapy Guidelines. UNC Hospitals coagulation laboratory established a heparin correlation value that corresponds to the patient's measured aPTT. Using the graph that correlated the measured anti-Xa concentrations to the aPTT, the measured aPTT is correlated back to the anti-Xa level. This value is named a heparin correlation and is reported without units. Converting the patient's measured aPTT to a heparin correlation value eliminates the need for a change in the heparin nomograms each time there is a change in laboratory reagent or equipment that measures the aPTT.

This observational study was designed to evaluate the execution of heparin nomograms at UNC Hospitals since the implementation of the heparin correlation monitoring parameter.

Methods: Patients include adults admitted to UNC Hospitals receiving a minimum of 48 hours of a continuous infusion of heparin for therapeutic anticoagulation. All heparin therapy was managed with a heparin nomogram (Thrombosis, Acute Coronary Syndrome, or Cardiology). Complete data collection on each patient includes (n=60): age, weight, gender, indication for heparin therapy, heparin loading dose, heparin infusion rates, and heparin correlation laboratory values.

Results: Historical data regarding the use of heparin nomograms exists from a previous observational study. Preliminary analysis suggests a dosing calculation and adjustment accuracy rate of 89.3% ± 14% with heparin nomograms using aPTT monitoring, and 94.7% ± 8% accuracy rate with the use of the heparin correlation. Further data analysis, including *t*-tests, will be done to assess the use of the heparin correlation.

Conclusion: Preliminary results suggest a heparin correlation may be used in place of an aPTT for the monitoring of heparin therapy.

112. Evaluation of glucose control in cardiac intensive care unit patients following myocardial infarction.

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Worcester, MA
Objectives: Glycemic control is often performed in critically ill patients but data specific to cardiac intensive care unit (ICU) patients are limited. Optimal glucose control for patients in the cardiac ICU following myocardial infarction may be associated with improved survival and decreased adverse complications. This study was conducted to compare the outcomes of cardiac ICU patients with acute myocardial infarction who achieved "adequate" glucose control versus those who did not.
Methods: A retrospective review was conducted on all adult patients admitted to the cardiac ICU for management of acute myocardial infarction between January 1, 2007 and October 14, 2009 at UMass Memorial Medical Center (UMMMC). All patients admitted to the cardiac ICU are placed on a glycemic control protocol targeting blood glucose values of 80 to 140 mg/dL. "Adequate" glucose control was defined as a median blood glucose value of 80 to 140 mg/dL by ICU-discharge or ICU day three, whichever came first. The primary outcome measure is the composite of death before hospital discharge, reinfarction, ventricular arrhythmia, stroke, hospital-acquired pneumonia, and acute kidney injury. Factors associated with the level of glucose control will be assessed, including glucose levels achieved, glycemic variability, baseline comorbidities and mortality risk, form of nutrition, ICU and hospital length of stay, and each individual component of the composite primary endpoint.
Results: A total of 731 patients were identified for evaluation. To date four patients who have been evaluated these four (100%) have met the primary outcome by experiencing in-hospital mortality. Of those four patients, two (50%) achieved "adequate" glucose control and two did not.
Conclusion: Pending

113. A cost evaluation of bivalirudin, eptifibatide, and enoxaparin during percutaneous coronary intervention in a community hospital.
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Objectives: The objective of this study is to assess bivalirudin and its associated pharmacy costs, clinically important bleeding, and length of hospitalization as compared to eptifibatide, heparin, or enoxaparin with percutaneous coronary intervention (PCI.)
Methods: This retrospective review will match patients who have received bivalirudin with provisional glycoprotein IIb/IIIa (GPI) to patients who have received eptifibatide plus heparin or enoxaparin, or heparin/enoxaparin alone. A previously completed medication use evaluation of 46 patients receiving bivalirudin between January 1, 2009 and September 30, 2009 will be used for the bivalirudin group. Patients for the eptifibatide and heparin/enoxaparin groups will be identified using the Premier database, ICD-9 codes, computerized medical records, and electronic pharmacy dispensing records. Bivalirudin patients will be matched to patients in the eptifibatide and heparin/enoxaparin groups by type of acute coronary syndrome (STEMI, NSTEMI, or unstable angina), coronary lesion characteristics, age, sex, and diagnosis of diabetes mellitus. Data collection relating to the objective will include baseline demographics; clinically relevant bleeding; hemoglobin, hematocrit and platelet counts; documentation of heparin induced thrombocytopenia (HIT); length of hospitalization (including time before and after the PCI); clopidogrel use; aspirin use; eptifibatide or heparin/enoxaparin duration; and number and type of stent placed.
Results: Data collection in the eptifibatide and heparin/enoxaparin groups is ongoing at the time of abstract submission. Forty-six patients have been identified in the bivalirudin group of which 16 received eptifibatide after bivalirudin dosage (provisional GPI). An additional seven of the 46 bivalirudin patients received eptifibatide before the intervention without administration of clopidogrel. Eleven of the 46 bivalirudin cases also received heparin or enoxaparin of which two patients developed moderate hematomas.
Conclusion: The remaining data to be evaluated in early 2010, and the results and conclusions are still to be presented.

Community Pharmacy Practice

114. An analysis of economic outcomes following pharmacist-provided medication therapy management services.
Ashley R. Branham, Pharm.D.[1], Stefanie P. Ferreri, Pharm.D., CDE[1], Joseph S. Moose, Pharm.D.[2], Macary Marciniak, Pharm.D., BCPS[1]; (1)UNC Eshelman School of Pharmacy, Chapel Hill, NC; (2)Moose Professional Pharmacy, Concord, NC
Objective: To compare the economic impact of pharmacist-provided MTM services among common chronic disease states encountered in community pharmacy practice.
Methods: Study cohort will be drawn from a population of patients at nine community pharmacies in North Carolina (five independent and four chain pharmacy locations). Each site has at least one experienced MTM pharmacist-provider who is trained to conduct medication reviews and document interventions. Patients will be included if they are a Medicare Part D beneficiary who is 65 years or older, a North Carolina resident, and received a comprehensive medication review between July 2009 and October 2009. For each encounter, patient demographics as well as the number and type of medications and disease states the patient has will be documented. Each pharmacist will record their interventions, recommendations, and the estimated cost avoidance (ECA). ECA is rated as a level from 1 (Improved Quality of Care) to 7 (Life-Threatening); each level is associated with an ECA amount as determined by the Outcomes Pharmaceutical Health Care platform. Any MTM intervention that fails to be accepted by a patient or prescriber will be excluded from the study analysis.
Results: Descriptive statistics will be used to report demographic characteristics of the study population and documented MTM interventions. The one way ANOVA will be used to report if a statistical difference of ECA exists among chronic disease states affected by a pharmacist intervention. We estimate that this study period will result in about 450 documented MTM interventions; data analysis will be completed in March 2010. Preliminary data from 86 MTM interventions at one study location reveals an average ECA of $1005.66 per intervention.
Conclusion: This study will seek to report financial outcomes of pharmacist-provided MTM services. Documentation of the impact of cognitive services offered by pharmacists is critical to obtain future reimbursement from third-party payers.

115. Assessing patient satisfaction of pharmacist-initiated counseling in a community setting.
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Objectives: Since community pharmacists are the most accessible health care professionals and retail pharmacy chains dispense more than 70% of prescriptions dispensed annually, community pharmacists are in an ideal position to help patients reach optimal medication therapy outcomes. Physician counseling on new prescriptions is many times inconsistent and incomplete. Unfortunately, many patients are unaware of the role pharmacists can have on helping them better manage their medications. Counseling patients on new prescriptions can educate patients, decrease medication misadventures, and improve patient-pharmacist relationships while opening the lines of communication. This study helps determine the level of patient satisfaction with a pharmacist-initiated counseling session.
Methods: Patients 18 years and older counseled by a pharmacist/student pharmacist at two Giant Eagle pharmacies were administered a patient satisfaction survey and informed consent to assess their satisfaction with pharmacist initiated counseling on any new prescription or change in dose they have not had in the last six months. Information collected on the survey included patient age, gender, highest level of education, questions measuring patient satisfaction, and information learned from the pharmacist/student pharmacist interaction. Surveys were distributed for several months.
Results: The data will be analyzed using descriptive quantitative statistics. Information collected during the counseling sessions: average amount of time per session, number of sessions accepted and rejected number of times incorrect medications were identified during

sessions, and number of positive or negative responses based on data reported by pharmacists/student pharmacists will also be collected and reported. All results will be presented at ACCP Spring Practice and Research Forum.
Conclusions: The profession of pharmacy is moving in a direction where patient-centered care is a priority resulting in offering more clinical services in all areas of pharmacy. This study helps determine the level of patient satisfaction once one of these services, pharmacist-initiated counseling, is implemented in a community setting.

116. Evaluation of clinical outcomes of a member benefit medication management program for high risk managed care patients with diabetes.
Elisa Muska, Pharm.D., Candace M. Kuhl, Pharm.D., Patricia A. Tabor, Pharm.D., BCPS, Paul J. Godley, Pharm.D., FASHP, Joyce Juan, Pharm.D., Yoona Kim, Pharm.D.; Scott & White Health Plan, Temple, TX
Objectives: A two-year study initiated to evaluate clinical outcomes of a member benefit diabetes medication management program performed by pharmacists, compared with usual primary care.
Methods: Patients included are health plan members age 18–63 enrolled in the medication management program with a hemoglobin A_{1c} greater than 7.5% at the time of enrollment. Patients meet monthly face-to-face with a pharmacist for diabetes education and monitoring, and receive copayment waivers for selected medications and testing supplies. Clinical outcome measures include hemoglobin A_{1c}, blood pressure, and serum lipid concentrations, which are analyzed at baseline, 12 and 24 months after enrollment. Outcomes are compared with a retrospective matched control group.
Results: Currently 201 patients are enrolled in the study, of which 49 have attained the two-year time point. Another 98 patients have reached one year. An interim analysis conducted in May 2008 showed significant improvement in clinical measures. Updated results with most recent analyzed data and control comparison will be presented.
Conclusion: According to preliminary results, patients receiving pharmacist conducted monthly medication management sessions have demonstrated significant clinical improvement when compared to those receiving usual primary care.

Critical Care

117. Incidence of renal failure in surgical intensive care unit patients following co-administration of vancomycin and piperacillin/tazobactam.
Ashley L. Rosenquist, Pharm.D., BCPS, Emily A. Durr, Pharm.D.; University of North Carolina Hospitals, Chapel Hill, NC
Objective: To determine the incidence of acute renal failure after the coadministration of vancomycin and piperacillin-tazobactam in surgical intensive care unit patients.
Methods: Medical records of patients admitted to a surgical intensive care unit at an academic medical center were reviewed. Adult patients who received vancomycin, piperacillin-tazobactam or the combination for 72 hours or more were included. Goal enrollment is fifty patients per study arm. Patients in the three study arms will be matched on age and baseline serum creatinine. The following data points were collected: patient demographics, comorbidities, doses of vancomycin and piperacillin/tazobactam, duration of therapy of vancomycin and piperacillin/tazobactam, indication for antibiotics/microbiology culture results, vancomycin trough levels, pertinent laboratory values, concurrent nephrotoxic medications, urine output, and admission diagnosis. The primary endpoint was the incidence of acute renal failure (ARF) as defined by an increase in serum creatinine of ≥ 0.3 mg/dL or 50% from baseline and/or urine output < 0.5 ml/kg/h for > 6 hours. Secondary endpoints included ICU and hospital length of stay, hemodialysis, and correlation of vancomycin trough level with incidence of renal failure.
Results: Preliminary data show that two patients in the combination group and one in each of the vancomycin and piperacillin/tazobactam alone groups developed acute renal failure. ARF was identified in three of these patients by an acute increase in serum creatinine and the fourth by a decrease in urine output to less than 0.5 mL/kg/hour for 10 hours. No patients required hemodialysis.
Conclusion: Preliminary data suggest a high incidence of acute renal failure in this surgical intensive care unit population, potentially secondary to the study medications. Further data collection and analysis is ongoing.

118. Impact of a clinical pharmacist on blood glucose control in the intensive care unit.
Melissa M. Lagzdins, Pharm.D., BCPS, Lisa McIntyre, Pharm.D., Andrea Decker, Pharm.D., BCPS; Mercy St. Vincent Medical Center, Toledo, OH
Objectives: Hyperglycemia is associated with increased morbidity and mortality, increased risk of infection, and decreased healing capacity. The impact of a clinical pharmacist on blood glucose control in the intensive care unit (ICU) has not been investigated. This study will determine how a clinical pharmacist rounding with the multidisciplinary team affects blood glucose control.
Methods: The primary outcome of this retrospective chart review is the percent of ICU patients with 80% or higher blood glucose results 140 mg/dL or more during during 24 hours. Blood glucose results for patients admitted to the ICU from January 1 to March 31, 2009, were collected to establish baseline data. A pharmacist participated in daily multidisciplinary rounds September 1 to November 30, 2009. Follow-up blood glucose results are being collected and compared with baseline data. The two groups will be analyzed using the chi-square test. Based on a power of 80% and alpha of 0.05, a sample size of 136 per group is required to detect a 15% difference. Patients 18 years and younger or admitted for diabetic ketoacidosis are excluded. Secondary outcomes include the duration of hyperglycemia and percent of patients with hypoglycemia (blood glucose 60 mg/dL or less).
Results: Before a clinical pharmacist on ICU rounds, 42% (57/136) of patients had at least one 24-hour period of 80% or more blood glucose results 140 mg/dL or more. About half (31 of 57) of these patients had 48 hours or more of 80% or more blood glucose results of 140 mg/dL or greater. Hypoglycemia occurred in 10% (13 of 136) of the patients. Follow-up blood glucose results and statistical analysis will be presented at the ACCP 2010 Spring Practice and Research Forum.
Conclusions: The impact of a clinical pharmacist on blood glucose control in the ICU is being determined.

119. Evaluation of adult patient outcomes with dexmedetomidine for prolonged sedation.
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Objectives: Evaluation of dexmedetomidine for sedation in adult intensive care units (ICUs) at a university hospital to assess outcomes of delirium, use of breakthrough analgesia and sedation, and duration of mechanical ventilation.
Methods: Patients 18 years and older, mechanically ventilated between January 2008 to September 2009 on ICU sedation and analgesia protocol who required the addition of dexmedetomidine for greater than 24 hours were included. Average daily amounts of as needed antipsychotic agents, breakthrough analgesia and sedation requirements 48 hours before and after dexmedetomidine infusion as well as overall duration of mechanical ventilation were evaluated. Data were analyzed using independent samples *t*-test and χ^2 test as appropriate.
Results: Seventy-two patients were identified as previously using dexmedetomidine for adjunct sedation, thirty-four of which met inclusion criteria (20 males; 14 females; median age 45 ± 16.8 years). Most patients requiring dexmedetomidine were from the medical ICU (44.1%), followed by the general surgical ICU (32.3%) and the neuro/trauma ICU (23.5%). The primary indication for dexmedetomidine was agitation (44.1%), most prominent in the medical ICU, followed by facilitation of extubation (23.5%), delirium (17.6%), and ventilator dyssynchrony (14.7%). Average as-needed haloperidol use was highest in the medical ICU (42 ± 61.3 mg), followed by the neuro/trauma ICU (24.3 ± 29.8 mg) and the general surgical ICU (23.8 ± 26.7 mg).
Conclusion: Dexmedetomidine was predominantly used in the medical ICU setting, which also had the highest average of as-needed haloperidol. Statistical outcomes regarding the incidence of delirium

as indicated by average as-needed antipsychotic use, average use of breakthrough analgesia, and sedation 48 hours before and during dexmedetomidine infusion are under investigation with results to follow.

120. Evaluation of diabetic ketoacidosis management at an academic medical center.

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Objectives: Specific guidelines exist for the management of diabetic ketoacidosis. Treatment involves a complex regimen of insulin, fluids, and electrolytes to achieve safe but rapid reversal of the condition. Difficulty with compliance to these guidelines has been identified in multiple health-systems. Identification of those interventions and treatment variables that have the most impact on patient outcomes and cost of care would help target programs for improvement in care of patients with diabetic ketoacidosis. We intend to identify variations in DKA treatment that have a significant impact on patient stay in the hospital and intensive care units (ICU).

Methods: A retrospective analysis is being conducted using the University HealthSystem Consortium (UHC) Clinical Database and patient chart review. Adult patients were selected who presented to the emergency department with a primary diagnosis of diabetic ketoacidosis between April 2006 and April 2009. Data will be collected regarding length of stay, type and amount of insulin, fluid and electrolyte administration. Times to glucose normalization, resolution of ketonemia, and resolution of acidosis will be determined. These factors will be compared between groups and correlated to hospital and ICU length of stay using Wilcoxon and χ^2 tests between groups and correlation analyses to evaluate morbidity and mortality.

Results: Of the initial 165 visits representing 123 unique patients, 53.3% (88 visits) resulted in ICU admission. Total length of stay averaged 2.6 days for visits not admitted to the ICU, while average stay for patients requiring intensive care stayed an average of 8.8 days, including 2.6 days of ICU care. Correlation to treatment and baseline characteristics will be performed when chart review is complete.

Conclusions: Preliminary analysis is limited, though chart review should be mostly complete by the time of presentation. DKA results in numerous single and repeat visits, and optimization of care would be advantageous.

121. Use of oral midodrine in weaning-off intravenous vasopressors in patients with septic shock.

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Objectives: Intravenous (IV) vasopressors are used for hemodynamic instability in the intensive care unit (ICU). When stable, patients are weaned-off IV vasopressors. Failure-to-wean may lead to increased length-of-stay and ICU-related complications. Use of midodrine, an oral sympathomimetic, may decrease time-to-wean patients off IV-vasopressors. Our goal is to compare time-to-wean between patients on IV-vasopressor(s) with midodrine versus IV-vasopressor(s) alone.

Methods: We conducted a randomized, retrospective study in ICU patients receiving IV-vasopressor(s) with midodrine (Group-A) versus IV-vasopressor(s) alone (Group-B) from December 2007 to December 2009. The primary endpoint was time-to-wean off IV vasopressor(s). Exclusion criteria included patients that expired while receiving vasopressors and when midodrine was used for reasons other than hypotension due to septic shock.

Results: Forty patients were included in the study (20 in each group). Median time-to-wean off was shorter in Group-A versus Group-B (two vs. three days). Mean time-to-wean off was statistically significant shorter in Group-A (3.4 vs. 3.7 days, p=0.049). Patients in Group-A received mineralocorticoid(s) more frequently than Group-B (n=17 vs. 5). In these patients, the mean time-to-wean off was longer in Group-A (6.6 vs. 3.2 days, p=0.087). A similar number of patients received IV hydrocortisone (n=4 vs. 5). In these patients, mean time-to-wean off was longer in Group-A (7.25 vs. 3.2 days, p=0.271). A similar number of patients received multiple IV-vasopressors (n=7 vs. 9). For patients on multiple IV-vasopressors, mean time-to-wean off was longer in Group-A (5 vs. 3.8 days, p=0.211).

Conclusion: Midodrine may decrease time-to-wean off IV vasopressors in patients recovering from septic shock, potentially resulting in decreased length-of-stay and ICU-related complications. A well-designed, clinical trial is needed to determine the beneficial effects that midodrine may have on improving ICU comorbidity and all-cause mortality.

Drug Information

122. Impact of American Society of Health-System Pharmacists' postgraduate year 2 requirements on drug information residencies.

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Objectives: The total number of drug information (DI) residencies is unknown; however, the number of DI centers and specialty trained DI pharmacists has decreased. The purpose of this study is to determine how American Society of Health-System Pharmacists' (ASHP) postgraduate year 2 (PGY2) residency requirements for DI training affected DI centers' offering residencies.

Methods: DI residencies will be identified by the ACCP directory of residency and fellowship programs and ASHP listings from 2004 to 2009. Other programs not listed in these databases will be identified via the Consortium for the Advancement of Medication Information, Policy and Research (CAMIPR) and ACCP PRN listserves. An electronic survey will be sent to program directors to assess differences in the number of DI residency programs offered, how ASHP requirements have affected DI residency offerings, and reasons for residency program discontinuation. Data will be analyzed by descriptive and inferential (e.g., χ^2 test for dichotomous data and *t*-test for continuous data) statistics.

Results: In 2009, 17 and 13 DI residency programs were identified in the ACCP and ASHP listings, respectively. Eight DI residency programs were listed in both ACCP and ASHP listings. Five unique programs were listed in the ASHP directory. Conversely, 9 unique programs were listed in the ACCP directory. Results from previous years are being collected.

Conclusion: Recent ASHP requirements may have affected the availability of postgraduate DI training. A reduction in DI trained pharmacists may potentially affect schools of pharmacy, health care institutions, and other practice areas that require DI-trained pharmacists.

Education/Training

123. Assessing the need for pharmacogenomic education in pharmacy point-of-care providers.

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Objective: This study utilized a needs assessment tool to evaluate Mayo Clinic and Mayo Health System pharmacists' self-perceived confidence in pharmacogenomics and the necessity for further pharmacogenomics education.

Methods: A 19-question, multiple-choice, email-based needs assessment was provided to 477 inpatient and outpatient pharmacists in a large health care system. The survey utilized a Likert scale and was administered by the Mayo Clinic Survey Research Center to ensure anonymity and blind investigators to participant information.

Results: A total of 303 (64%) assessments were completed. The pharmacist population consisted of 68% (205) hospital/inpatient and

21% (64) ambulatory/outpatient. Of the assessed population, 32% (97) have been practicing pharmacy for five years or less, 18% (53) for six to ten years, 24% (72) for 11 to 20 years, and 27% (80) for 21 or more years. Nearly 85% (257) agreed that pharmacists should be required to have some knowledge of pharmacogenomics. Additionally, 67% (203) agreed that they should be able to provide information on appropriate use of pharmacogenomic testing. When self-perceived confidence was assessed, only 26% (78) felt they could accurately identify medications that require pharmacogenomic testing. When asked if they could accurately apply the results of pharmacogenomic tests to drug therapy selection, dosing, or monitoring, 63% (192) disagreed.
Conclusions: Pharmacists believed they should be required to have some knowledge of pharmacogenomics and be able to provide this information to practitioners. However, they did not feel confident in their knowledge of drugs requiring pharmacogenomic testing or their ability to accurately use the results. This may have been due to heightened awareness surrounding recent labeling changes by the Food and Drug Administration, which recommend pharmacogenomic testing in particular instances. These results indicate a need to provide clinically applicable pharmacogenomic education to pharmacy point-of-care providers.

124. Impact of pharmacist interventions on meeting the core measure requirement of appropriate initial antibiotic selection for community-acquired pneumonia patients in a level II trauma, community teaching hospital.
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Objectives: To implement a process and determine the impact of pharmacist interventions on meeting the core measure requirement of appropriate initial antibiotic selection for community-acquired pneumonia patients.
Methods: Due to the success of pharmacist interventions on documenting core measure requirements in heart failure patients at this institution, the decision was made to have direct patient care (DPC) pharmacists monitor initial antibiotic therapy in pneumonia patients. An educational competency on pneumonia was developed for DPC pharmacists. This competency included: pathophysiology, indications for hospitalization, guidelines for antibiotic therapy, and definitions for susceptibility to high risk pathogens, core measures, and documentation requirements. Once all DPC pharmacists have completed the competency, the pharmacy's computer system will identify patients with a pneumonia diagnosis. Pharmacists will perform daily prospective audits consisting of reviewing patient location, presence of risk factors, and appropriateness of current antimicrobial therapy. Pharmacists will contact the prescribing physician within 24 hours of admission if the therapy is considered inappropriate. The electronic charting system is being updated to include these data in a standardized format. After pharmacists have conducted their review and made recommendations, if appropriate, they will document their interventions in the electronic record.
Results: Community-acquired pneumonia competencies were developed in December 2009. It is anticipated that all DPC pharmacists will have completed the competency, begin making recommendations and documenting interventions by January 2010. Current documentation for fiscal year 2009 of adherence to the core measure requirement for appropriate initial antibiotic selection is 90.8% and 60.7% for non-ICU and ICU patients, respectively. A comparison of documentation adherence before (November-December) and after (February-March) pharmacist interventions will be made early April 2010.
Conclusion: Implementation of pharmacist involvement in other core measures has been successful to date. It is anticipated this study will see similar results, especially in the ICU setting where significant improvements can be made.

125. Enhancing tobacco cessation counseling among cancer care providers through web-based learning.
Andrew N. Schmelz, Pharm.D., Alan J. Zillich, Pharm.D., Christine Fenlon, BFA, Karen S. Hudmon, DrPH; Purdue University, Indianapolis, IN
Objectives: Cigarette smoking is the leading cause of preventable death in the United States and negatively affects the outcomes of cancer treatment (surgery, chemotherapy, and radiation). Although counseling from health care providers increases quit rates, few providers address tobacco use among cancer patients. The purpose of this study was to estimate the impact of an online continuing education (CE) program on the tobacco cessation activities of cancer care providers.
Methods: Online technology including streaming audio and video was used to create a two hour, asynchronous, modular CE program. The modules contained tobacco use and cessation information specifically tailored around cancer and the association with tobacco use. Physicians, nurses, pharmacists, and other allied health professionals who provide care to patients with cancer completed the CE course and provided pre-training, post-training, and 30-day follow-up evaluations. Evaluations assess several constructs including self-efficacy and self-reported ability for provision of tobacco cessation counseling. Both constructs included a series of validated survey items with 5-point Likert response scales. Data were analyzed using nonparametric statistics (Wilcoxon signed-rank tests) comparing the follow-up responses to the baseline responses.
Results: To date (data collection ongoing), 25 providers have completed the CE program and all evaluations. Significant improvements from pre-program to post-program evaluations were noted primarily in self-reported counseling abilities ($p<0.01$) and self efficacy ($p<0.01$). After 30 days, providers continued to report significant increases counseling abilities ($p=0.012$).
Conclusion: Preliminary results suggest that an online tobacco cessation CE program enhanced tobacco cessation counseling abilities and self-efficacy among cancer care providers. Ongoing data collection and analyses will provide more definitive conclusions about the effectiveness of this CE program.

126. Post-PharmD industry fellowships: an analysis of the currently available programs and post-graduate career opportunities.
Stephanie N. Melillo, Pharm.D., James Scanlon, Pharm.D., Amy Gangadharan, Pharm.D., Raymond P. Kim, Pharm.D.; Massachusetts College of Pharmacy and Health Sciences, Worcester, MA
Objective: The objective of this research is to develop a comprehensive list of all post-Pharm.D., industry fellowships recruiting applicants for the 2010–2011 fellowship year, to identify distinguishable characteristics between these fellowships, and to determine the incentive of completing these programs based on the positions occupied by graduate-fellows the first year after the cessation of the fellowship.
Methods: A list of post-Pharm.D., industry fellowships recruiting applicants for the 2010–2011 year was compiled using the Personal Placement Service (PPS) database as well as individual program brochures. From these sources, information including the school affiliation, departmental focus, opportunity for inter-departmental rotation, number of fellows/position/year, geographical location and required degree were obtained. Inclusion criteria were limited to those programs that recruited applicants at the 2009 American Society of Health-system Pharmacists (ASHP) Midyear Clinical Meeting. Each fellowship track within the program was included as an individual program. Following the completion of the database, a standardized email will be sent to each of the programs to obtain information regarding stipends, number of interviewees and applicants, the occupation of the graduate-fellow the first year after completing the fellowship, and the occupation of previous fellows today.
Results: Final results of the research are pending responses from fellowship programs. Preliminary results demonstrate approximately 74 industry fellowships are being offered for the 2010-2011 fellowship year. Of these programs, the vast majority (89%) are affiliated with a school of pharmacy. The school with the largest number of affiliated programs is Rutgers Ernest Mario School of Pharmacy (47%). Other affiliated schools include Massachusetts College of Pharmacy and Health Sciences (9.5%) and the University of North Carolina Eshelman School of Pharmacy (8.1%). The most common departmental concentrations of these fellowships include medical affairs (37.7%) and clinical research (22.0%).
Conclusion: Pending results.

127. Use of a self-directed learning readiness scale (SDLRS) to

predict performance in a doctor of pharmacy abilities lab course.
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Objectives: Abilities Lab is a required course at the University of Maryland School of Pharmacy that incorporates various self-directed learning (SDL) activities. SDL is a process requiring students to take initiative in their learning through setting goals, identifying resources, implementing learning strategies and evaluating outcomes. The purpose of this study is to evaluate the relationship between readiness for SDL and academic performance on SDL activities and resources used to prepare and study for abilities lab.
Methods: The Self-Directed Learning Readiness Scale (SDLRS) was administered to first year student pharmacists to assess readiness for SDL. SDLRS is a validated tool scored out of 200 points and is used to assess the degree students possess attitudes and abilities required for SDL. A score ≥ 150 indicates high readiness for SDL. An additional 16 item survey assessed demographic information, resources used and study habits in abilities lab. Academic performance is assessed in lab through weekly quizzes and a final exam.
Results: A total of 161 surveys were returned (95.3% response rate). The median score on the SDLRS was 152 and 61.4% (n=97) of students scored ≥ 150 indicating a high readiness level. In the 30 days before the survey, 27.3% of students used tutoring resources outside our institution. More than 80% of students preferred to study alone; however, almost 30% also reported studying with a partner. Most students, 95.6%, report use of required medical terminology and calculations texts, and 70.8% do not use textbooks outside those recommended.
Conclusion: Pending.

Endocrinology

128. A glucose meter accuracy study: a comparison of the yellow springs instrument with venous laboratory glucose measurements and plasma-calibrated value-added, auto-coded glucose meters.
Andrea N. Traina, Pharm.D.,[1] Michael P. Kane, Pharm.D.,[1] Robert A. Hamilton, Pharm.D.,[1] Gary Bakst, M.D.,[2] Robert S. Busch, M.D.,[2] Jill M. Abelseth, M.D.[2]; (1) Albany College of Pharmacy and Health Sciences, Albany, NY; (2) The Endocrine Group, LLP, Albany, NY
Objectives: To compare the accuracy and precision of four generic auto-coded blood glucose (BG) meters to each other, to a capillary-based YSI glucose measurement obtained by a finger stick, and to a laboratory reference value obtained via venous puncture.
Methods: Finger stick glucose measurements in consenting adults with diabetes undergoing venipuncture for glucose testing were performed using the Abbott OptiumEZ, HDI TRUEresult, Bayer Contour TS and the Taidoc Clever Chek. Within five minutes following venipuncture, finger BG measurements were taken in duplicate (middle finger for samples for all glucose meters and ring finger for YSI samples). Meter sequence was randomly assigned. Accuracy was assessed by comparing the glucose results of finger sticks obtained with each of the meters to the venous laboratory reference value and the YSI capillary glucose values (Clarke error grid analysis (EGA), Parke EGA, and tabulation of the percentage of results obtained with each meter falling within ± 5%, 10%, 15%, and 20% of the reference methods - YSI and laboratory values). Meter precision was determined by calculating absolute mean differences in glucose values between duplicate samples (paired t-test).
Results: Finger sticks were obtained in duplicate from 101 diabetes patients: 94.1% of patients were white, 50.5% were male, 84.2% had type 2 diabetes, and the average age was 60 years (S.D. ± 13). Mean YSI and venipuncture BG was 144 mg/dL (± 49; range 67.9 - 359) and142 mg/dL (± 51; range 65.5 - 383), respectively. Accuracy and precision data are currently being analyzed.
Conclusion: Study conclusions will be made after final analysis of the data.

129. Efficacy of teriparatide in patients with resolved secondary hyperparathyroidism due to vitamin D deficiency.
Andrea N. Traina, Pharm.D.[1], Michael P. Kane, Pharm.D.[1], Robert A. Hamilton, Pharm.D.[1], Robert S. Busch, M.D.[2], Gary Bakst, M.D.[2], Jill M. Abelseth, M.D.[2]; (1)Albany College of Pharmacy and Health Sciences, Albany, NY; (2)The Endocrine Group, LLP, Albany, NY
Objectives: To determine the efficacy of teriparatide on bone mineral density (BMD) and T-scores in patients with a history of resolved secondary hyperparathyroidism (2HPT) and at least one year of teriparatide treatment and to compare the efficacy of teriparatide in these patients to patients without a history of 2HPT and at least one year of teriparatide treatment.
Methods: Retrospective study conducted at a private-practice endocrinology office. Pertinent patient information was identified utilizing an electronic medical record (EMR) system. Data collected included patient demographics, duration of teriparatide treatment, history of 2HPT, BMD information, and T-scores. Paired and unpaired t-tests were performed to compare baseline data to follow-up; p-values less than 0.05 were considered statistically significant.
Results: EMRs of 169 patients receiving teriparatide, including 14 patients with a history of resolved 2HPT due to vitamin D deficiency, were analyzed. Demographics: 98.5% white, 89.7% female, average age 67 (±13) years. Mean baseline T-scores (Hip: -2.4 ± 1.1, -2.4 ± 1.1; Spine: -2.4 ± 1.4, -2.7 ± 1.2; Wrist: -2.9 ± 0.9, -2.2 ± 1.6) and BMD (Hip: 0.68 ± 0.14, 0.68 ± 0.13; Spine: 0.77 ± 0.17, 0.75 ± 0.14; Wrist: 0.46 ± 0.05, 0.47 ± 0.08) were similar in patients with and without a history of 2HPT. After an average of 20.6 ± 4.9 and 21.3 ± 4.5 months of teriparatide therapy, respectively, there were no significant differences between the groups in post-treatment T-scores (Hip: -2.2 ± 0.9, -2.0 ± 1.1; Spine: -1.8 ± 1.1, -2.1 ± 1.4; Wrist: -2.4 ± 1.3, -2.2 ± 1.5) or BMD (Hip: 0.71 ± 0.12, 0.64 ± 0.22; Spine: 0.73 ± 0.33, 0.73 ± 0.28; Wrist: 0.46 ± 0.17, 0.43 ± 0.17).
Conclusion: Patients with a history of resolved 2HPT due to vitamin D deficiency responded to teriparatide therapy no differently than patients without a history of resolved 2HPT.

Family Medicine

130. Effect of pharmacist intervention on medication use and healthcare resource utilization at transitions of care.
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Objectives: A strategic focus on pharmaceutical care during the peridischarge period may reduce the risk of drug-related adverse events, rehospitalization, and ED visits postdischarge. The purpose of this study is to evaluate the effectiveness of a pharmacotherapy clinic visit 72 hours after hospital discharge on the incidence of a composite of rehospitalization and emergency department visits as one primary outcome, and postdischarge medication discrepancies as a second primary outcome. Secondary objectives include evaluation of discharge-related patient satisfaction.
Methods: Patients are recruited from an inpatient family medicine service and are included if they have risk factors for re-hospitalization, including heart failure, COPD, hyperglycemic crisis, stroke, NSTEMI/UA, more than three hospitalizations in the last five years, or at least eight scheduled medications anticipated at the time of discharge. Patients are consented and randomized to either the intervention or usual care study arm. A Best Possible Medication Discharge List (BPMDL) is formulated by inpatient clinical pharmacists before the discharge of all study patients as a standard for determination of medication discrepancies. Patients in the usual care arm are discharged according to usual practice. Patients in the intervention arm attend a Pharmacotherapy Clinic visit within 72 hours of discharge. All study subjects receive telephone follow-up approximately 30 days after discharge to assess health care resource utilization and to complete a Discharge-Related Patient Satisfaction Survey.
Results: This study has been approved by the UNC Biomedical Research Institutional Review Board. To date, 215 patients have been screened. Of the 41 eligible patients, nine agreed to enrollment. Preliminary medication discrepancy rates at discharge are 83% in the usual care group and 67% in the intervention group. Preliminary data show no 30-day rehospitalizations in the intervention group and

two in the usual care arm. Completion of data collection is scheduled for April 2010.
Conclusion: Pending.

Geriatrics

131. Administration of drugs by nurses: a survey in a geriatric hospital.
Jennifer Grangé Sr., Pharmacist, Isabelle Peyron, Pharmacist, Heloïse Massa, Student, Clément Badie, Student, Françoise Lamberdière, Risk Manager, Anna Sarfati, Pharmacist; Charles Foix Hospital, AP-HP, Ivry Sur Seine, France
Objectives: Pharmaceutical forms are not always adapted for the elderly population. Because of a recurrent demand from the nurses and the frequent prescriptions of half-doses, a survey was performed in several clinical departments. The objective was to describe the administration of drugs by oral route (tablets, capsules, and drinkable forms) to determine the most often problems encountered by nurses.
Methods: A scale with eight items was created by a pharmacist. The survey was followed by two students in pharmacy. The scale was filled in for each patient and included all the drugs administered at one time. For each administration, the eight items were checked, and the correlation with the prescription rules and the Summary of Product Characteristics was evaluated (correlated (C) / not correlated (NC)/not applicable (NA)).
Results: 455 administrations were analyzed (104 patients, 21 nurses): 86 and 266 concerning respectively capsules and tablets. 66.6% are totally in accordance.
Results by item:
Name, dose and galenic form of drugs: 99.6; 99.6; 99.8% correlated with prescription
Schedule of administration: 88.8% correlated with prescription
Time of administration: 94.5% correlated with prescription
Opened capsules: 24.4% (21/86): 47.6% C; 52.4% NC
Crushed tablets: 33.1% (88/266): 13.6% C; 86.4% NC
Drug mixed with food: 22.6%: 98.1% C; 1.9% NC
Conclusion: 22.6% of drugs were mixed with food and we don't know if all the dose was taken by the patient. Furthermore the administration of solid forms is problematic with elderly people: 31% are modified. The pharmacist suggest correctives measures: to create a synthetic index of the most frequently modified solid forms, mentioning the alternatives forms and the possibility to open or crush or to substitute by another drug. This survey underlines the key-role of the pharmacist to improve professional practices for the best patient management.

132. Changes in psychoactive drug use following relocation of skilled nursing facility residents.
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Introduction: While literature supports an increase in mortality and hospitalizations following the relocation of elderly patients, the requirement for psychoactive drug use to manage agitation associated with relocating elderly patients has not been adequately studied.
Objectives: To determine the use of psychoactive medications following the relocation of a 152-bed teaching skilled nursing facility in August 2009.
Methods: In this single-center retrospective cohort study, patient medical records were reviewed to compare prescribing patterns, medication use, and behavioral monitoring records from July 10 to August 9 (pre-relocation) with data from August 10 to September 10 (post-relocation).
Results: 87 patients were included in the preliminary analysis (mean age 81, 69% female, 61% white, 38% black, 70% with dementia diagnosis, 63% with depression diagnosis). For the primary outcome of change in antipsychotic or benzodiazepine use: four patients were started on an antipsychotic or benzodiazepine, one patient required increased dose, and one patient required more doses of their "prn" benzodiazepine. However three patients' doses were decreased and four patients required less "prn" drug use for anxiety/agitation in the month following relocation. For secondary outcomes there was not a statistically significant difference in the use of antidepressants, mood stabilizers, acetylcholinesterase inhibitors, memantine, hypnotics, melatonin agonists, or non-benzodiazepine sleep medications following relocation to a new facility.
Conclusion: While a previous study showed an increase in use of antipsychotics following the relocation of skilled nursing facility residents, our study did not find a statistically significant increase or decrease in use of psychoactive medications.

133. Medication discrepancies identified at time of hospital discharge in a geriatric population.
Danielle M. Stitt, Pharm.D.[1], David P. Elliott, Pharm.D.[2]; (1)Charleston Area Medical Center, Charleston, WV; (2)West Virginia University, Charleston, WV
Objectives: It has been reported that 14.1% of geriatric patients experience one or more medication discrepancies post-hospitalization. Discharge medication lists may be a contributing source to these discrepancies. This study will identify and characterize discharge medication list discrepancies among geriatric patients, and it will also detail factors associated with discrepancies.
Methods: An institutional review board approved retrospective chart review will be conducted of patients aged 65 years or older discharged from hospitalist and internal medicine services at the Charleston Area Medical Center General and Memorial Hospitals from August 2008 through December 2009. Subjects will be categorized by age, gender, attending medical service, and the absence or presence of a clinical pharmacist on the service. Medication lists will be obtained from physician discharge summaries, discharge orders, and nursing discharge lists. Statistical analysis will be conducted utilizing SAS 9.2.
Results: Presently, 74 patients have been identified from August 2008 through August 2009. A total of 673 medication discrepancies occurred, consisting of 125 related to the absence or presence of a medication, 119 related to the total daily dose, 69 related to the number of daily dose(s), and 360 related to dosage form. Physician discharge summaries were the most common source of these discrepancies. The average number of discrepancies per patient were 10.9 for hospitalist-no clinical pharmacist, 6.92 for internal medicine-clinical pharmacist, and 7.56 for internal medicine-no clinical pharmacist (p=0.068). Data collection and analysis from September 2009 through December 2009 are anticipated to be completed by date of presentation.
Conclusions: Medication discrepancies at the time of hospital discharge are a common occurrence for geriatric patients. Physician summaries may be the least reliable source of discharge medication lists. Discrepancies among medicine services appear to not be significant, and the presence of a clinical pharmacist seems to not significantly impact the number of medication discrepancies.

Hematology/Anticoagulation

134. Tuberculosis and diabetes: blood glucose level and leukocytes count are they correlated?
Daud Moalin Ishaq, Ph.D., Student, Syed Azhar Sulaiman, Assoc., Prof; Universiti Sains Malaysia, Penang
Objectives: This is a pilot study for Ph.D., program in the area of diabetes and tuberculosis. The main objectives are: (1) to assess if diabetes mellitus patients have quantitatively abnormal leukocyte and platelet counts; (2) to compare DM to TB with respect to leukocyte and platelet counts; (3) to identify if there is any correlation between leukocyte count and blood glucose level.
Methods: Groups studied included: DM (118 patients), TB (115 patients), DM-TB (76 patients) and Control subjects (118 patients). Retrospectively leukocyte count, platelets, and blood glucose levels of these groups were compared.
Results: DM patients showed quantitatively higher lymphocyte and neutrophil count. Tuberculosis (TB) patients showed the lowest lymphocyte count. Combined lymphocytopenia-neutrophilia was observed in all groups for severely ill patients. Depending on the severity of illness, lymphocytopenia-neutrophilia may have resulted from migration of lymphocytes to the area of inflammation at the expense of circulating peripheral lymphocytes and this abnormal distribution of lymphocytes normalized after the correction of inflammation. The inflammation could be due to excessive release of

hormones and/or catechlomines, injury / surgery, infection or others. Thrombocytosis was observed in TB and DM-TB groups. Although it is not clear, thrombocytosis might have resulted from tuberculous infection.

Conclusion: Compared to other groups, DM patients had the highest average lymphocytes count, and neutrophilia. TB patients had the lowest lymphocyte count which may have resulted from infection and/or malnutrition. Thrombocytes of the TB and DM-TB patients were elevated, may be, as a result of TB infection.

135. Venous thromboembolic events during hospitalization in patients that missed doses of pharmacologic venous thromboembolism prophylaxis.

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Objectives: Determine the frequency of missed doses of pharmacologic venous thromboembolism (VTE) prophylaxis in hospitalized patients with positive computed tomography (CT) scans, pulmonary ventilation/perfusion (V/Q) scans, or Duplex ultrasounds.

Methods: After obtaining approval from the Institutional Review Board of the Johns Hopkins Medical Institutions, we conducted a retrospective review of patients that received VTE prophylaxis. The database used for this study was obtained from a study conducted over a one-year period in 2008 that evaluated the frequency of missed doses of pharmacologic VTE prophylaxis in hospitalized patients. The current study included all adult patients 18 years and older prescribed pharmacologic VTE prophylaxis with either unfractionated heparin (UFH) or enoxaparin from July 1, 2007 to June 30, 2008. Patients admitted to floors without computerized physician order entry (CPOE) were excluded from the study. For each subject, we will collect the patient identification numbers from the previous study, number of VTE prophylaxis doses ordered during each hospital visit, and number of VTE prophylaxis doses missed during each hospital visit. In addition, we will collect the date of the scan, reasons that the scan was ordered, and the impression of the scan. SPSS 16.0 statistical analysis software will be used for data analysis. Data will be analyzed by assessing the incidence of missed doses in quartiles during each hospitalization and evaluating the incidence of positive scans in each quartile. We hypothesize that the percentage of positive scans will increase as the percentage of missed doses increases.

Results: Data analysis is currently ongoing and will be complete by the date of the ACCP presentation.

Conclusion: Conclusion will be complete by the date of the ACCP presentation.

136. Evaluation of the use of phytonadione in warfarin reversal at a community hospital.

Darowan Akajagbor, Pharm.D., Valery L. Chu, Pharm.D., CACP, Henry Cohen, MS, Pharm.D., FCCM, BCPP, CGP; Kingsbrook Jewish Medical Center and Arnold & Marie Schwartz College of Pharmacy and Health Sciences of Long Island University, Brooklyn, NY

Objectives: In response to a lack of uniformity and evidence-based use of phytonadione to reverse warfarin, Kingsbrook Jewish Medical Center implemented an institutional protocol to treat warfarin-induced elevated INR and/or bleeding on January 1st 2009. This review evaluates adherence to phytonadione use as recommended by this protocol, and assesses its efficacy and safety.

Methods: This is a retrospective review of inpatients who received phytonadione at any dose and route to reverse warfarin for elevated INR and/or bleeding between January to October 2009. If consecutive doses were used to treat the same event, only phytonadione doses administered on the first day were included. Labs obtained include INRs on the first day of phytonadione treatment (Day 0), within 24 and 48 hours after, and hematocrit and hemoglobin on admission and Day 0. Administration of blood transfusions and/or fresh frozen plasma were identified. Safety and rationale for dose and route of phytonadione therapy were collected from adverse drug event reports, pharmacy computerized profile, computerized physician order entry system, chart review, and emergency department and ambulatory care electronic health record systems.

Results: In a preliminary analysis from May to July 2009, 108 cases of administered phytonadione were identified. Phytonadione was used for elevated INR in 28.7% of cases, at a mean dose of 8.15 mg. Routes of administration were oral (48.4%), intravenous (29%), intramuscular (16.1%), and subcutaneous (5.9%). Mean INR on Day 0 was 7.12, and mean INR reduction from Day 0 to Day 1 was 3.96. No phytonadione adverse drug events were reported in 2009.

Conclusion: Preliminary analysis suggests deviation from protocol phytonadione route recommendations, although chart review is needed to determine if justified. Elevated INR made up the minority of phytonadione use, indicating that protocol modification is needed to include other uses. Other conclusions are pending further data collection and analysis.

137. Does a standardized warfarin dosing protocol reduce patient bleeding and thromboembolic events?

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Objectives: The UMass Memorial Medical Center Anticoagulation Task Force designed a warfarin protocol to standardize warfarin management. Previous studies evaluating the effect of warfarin protocols have shown similar efficacy and safety when compared to non-protocol dosing. There are few studies available evaluating the use of a single warfarin protocol in a diverse patient population.

Methods: This retrospective, observational study evaluates the impact of a warfarin protocol verses standard-of-care dosing in a large, tertiary care, medical center. The primary outcome is the incidence of in-hospital bleeding and thromboembolic events. Patients are identified as being dosed per "protocol" when the warfarin protocol is utilized by the prescribing physician; otherwise patients are identified as standard-of-care. Patients are included if prescribed warfarin from September 1st, 2009 to February 28th, 2010. Pediatric and pregnant patients are excluded. Protocol utilization, International Normalized Ratios (INR) $\geq$ 5, INRs upon discharge, readmission within 30 days due to bleeding or thromboembolic events, and appropriateness of vitamin K administration will also be measured.

Results: Data has been analyzed in eighty patients thus far. The average age was 67.9 years old with a 6.9 day average length of stay. A total of 46.3% patients were discharged with subtherapeutic INRs and 6.3% reached supratherapeutic INR>5. 30-day readmission rates were 12.5%, 20% were bleeding events, 20% were thromboembolic events, and 60% were for non-coagulation related causes. Vitamin K was used in 11.3% of patients, 77.8% was enteral, 11.1% was subcutaneous, and the remainder was intravenous. Most patients had a history significant for atrial fibrillation (60%), followed by previous deep vein thrombosis (20%), and previous pulmonary embolism (11%). Data collection is ongoing and complete comparative analysis will be presented.

Conclusions: Pending

138. Evaluation of a heparin induced thrombocytopenia (HIT) guideline at an academic medical center.

Kathryn M. Ruf, Pharm.D., Daniel A. Lewis, Pharm.D., BCPS, Jeremy D. Flynn, Pharm.D., BCPS, George A. Davis, Pharm.D., BCPS; UK HealthCare, Lexington, KY

Objective: The diagnosis of HIT is complex and involves integrating both clinical and laboratory findings. Therefore, the decision to initiate direct thrombin inhibitor (DTI) therapy for HIT is challenging. A guideline incorporating the 4T pretest probability score, ELISA result, and optical density (OD) value was implemented to determine a patient's candidacy for DTI therapy. The objective of this study was to evaluate the impact of a HIT guideline on appropriate DTI utilization.

Methods: Retrospective chart review was conducted of patients who received DTI therapy during a two year period. Indication for DTI therapy included a 4T score > 3 and positive ELISA result with an OD $\geq$ 1. The primary endpoint was to evaluate the guideline's ability to identify patients with HIT confirmed by serotonin release assay (SRA) for DTI therapy. A cost avoidance analysis will also be performed.

Results: To date, fifty three patients have been identified for inclusion and ten patients have been reviewed. The guideline correctly categorized eight of ten patients (80%) for initial DTI therapy. Of these eight patients, one had a positive SRA result. This was coupled

with an intermediate 4T score with an OD ≥ 1. Two patients were categorized incorrectly by the guideline. One had a 4T score of 5 and an OD of 0.49 with a positive SRA result and was not identified for initial DTI therapy. Alternately, one patient had a negative SRA result with a 4T score of 4 and OD of 1.56.
Conclusion: Preliminary data suggest a HIT guideline may be a tool to aid in the appropriate utilization of DTIs. Final study results will be available at the time of presentation and may identify areas for guideline improvement and clarify its utility at an academic medical center.

139. An evaluation of pharmacy intervention on the prescribing of vitamin K and associated length of stay in a community hospital setting.
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Objectives: The objective of this study is to assess the effectiveness of a multifaceted educational approach by pharmacy designed to influence the prescribing habits of physicians for vitamin K (phytonadione) and the effects on length of stay.
Methods: This study will evaluate the effectiveness of a multifaceted education program put forth by the associated institution's department of pharmacy in response to a medication use evaluation (MUE) of vitamin K (phytonadione.) A further assessment of these vitamin K orders and their influence on hospital length of stay was completed. Patient records identified during the MUE process were reviewed for the following: demographic data; admission and discharge dates; indication for outpatient anticoagulation with warfarin; reason for admission; international normalization ratio (INR) values at admission and during hospitalization; warfarin and vitamin K use; blood or fresh frozen plasma (FFP) administration; time to INR reduction for required surgery, cardiac catheterization, or diagnostic procedure; time to therapeutic INR after the procedure; and hospitalization days post procedure. Education efforts focused on currently recommended vitamin K doses, routes of administration, contraindications, and data from the literature about anticoagulation reversal. Modes of communication included written letters to the physicians, continuing medical education (CME) presentations, and presentations at key hospital medicine and pharmacy departmental meetings. A review will be completed in the same manner stated previously after the educational undertakings have been completed and compared to the previous findings to assess prescribing habits before and after physician education.
Results: The initial MUE revealed the following vitamin K orders over a six month time frame: 112 subcutaneous doses, 44 intravenous doses, and 28 oral doses. Full evaluation of the data and educational activities are still in process at the time of abstract submission.
Conclusion: The remaining data to be evaluated in early 2010 and the final results and conclusions are still to be presented.

HIV/AIDS

140. Prevalence of cardiovascular risk factors in perinatally HIV-infected children and adolescents.
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Background: Highly active antitretroviral therapy has greatly reduced morbidity and mortality for HIV-infected pediatric patients; however, long-term toxicities associated with antiretroviral therapy have not been fully elucidated in the perinatally infected population. There is a growing concern that cardiovascular disease may develop prematurely and there are limited data on the prevalence of these risk factors in the perinatally HIV-infected population.
Objectives: Primary objective is to determine the prevalence of cardiovascular risk factors in the perinatally HIV-infected pediatric population at the Ruth M. Rothstein CORE Center compared to the healthy pediatric population. Secondary objective is to determine factors associated with development of dyslipidemia, diabetes, or hypertension in this patient population.
Methods: Retrospective chart review of HIV-infected children and adolescents receiving active care at the CORE Center. Medical history, family history, height and weight, and collected laboratory values to assess for dyslipidemia, diabetes, hypertension, and renal disease, as defined by the pediatric literature. Hypercholesteremia was defined as at least two counts above 200 mg/dL in the past year. CD4 counts and HIV-1 viral loads were collected in addition to HAART history.
Results: Sixty-eight children between the age of six months to 20 years were assessed. Hypercholesterolemia was noted in eigh patients (12%), hypertriglyceridemia in 14 (21%), and hyperlipidemia in three (4%) patients. Eight children (12%) were prehypertensive or hypertensive, ten (15%) were overweight or obese, and none was diagnosed with type 1 or type 2 diabetes mellitus or renal disease. Family history was unavailable; 23 children (34%) were in foster care or adopted. Data collection and analysis are still in progress.
Conclusions: Data collection and analysis are still in progress and should be completed before the ACCP 2010 Spring Practice and Research Forum.

Infectious Diseases

141. Trends in antibiotic usage for community-acquired methicillin resistant Staphylococcus aureus.
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Objectives: Since 2000, there has been increasing prevalence of community-acquired methicillin-resistant *Staphylococcus aureus* (CA-MRSA). Commonly CA-MRSA presents as skin and soft-tissue infections (SSTI), yet concern has developed about CA-MRSA pneumonia. While there is a multitude of literature highlighting increasing trends of CA-MRSA SSTI and pneumonia, there are limited data describing trends in antibiotic usage for CA-MRSA. The primary objective of this study is to determine if there has been an increasing trend of anti-CA-MRSA coverage integrated into empiric therapies for SSTI and pneumonia in adult Kentucky Medicaid patients. Secondary objectives will evaluate subsets of the primary population to determine if there are significant trends within each group.
Methods: An observational study using the Kentucky Medicaid claims were queried from January 1, 2001-December 31, 2008 to identify adult patients aged 18 and older who received a diagnosis of SSTI or pneumonia and filled a prescription for an antibiotic(s) within 72 hours of diagnosis. For the secondary objectives, patient information extracted on comorbid disease states, procedures, gender, rurality, and age were gathered to determine trends for various subsets. *International Classification of Disease, 9th revision* (ICD-9), *Current Procedural Terminology* (CPT) codes, revenue codes, and *National Drug Codes (*NDCs) for extraction of data. Quantity of courses of anti-MRSA antibiotics were compiled for each year. The pattern of antibiotic usage over time were charted and to show the change in CA-MRSA antibiotics through time. χ^2 statistics and linear regression were used for data analysis.
Results: (In progress) The SSTI population over 2001-2008 included 39,398 patients. Diagnosis of SSTI decreased from 4205 to 3,10 in 2001–2008 ($p<0.001$). There was a significant decrease in β-lactam agents in 2001 to 2008 (2737 vs. 1168, $p<0.001$) and a significant increase in anti-CA-MRSA agents with 996 versus 1857 ($p=0.000$).
Conclusions: Conclusions will be drawn when data collection and evaluation are complete.

142. Characterization of heteroresistant vancomycin-intermediate *Staphylococcus aureus* (hVISA) and community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA) in an academic hospital setting.
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Ph.D.[2], Joan-Miquel Balada-Llasat, Pharm.D., Ph.D., D(ABMM)[1], Preeti Pancholi, Ph.D., D(ABMM)[1], Debra A. Goff, Pharm.D.[1]; (1)The Ohio State University Medical Center, Columbus, OH; (2)Anti-infective Research Laboratory, Wayne State University, Detroit, MI

Objectives: The prevalence of hVISA varies geographically and its detection is difficult, time-consuming and costly. CA-MRSA strains have increased dramatically and are now present in most hospitals. Little is known regarding the prevalence of hVISA in CA-MRSA strains. The study objective was to evaluate the molecular epidemiology of MRSA bloodstream isolates to determine the prevalence and clinical significance of hVISA and CA-MRSA.

Methods: Two hundred MRSA blood isolates from 150 hospitalized adult patients were collected between August 1, 2007 and September 30, 2008 at a large, academic medical center. All isolates were assessed for hVISA characterized by modified population analysis profile and were molecularly evaluated for USA strain and SCC*mec* type, agr group, and the presence of lukS-PV and lukF-PV genes. Time to acquisition of MRSA, hospital length-of-stay, mortality, and antimicrobial therapy were assessed.

Results: One patient had health care–associated hVISA and failed vancomycin. Seventy-six (38%) of the isolates representing 61 unique patients were CA-MRSA based on SCC*mec* type IV of which 55 (72%) were PVL-positive, 73 (96%) were agr group I and 53 (70%) were USA300 strain. Seventy-two percent of PVL-positive isolates were health care associated. The average length of stay for patients with PVL-positive isolates was 14.6 ± 10.9 days, and all-cause mortality was 6%. Eighty-six percent of health care–associated PVL-positive isolates were susceptible to tetracyclines and 92% to trimethoprim-sulfamethoxazole. Sixty-two percent of PVL-positive patients received vancomycin monotherapy while the other 38% received linezolid, daptomycin, trimethoprim-sulfamethoxazole, rifampin and/or vancomycin.

Conclusion: Of the isolates sampled, the prevalence of hVISA was low. CA-MRSA strains have emerged; however, increased length of stay, increased mortality and decreased drug susceptibilities have not been observed. The blurring of nosocomial and community-acquired MRSA bloodstream infections creates new challenges for infection control surveillance as MRSA colonization sites may vary by phenotypic profile.

143. Evaluating risk factors for the development of ESBL-producing infections in a veterans affairs medical center.

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Objectives: This study evaluates risk factors for the development of nosocomial and community-acquired ESBL-positive infections and assesses effects on morbidity and mortality.

Background: Extended-spectrum β-lactamase (ESBL)-producing organisms are becoming more common as the rate of resistant gram-negative infections continues to rise. This particular mechanism of resistance often affects gram-negative *Enterobacteriaceae,* and effective antimicrobial options are limited. Available studies have been limited by size and more data is needed in the literature to continue to identify risk factors as well as clinical effects on morbidity and mortality.

Methods: We performed a retrospective case-control study of patients who developed ESBL-producing infections from January 2007 through October 2009 at the Richard L. Roudebush Veterans Affairs Medical Center. Each case patient was matched with two control patients based on site of infection and organism species (non-ESBL producing). Data on demographic characteristics, infection site, microbiology, patient location, recent or current hospitalization, foreign body use, urologic manipulations, and cause of death was collected, analyzed, and compared between cases and controls.

Results: A total of 72 patients were analyzed for the study. There were 24 case patients with ESBL-positive infections included. Case patients were than matched with a total of 48 control patients. Data collection is currently in progress with results pending.

Conclusion: The results of this study are pending finalization of data collection and statistical review. Results will be presented at the ACCP Spring Practice and Research Forum.

144. Methicillin-resistant *staphylococcus aureus* nasal colonization and correlation to methicillin-resistant *Staphylococcus aureus* pneumonia in the intensive care unit.

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Objectives: The link between methicillin-resistant *Staphylococcus aureus* (MRSA) colonization and infection is well studied and suggests a more judicious use of empiric antibiotic regimens with activity against MRSA to promote antimicrobial stewardship. However, none of these investigations have discovered a significant relationship between MRSA pneumonia and colonization with MRSA. This study aims to evaluate the incidence of MRSA pneumonia in intensive care unit (ICU) patients colonized with MRSA as detected by nasal swab.

Methods: A retrospective chart review will be performed for 800 patients admitted to the 24-bed ICU of a community hospital between November 2008 and October 2009. The investigators will record age, sex, total hospital and ICU days, level of care before admission, results of nasal swab (positive or negative for MRSA), type of infection (if applicable), and type of pneumonia (if applicable).

Results: As of December 14th, 2009, 103 charts were reviewed and an interim analysis was performed. Positive nasal swabs were present in 11% of patients, and pneumonia occurred in 17% of patients. Of patients colonized with MRSA, none had pneumonia. No cases of MRSA pneumonia were documented; therefore, statistical analysis of the primary outcome could not be performed at this time. More patients colonized with MRSA had an infection caused by MRSA compared to patients without MRSA colonization (18% vs. 0%, $p = 0.021$). Data collection will be completed in February 2010.

Conclusion: The results of this interim analysis do not indicate that MRSA pneumonia is more frequent in patients colonized with MRSA than in patients not colonized with MRSA. However, interim data are consistent with previous studies indicating that MRSA nasal colonization may predict MRSA as the causative organism for other infections. More data from this study population is necessary to determine if nasal colonization with MRSA is related to MRSA pneumonia.

145. Outcomes for culture-positive vs. culture-negative pneumonia patients: data from the national hospital discharge survey.

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Objectives: Recent pneumonia studies among culture-positive patients have found increased rates of resistant pathogens and worse health outcomes for healthcare-associated pneumonia (HCAP) patients compared to community-acquired pneumonia (CAP) patients. By excluding culture-negative patients, these studies may have unintentionally introduced selection bias if culture-positive and culture-negative patients are distinctly different. This study assesses differences in disease severity and health outcomes among culture-positive and culture-negative pneumonia patients.

Methods: The CDC's National Hospital Discharge Survey (2001-2006) was used to extract data of community-dwelling patients with a principal ICD-9 discharge diagnosis of pneumonia (481-486). Baseline demographics, health outcomes, and comorbidities (including chronic pulmonary disease, heart failure, diabetes, cerebrovascular disease, renal disease, liver disease, and any malignancy) were collected and compared between culture-positive and culture-negative patients using chi-square and Student's t-tests. Data weights were used to derive national population estimates. Statistical significance was defined as $p<0.0001$.

Results: From 2001-2006, 5.4 million community-dwelling patients were discharged from U.S. short stay hospitals with a principal discharge diagnosis of pneumonia. The mean age for all patients was 70.1 years; 12.6% of patients were culture-positive. Culture-positive pneumonia patients had more severe disease (using mechanical ventilation [MV] ≥96 hours as a marker of disease severity) and endured a longer mean hospital length of stay (LOS) than their

culture-negative counterparts: MV, 5.5% vs. 1.2% (p<0.0001); LOS, 7.8 vs. 5.4 days (p<0.0001). Culture-positive patients also suffered greater mortality compared to culture-negative patients (6.6% vs. 4.6%, p<0.0001).
Conclusion: Culture-positive pneumonia patients have more severe disease and suffer worse health outcomes compared to culture-negative patients. Future studies should include both culture-positive and culture-negative pneumonia patients to avoid any potential selection bias.

146. Pneumococcal vaccine CPOE pathway for preventing re-vaccination of patients with multiple admissions in a community hospital: effective or not effective?
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Objectives: In the fourth quarter of 2003, compliance with pneumococcal vaccination assessment in patients ≥65 years old admitted to Kingsbrook Jewish Medical Center (KJMC) for pneumonia was poor, possibly due to discrepant record keeping and assessment. This triggered the creation of a computerized vaccine assessment and tracking pathway in January 2004. The pathway includes a Clinical Observations & Results (COR) database to permanently store vaccination order entry and a nursing vaccination assessment pathway which requires nurses to review the vaccination history of admitted patients and intervene, when necessary. According to the ATS/IDSA guidelines, pneumococcal polysaccharide vaccine is recommended for persons ≥65 years old and for high risk persons 2-64 years. Revaccination is not routinely recommended for patients ≥65 years. Our objective is to assess the effectiveness of the vaccination tracking pathway in preventing patients from inappropriately receiving multiple pneumococcal vaccinations.
Methods: One hundred inpatient medical records for patients admitted from November to December 2009 who were ≥65 years with >1 admission to KJMC were reviewed. Data were analyzed to detect any deviation from the ATS/IDSA guidelines in the administration of the pneumococcal vaccine using the CPOE pathway.
Results: Physicians inappropriately ordered second or more doses (less than five years apart) of pneumococcal vaccine in 37 of 100 patients (37%) and of these, 19 were inappropriately vaccinated more than one time. Eighteen of the 37 patients were inappropriately ordered a pneumococcal vaccine, however, they did not receive it due to nursing intervention made possible via the vaccination assessment pathway. Overall compliance with the ATS/IDSA guidelines for Pneumococcal vaccination was 81%.
Conclusion: Through a systems based, multidisciplinary CPOE approach to vaccination assessment and administration, KJMC improved vaccination recording and had a low/moderate rate of revaccination. Improvement is still needed to reduce re-vaccination rates via inclusion of pharmacists in the vaccination reconciliation process.

Medication Safety

147. ON-Q PainBusters®: the road to compliance with the ISMP recommendations for safest use.
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Objectives: ON-Q PainBusters® are elastomeric pain relief balls that deliver a local anesthetic continuously by an indwelling catheter. The purported benefits are to reduce post-operative pain, decrease use of narcotics and therefore, decrease risk of opiate side effects. However, according to the Institute of Safe Medication Practices (ISMP), the ON-Q pain balls have many safety concerns associated with their use. The main objective was to evaluate Grant Medical Center's (GMC) current practices surrounding ON-Q use and to make process improvements to meet ISMP's recommendations.
Methods: Several meetings with nurse managers and pharmacy managers took place to define current ON-Q practices. A gap analysis was conducted with several improvement opportunities identified. The gap analysis was presented to various committees, such as Medication Safety Committee, Patient Safety Committee, and others. Medication Safety Committee formed a multidisciplinary subcommittee, the PainBall Task Force, to address the identified opportunities.
Results: Initially, most ON-Q pain balls were being made in the OR area. Because of multidisciplinary action, there was increased physician awareness of the issues and risks associated with these products. Currently, the surgeons order them in advance, and pharmacy is now involved in the preparation and dispensing of all ON-Q pain balls hospital-wide. A draft preprinted order set was created to standardize the prescribing, preparing, and dispensing practices. The number of ISMP recommendations in compliance is significantly greater after the gap analysis and multidisciplinary action. Subsequently, the lessons learned from the new processes were applied to another local anesthetic pump introduced to GMC and allowed standardization of processes in a timely manner.
Conclusions: The creation of a gap analysis successfully identified process improvement opportunities. A multidisciplinary approach provided the most optimal and effective outcomes. In the end, patient safety and quality of care was significantly affected in a positive way.

148. Development of trigger methodology for an adverse drug reaction surveillance program.
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Objectives: To develop a list of adverse drug reaction (ADR) triggers and implement a process for using trigger methodology within a pharmacy computer system for the purposes of detecting ADRs or near misses.
Methods: A MEDLINE literature search using the key words, adverse drug reaction, adverse drug event, trigger, computer-based, automated, monitor, and tool was performed and discussions with ADR reporting and pharmacy informatics specialists were held to create a list of potential triggers and subsequent processes for ADR reporting that could be implemented at our institution. In addition, evaluation of the implementation will include positive predictive value of each trigger, total number of times each trigger activates, number of ADRs uniquely identified due to implementation, and number of ADRs identified before and after implementation.
Results: An initial list of 25 triggers was identified as having potential use within our pharmacy computer system. Of these, 24 were identified from the medical literature, while one unique trigger was proposed based on local practice. After discussion with the specialists, this initial list was decreased to a total of ten triggers for implementation. The final list of triggers is meant to identify reactions of nephrotoxicity, hypoglycemia, thrombocytopenia, hepatotoxicity, eosinophilia, and medication overdose. The process for reporting ADRs based on activated triggers will include a retrospective chart review for identification of true events. Any identified ADRs or near misses will be reported through the Patient Safety Network (PSN) for tracking. Additional analysis of the trigger implementation is expected to be completed by April 2010.
Conclusion: A list of ten triggers with potential to identify a broad range of ADRs and an initial process for reporting has been determined. Additional analysis will provide information on potential expansion of current rules and feasibility of continuation of trigger methodology at our institution.

149. Pilot project on the development of a clinical prediction model for major bleeding complications in hospitalized patients on coumarin therapy.
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Objectives: The development of a clinical prediction model for the risk of major bleeding complications with coumarin use in hospitalized patients. This enables hospital pharmacists to identify high-risk patients and provide them with specific medication advice. Adverse events can be limited and the use of expensive prothrombin complex concentrate (PCC) will be reduced.
Methods: Design: nested case-control research in a cohort of hospitalized patients using vitamin K antagonists (VKA's).

Cases: 100 patients who are prescribed PCC for a major bleeding complication
Controls: Three controls per case who are not prescribed PCC. Inclusion criteria: Patients 18 years and older, having VKA prescribed on day of admission
Exclusion criteria: other indications for PCC prescription (e.g. 'bridging' therapy
Strategy: electronic patient records for extracting data on (a.o.) medication, clinical laboratory results, haematologic parameters (e.g. INR, PT), procedures/surgery, demographics, comorbidity.

Outcome: Risk factors for the use of PCC for major bleeding complication in hospitalized patients, incorporated in a clinical prediction model.

Analysis: Logistic regression-analysis for analysis of the case-control design. Backward selection to select the stronges predictors in a mulitvariate regression model. The development process will be repeated in bootstrap samples to determine the optimization of the model (internal validation).

Results: In 2008, 716 (2.0% of total admissions; n=35,120) patients were admitted using VKAs. Of these, 46 patients (6.4%) were prescribed PCC. At present, 14 of them have died. More detailed data on these patients, as well as data of 2006, 2007, and 2009, will follow shortly.

Conclusion: The percentage of patients who are admitted using VKA's and who are prescribed PCC is low (0.1%). However, the mortality-rate in this group is high, and it is plausible they might benefit from early detection and increased care in an early stage.

Men's Health

150. From fruit extract to structure activity relationship studies: dietary xanthones isolated from the mangosteen fruit for prostate cancer chemoprevention.

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Objectives: This study examines the anti-cancer effect of dietary xanthones isolated from the mangosteen fruit in human prostate cancer using pre-clinical models.

Methods: Experiments were performed with a standardized mangosteen fruit extract and nine individual xanthones using Western blot, flow cytometry, cell free biochemical based assays and athymic nude mouse models.

Results: Using a mangosteen fruit extract (MFE) standardized to alpha-mangostin (40%) and three other xanthones a significant decrease in cell viability was observed against four prostate cancer cell lines (LNCaP, CWR22, PC3, DU145). Using two different cells lines (PC3 and CWR22Rv1) we have evidence suggesting alpha-mangostin promotes G1 cell cycle arrest. Next, using an athymic nude mouse model implanted with CWR22Rv1 cells we randomized mice to receive intraperitoneally the standardized mangosteen fruit extract (MFE) or placebo two times weekly with tumors measured twice weekly once tumors reached a volume of 200 mm3. At the conclusion of the study the treatment group had a significantly smaller tumor that was 87.5% smaller compared to placebo. To gain an understanding of the pharmacology we selected alpha-mangostin as the lead compound and evaluated alpha-mangostin using a cell free kinase assay we identified 11 unique kinase targets of alpha-mangostin. A preliminary pharmacokinetic analysis of mice administered 1mg of alpha-mangostin intraperitoneally resulted in a plasma concentration of 7.3 μM - within the concentration of in vitro mechanistic studies. Next, using an athymic nude mouse model as described above mice receiving alpha-mangostin (>95%) had a significantly smaller tumor that was 69% smaller compared to placebo. Based on these promising results we used purified xanthones from the mangosteen fruit and selected 9 xanthones for structure activity relationship studies against cyclinD1/CDK4 using cell free biochemical assays and molecular modeling.

Conclusion: Collectively these data suggest that dietary xanthones could be a promising agent(s) for PCa prevention.

Nephrology

151. Use of erythropoietin stimulating agents in hospitalized patients with end stage renal disease receiving dialysis.

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Objectives: This study is designed to review the effect of hospitalization on hemoglobin levels from admission to discharge in patients with end-stage renal disease receiving dialysis and erythropoietin stimulating agents (ESAs). Differences of change in hemoglobin and trends between patients receiving continuation of current outpatient ESA dose during hospitalization and patients receiving ESA doses higher than previous outpatient doses were analyzed to assess effect of ESA dosing on hemoglobin levels.

Methods: This retrospective review evaluated patients with end-stage renal disease receiving dialysis and ESAs admitted to institution from January 1, 2009 to September 30, 2009. Patients with the above criteria 18 years or older were eligible for inclusion. Excluded patients included those with surgical procedures or major bleeding events during hospitalization, and those with active malignancy. Primary objective was to assess effect of ESA dosing on hemoglobin levels from admission to discharge and to evaluate differences, if any, between hospitalized patients who were continued on equivalent ESA dosing from outpatient and those receiving an increased ESA dose. Descriptive analysis of all eligible patients is ongoing with comparative analysis for patients with recorded outpatient ESA doses stratified by doses received during hospitalization for evaluation of outcomes in each group.

Results: To date, 49 patients have been analyzed for inclusion in descriptive analysis of ESA use. Median darbepoetin dose received was 100 mcg within this group with average age of 57 years (std. dev. 14.5) and weight of 81.4 kilograms (std. dev. 17.9). Of these patients, average change in hemoglobin was -0.87 g/dL over hospitalization (range 1.1 to -3.7) from baseline hemoglobin average of10.6 g/dL. Analysis of hemoglobin trends is ongoing at this time as is evaluation and stratification into comparative groups based upon outpatient doses.

Conclusion: No conclusions to date as data are still being evaluated.

Oncology

152. Quantifying and understanding out patients adherence to oral antineoplastic treatments: an italian single institution survey.

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Objectives: Most recently introduced anticancer drugs are orally delivered to outpatients. Efficacy of the treatment is strictly related to the total dose administered and the dose-intensity. Both come from the compliance of the patient to the therapy. We investigated the adherence to oral therapies, looking at the reasons of lack of adherence, administering an anonymous questionnaire

Methods: The questionnaire included 13 items inquiring about patient adhrencel it was drawn up by multidisciplinary staff of oncologist, pharmacist, and psychoncologist. The sum of the scores led to a evaluation defined as 91–100% optimal adherence, 81–90% good, and less than 80% unacceptable. Concurrently, patients were asked to complete the Hospital Anxiety and Depression Scale Test.

Results: From October 2008 to April 2009, 100 patients entered the study. Eligible patients had received oral chemotherapy for at least 2 months. Adherence was recorded as optimal in 66 patients, good in 28, and unacceptable in 6. The HADS Test identified 28 patients with moderate anxiety, 2 with heavy anxious status, and 13 with a moderate depressive condition. Neither the relationship among anxiety nor among depression and adhrence to the chemotherapy (p=0.063) was found meaningful. On the basis of the results, pharmacist realized brochures and diaries that are appraised together with the patient within the visit with physician and pharmacist.

Conclusion: There are not standard methods to quantify adherence to

oral therapy. The questionnaire has been revealed to be a reliable, economic and easily realizable method, and it has constituted an occasion to effect multidisciplinary interventions turned to patient submitted to oral therapy.

Pediatrics

153. An evaluation of the accuracy of Neofax gentamicin dosing recommendations; are targets met?

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Objectives: This evaluation is aimed at assessing the accuracy of Neofax dosing recommendations to achieve therapeutic gentamicin serum peak and trough concentrations at a single institution. While Neofax gentamicin dosing recommendations are based upon published literature and pharmacokinetics, limited data exists outlining the overall accuracy of these dosing recommendations to produce therapeutic serum concentrations without additional kinetic manipulation or dose adjustments. A further goal is to determine whether phlebotomy for routine monitoring of gentamicin can be limited during the neonatal period, thus reducing blood loss and associated medical costs. This will be possible if the accuracy is demonstrated to be greater than 90%.

Methods: The medical records of all patients admitted to the Newborn Critical Care Center receiving gentamicin between January 1, 2007 and January 31, 2010 will be evaluated both retrospectively and concurrently. Patients' demographic data, pertinent laboratory information, gentamicin dosage and measured serum trough and peak concentrations will be documented during the neonatal period.

Results: A total of 400 orders for gentamicin have been evaluated at the first interim analysis. Therapeutic drug monitoring was performed on 95/400 (23.8%) of orders, demonstrating that 76.3% of gentamicin use was for a 48-hour empiric period. Trough and peak concentrations were accurate (within Neofax range) 80% (76/95) and 82.1% (78/95) of the time, respectively. Postmenstrual and postnatal age subgroup analyses revealed accuracies ranging from 50% to 100%.

Conclusion: Data collection is ongoing, expected to be completed by April 1, 2010. Final conclusions will be reported upon comprehensive data analysis. Results from the first interim analysis revealed accurate serum gentamicin trough and peak concentrations an average of 80% of the time, ranging from 50-100% depending on subgroup.

154. Using a classification of errors to improve decision support in computerized prescriber order entry in neonates with renal dysfunction.

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Objectives: We previously reported significantly reduced medication errors with a computerized prescriber order entry program with decision support (CPOE-DS) for antibiotics in neonatal late-onset sepsis (LOS). However, prescribing errors increased in patients with renal dysfunction, primarily due to lack of dose adjustment. This project's purpose is to classify prescribing errors, identify areas for improvement, and evaluate a revised CPOE-DS's effect on medication errors.

Methods: Prescribing errors previously identified in post-CPOE-DS orders (n=147) for patients with renal dysfunction (n=30) were further classified by antibiotic, patient's serum creatinine, and serum concentration monitoring. Revisions based on these findings will be tested by prescribers (n=12) ordering antibiotic(s) for mock neonatal cases (n=10) with and without renal dysfunction with standard *and revised* CPOE-DS. Assuming error reduction from 55% to 10%, 26 orders are needed for 80% power at α=0.05. Mock cases should provide 30 orders requiring dose adjustment for renal dysfunction. Two pharmacists will evaluate orders for errors with differences between CPOE-DS programs determined by Wilcoxon rank-sum analysis.

Results: There were 24 prescribing errors in neonates with renal dysfunction with 18 lacking dosing adjustment including seven piperacillin/tazobactam, six vancomycin, and five gentamicin orders. Of the six vancomycin orders, four had serum concentrations monitored after one or two doses (range: 10–15.9 µg/mL), one patient's renal function improved, and one was discontinued within 24 hours. Of the five gentamicin orders, two had serum concentrations after one dose (0.8 and 1.3 µg/mL), one patient's renal function improved, and two were discontinued within 24 hours. The remaining six were one inappropriate antibiotic, one impractical dose, and 4 incorrect patient weights. Serum creatinine values ranged from 1.1–1.4 mg/dL. Further results are pending.

Conclusion: Revisions for dose recommendations in renal dysfunction are needed for piperacillin/tazobactam, vancomycin, and gentamicin. Guidance for serum concentration monitoring depending on degree of renal dysfunction will be considered.

155. Utilization, adverse event, and cost trends associated with watchful waiting in the treatment of acute otitis media.

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Objectives: In 2004, the American Academy of Pediatrics recommended "watchful waiting" (WW) for the management of acute otitis media (AOM) in children older than two years with nonsevere illness. WW is defined as deferring antibiotic treatment unless the child worsens after the ensuing 48–72 hours. We retrospectively evaluated the use trends, potential adverse clinical outcomes, and costs associated with WW.

Methods: A state Medicaid claims database was queried from 1/1/94 through 9/30/09 to identify AOM (by ICD-9 coding) in children older than two years. Recurrent and chronic cases were excluded. Conventional treatment (CT) cases were defined as those with an antibiotic claim on day zero or one after diagnosis. WW cases were defined as those with no antibiotic claim within 30 days following the diagnosis or an antibiotic claim on day two or three. Using statistical process control (SPC) charts, the proportion of AOM cases using WW over time was determined. Healthcare costs and AOM complications will be compared between the CT and WW groups.

Results: There were 186,983 cases of AOM during the study period. 31,179 (16.67%) met the definition of WW. SPC charting revealed no change in the proportion of cases with WW over time. Among the 2,248 *WW cases* where an antibiotic was filled on day two or three, 90 (4.0%) were associated with an additional office visit on day two or three. Further analyses evaluating adverse clinical outcomes and costs associated with "WW" will be available at the time of presentation.

Conclusions: Preliminary results indicate WW for AOM may be underused. Completed analyses will be available at the time of presentation.

156. Assessment of medication-related falls in children in a level one trauma center.

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Objectives: Medications have been implicated in increasing the risk of falls in children; however, there is a lack of data on this subject in pediatric literature. The purpose of this study is to characterize medication-related falls in pediatric patients. The primary objective of this study is to determine if correlations can be made between medications and/or medication classes and pediatric falls. The secondary objectives include evaluating the rate of falls in patients who are taking any medication versus all-comers with falls, and rates of injuries associated with medication-related falls.

Methods: This single-center retrospective study evaluated data from year 2000 to present. Study participants were identified by MS-DRG and ICD-9 codes for accidental falls or syncope and collapse, and cross-referenced with data from our organizational risk management occurrence system. All pediatric patients age 2–18 years who sustained inpatient fall(s) or were admitted to the hospital because of accidental fall, syncope, and/or collapse were considered for study inclusion. Medical records were reviewed for demographics, medical and surgical histories, comorbidities, inpatient and outpatient

medications, type of injury, injury severity, and activity surrounding the fall.
Results: Twenty nine patients were preliminarily chosen for inclusion. Of these patients, 14 were female and 15 were male, with an average age of 8.9 years (range: 2–17 years). Twenty-three subjects (79.3%) were prescribed at least one drug surrounding the time of the fall, including: opioids (39.1%), acetaminophen (21.7%), nonsteroidal anti-inflammatory agents (21.7%), and antibiotics (21.7%). Injuries resulting from drug-related falls were as follows: 39.1% no injury, 17.4% minor injury, 8.7% moderate injury, and 8.7% major injury. Fall severity information was not available for 26.1% of these patients.
Conclusion: Based on preliminary data, medications may appear related to falls in children. However, data collection and analysis remain in progress.

Pharmacoeconomics/Outcomes

157. Conversion from donepezil to galantamine extended-release: evaluation of the safety and efficacy of a cost savings initiative.
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Objectives: To evaluate the safety and efficacy of a cost savings initiative involving conversion of donepezil to galantamine ER at the West Palm Beach VA Medical Center (WPB VAMC).
Methods: An assessment of the first 240 patients converted from donepezil to galantamine ER by P&T protocol will be conducted. As part of the conversion protocol, functional assessment staging (FAST) scales will be completed by the converting clinical pharmacist both before and four to six weeks after conversion. Demographic data and information categorizing cholinesterase inhibitor therapy and concomitant anticholinergic medications will also be collected. The primary endpoint, change in FAST score following conversion will be evaluated with Wilcoxon signed rank test. Descriptive statistics will be used to characterize other data collected.
Results: Analysis of the first 240 patients converted began on November 23, 2009. The average baseline FAST score of these patients is 3.5, which coincides with mild dementia. One hundred forty of the first 240 patients have a follow-up FAST score as of December 14, 2009, with the average follow-up FAST being 3.47. Of the patients with follow-up FAST scores, three (2.1%) decreased from baseline FAST and two other patients (1.4%) specified deterioration at follow-up with no change in FAST score. Twenty-three of the first 240 patients (9.6%) have experienced an adverse reaction to galantamine ER. Data collection and analysis are expected to be completed by January 31, 2010, with full results to follow.
Conclusion: Currently, there are limited data regarding converting patients from one cholinesterase inhibitor to another. According to the American Academy of Family Physicians, no cholinesterase inhibitor is superior to another. Our conversion's positive, preliminary efficacy and safety results mirror this recommendation with galantamine ER appearing to be comparable to donepezil in efficacy and safety in a veteran population.

Pharmacoepidemiology

158. Follow-up care after acute asthma events.
John T. Holmes, Pharm.D., Brooke Pugmire, Pharm.D., Rex W. Force, Pharm.D.; Departments of Family Medicine and Pharmacy Practice, Idaho State University, Pocatello, ID
Objectives: Our previous Medicaid analysis showed that 76.5% of hospitalization- or ED visit-associated acute asthma events (AAE) occurred in patients who were not receiving inhaled corticosteroids (ICS). We retrospectively examined 90-day post-AAE outpatient provider follow-up, ICS and beta agonist use, and next asthma event in these patients.
Methods: A state Medicaid database was queried from January 1994 through September 2009 to identify all ICD-9-coded asthma-associated hospitalizations or ED visits with no ICS claim in the preceding 60 days. Follow-up provider visits within 14 days of the AAE were identified. Next AAE in patients who had no ICS or beta agonist claim within 90 days of the AAE were identified. Rates of the next AAE were evaluated for those without a follow-up visit within 14 days and for those without an ICS within 90 days. Statistical process control (SPC) charts will be used to evaluate trends in follow-up visits and ICS use over time.
Results: Of 10,984 AAEs in patients with no prior ICS who were still active clients, 7069 (64.4%) did not have a follow-up visit within 14 days of the AAE. There were 3966 (36.1%) AAEs not associated with any follow-up visit within 90 days. No claims for ICS or β-agonist therapy within 90 days were identified for 7802 (71.0%) and 4027 (36.7%) of the AAEs, respectively. The rates of next AAE were 18.0% in those without a follow-up visit within 14 days and 14.4% in those without an ICS claim within 90 days. SPC charts evaluating trends in follow-up visits and ICS use over time will be available at the time of presentation.
Conclusions: Approximately two-thirds of the AAEs identified were not associated with timely provider follow-up or a prescription for ICS. 90-day recurrent AAEs were common. These data suggest the need for improvement in asthma care processes.

159. Acute asthma events and prior use of inhaled corticosteroids.
John T. Holmes, Pharm.D., Brooke Pugmire, Pharm.D., James G. Jepson, Pharm.D., Candidate, Vaughn L. Culbertson, Pharm.D.; Departments of Family Medicine and Pharmacy Practice, Idaho State University, Pocatello, ID
Objectives: To determine the proportion of patients with a hospitalization or emergency department (ED) visit for fan acute asthma event (AAE) that did not receive prior inhaled corticosteroid (ICS) prescriptions.
Methods: A state Medicaid database was queried from January 1994 through September 2009 to identify all ICD-9-coded AAEs associated with a hospitalization or ED visit. Prior ICS use was identified from prescription claims histories in the 60 days preceding the AAE. Patients with an AAE and no ICS use were evaluated for a previous ICD-9-coded asthma diagnosis. AAEs and rates of ICS use were analyzed by age. Statistical process control (SPC) charts were used to evaluate the trends in the rate of ICS use before the event over time.
Results: Of 16,223 AAEs identified in the study period, 12,408 (76.5%) were not associated with an ICS prescription claim within the previous 60 days. Among those with no ICS claim, 9,553 (77.0%) had been diagnosed with asthma before the event. Among the AAEs identified, 51.6% were in children. The rates of ICS use did not differ by age. SPC analysis revealed a decreased rate of AAEs not covered by ICSs during the study period.
Conclusions: More than 75% of hospitalization- or ED visit-associated AAEs occurred in patients who did not appear to be using ICSs. Most patients had previously been diagnosed with asthma. Inadequate asthma evaluation and treatment, lack of good physician follow-up, and/or medication nonadherence may have contributed. In this cohort of patients with acute asthma events, ICSs were underused. Although further study is needed, the proportion of AAEs not covered by an ICS may be a useful quality improvement measure.

Pharmacokinetics/Pharmacodynamics

160. Tobramycin pharmacokinetics in patients with cystic fibrosis before and after bilateral lung transplantation.
Kelly A. Walsh, Pharm.D., Robert J. Kuhn, Pharm.D., George A. Davis, Pharm.D., BCPS, Kyle A. Weant, Pharm.D., BCPS, Don Hayes Jr., M.D., Jeremy D Flynn, Pharm.D., BCPS; University of Kentucky HealthCare, Lexington, KY
Objectives: Individuals with cystic fibrosis (CF) demonstrate rapid clearance of aminoglycoside antibiotics compared to the average population. Following a bilateral lung transplant, the pharmacokinetics (PK) of aminoglycosides appear to change in these patients. This study compared the PK of tobramycin in patients with cystic fibrosis before and after bilateral lung transplantation.
Methods: Medical records of the 13 patients with CF who had received bilateral lung transplants at University of Kentucky HealthCare before August 2009 were reviewed. Tobramycin concentrations pre- and post-transplant were collected and used to compare PK parameters, including elimination rate constant (K_e), half-life ($t_{1/2}$), volume of distribution (V_d), and area under the curve (AUC). Cumulative

tobramycin doses to date, tacrolimus concentrations, serum creatinine, and diuretic use in the post-parameters towards pre-transplant values over time.
Results: Preliminary data from seven patients indicate that the mean elimination rate constant decreased in the post-operative period, from 0.25 ± 0.05 $hour^{-1}$ to 0.16 ± 0.09 $hour^{-1}$, while the mean half-life increased from 2.9 ± 0.7 hours to 8.0 ± 8.7 hours. The mean volume of distribution increased from 0.33 ± 0.09 L/kg to 0.44 ± 0.18 L/kg, while the mean area under the curve increased from 110.2 ± 32 mg L^{-1} hr to 160.7 ± 23 mg L^{-1} hr. The mean tobramycin doses in the pre – transplant period were 10.1 ± 1.4 mg/kg/day compared to 7.65 ± 1.5 mg/kg/day in the post – transplant period.
Conclusion: Preliminary results indicate that tobramycin pharmacokinetics in patients with cystic fibrosis are altered after bilateral lung transplantation.

Psychiatry

161. Evaluation of quetiapine use in an inpatient urban teaching hospital.
Tiffany Chen, Pharm.D.[1], April Cope, Pharm.D.[1], Henry Cohen, MS, Pharm.D., FCCM, BCPP, CGP[2], Aaron Pinkhasov, M.D.[3]; (1)Kingsbrook Jewish Medical Center and Arnold & Marie Schwartz College of Pharmacy, Brooklyn, NY; (2)Arnold & Marie Schwartz College of Pharmacy and Health Sciences of Long Island University and Kingsbrook Jewish Medical Center, Brooklyn, NY; (3)Kingsbrook Jewish Medical Center, Brooklyn, NY
Objectives: Quetiapine fumarate is an atypical antipsychotic that is approved for the treatment of schizophrenia and bipolar disorder with normal dosing in adults ranging from 300–800 mg/day. There is evidence to support off-label use of quetiapine for other psychiatric conditions, including agitation/aggression, and refractory anxiety. Despite the many labeled and off-labeled indications for quetiapine use, it is also prescribed for indications at doses that are not supported by clinical data without the proper monitoring parameters. This study assessed the appropriateness of the use of quetiapine with respect to indication, dosing, and monitoring parameters.
Methods: A retrospective chart review was performed for patients receiving quetiapine while admitted to the acute units from May to October 2009. Pharmacy reports of patients for this six month period of time were reviewed to identify subjects receiving quetiapine. The sample for evaluation was randomly selected and was stratified based on admission to the inpatient psychiatric unit. Data collected and analyzed included patient demographics, indication for use of quetiapine, dose of quetiapine, vital signs, concomitant medications, and orders for laboratory or diagnostic testing.
Results: One hundred subjects were randomly selected for chart review and stratified by psychiatric unit (62%) and non-psychiatric unit (38%) to accurately represent the hospital population use of quetiapine. The mean age was 71.3 (SD±14.99) with 51% of the study population being women. A preliminary analysis of 26 subjects showed that upon discharge, the mean dose of quetiapine was 181.7 mg (SD±188.49). Lipid panels were ordered in 16 (61.5%) of the subjects while 11(42.35%) subjects had an order for an EKG.
Conclusion: Pending

Rheumatology

162. Association between prior tumor necrosis factor inhibitor use and malignancy.
Michael A. Biddle Jr., Pharm.D., Brooke Pugmire, Pharm.D., Rex Force, Pharm.D.; Departments of Family Medicine and Pharmacy Practice, Idaho State University, Pocatello, ID
Objectives: Tumor necrosis factor (TNF) inhibitors are used in rheumatic and inflammatory bowel diseases often when other therapies have failed. Recent information suggests that patients receiving TNF inhibitors may be at increased risk for some malignancies, including lymphoma. However, the association between the development of malignancy and exposure to TNF inhibitors is controversial and ill defined. In this retrospective, case-control analysis we compared the likelihood of TNF inhibitor exposure in patients with and without malignancy.
Methods: A state Medicaid claims database was queried from January 1, 1998 through September 30, 2009 to identify all patients with a malignancy diagnosis by ICD-9 coding. The index date for each case patient was the date of the first malignancy diagnosis. On average, three control patients without a malignancy diagnosis were matched to each case patient based on age (±1 year), gender, TNF inhibitor indication, and Medicaid use at index date. Matched controls were assigned the index date of the case patient. Cases and controls receiving one or more claims for a TNF inhibitor anytime before their index date were identified. A case-control logistic regression analysis using conditional likelihood will be used, adjusting for potential confounders affecting TNF inhibitor exposure rates in the two groups including exposure to non-biologic DMARDs, duration of TNF inhibitor-indicated diagnosis, and other factors.
Results: Preliminary unadjusted results identified 14,014 cases of which 34 (0.24%) were previously exposed to a TNF inhibitor. Of the 39,554 matched controls, 83 (0.21%) had previously received a TNF inhibitor (OR 1.16; 95% CI 0.78 to 1.724; P=0.475). Results adjusted for possible confounding variables will be available at the time of presentation.
Conclusion: The unadjusted rates of TNF inhibitor use were not different between the groups. A complete analysis will be available at the time of presentation.

STUDENT SUBMISSIONS

ADR/Drug Interactions

164. Risk of ischemic stroke associated with concomitant use of clopidogrel and proton pump inhibitors.
Lucas B. Stoller, Pharm.D., Candidate, Jingyang Fan, Pharm.D., BCPS; Southern Illinois University Edwardsville School of Pharmacy, Edwardsville, IL
Objectives: While there have been several studies evaluating the clinical significance of concomitant clopidogrel and proton pump inhibitor (PPI) use, to the best of our knowledge, none have focused on its effect on cerebrovascular accidents (CVA). The purpose of this study was to evaluate the clinical effect of this purported drug interaction on transient ischemic attacks (TIAs) and ischemic stroke (IS).
Methods: This was a case-control study conducted in a 950-bed community teaching hospital. Case patients were those admitted between July 2006 and June 2009 with a primary diagnosis of TIA or IS and were on clopidogrel before admission. Control patients were matched to cases on age, hospitalization date, and prior clopidogrel use, and were admitted with diagnoses other than TIA, IS or any coronary events. Patients with diagnosis or risk factors for cardioembolic stroke or those who developed any coronary events during the hospitalization were excluded from the study. Exposure to PPIs before admission was assessed in both case and control patients.
Results: Of the 90 case patients, 28.9% were on PPIs compared to 35.4% of control patients (n=158). After multivariate analyses, concomitant use of PPI and clopidogrel was not associated with an increased risk of TIA or IS (adjusted odds ratio [AOR] 1.00, 95% confidence interval [CI] 0.52–1.93). Since prior history of CVA was strongly associated with recurrent CVA, we evaluated those case patients with a prior history of CVA (n=62) and their matched controls (n=102), and found 22.6% vs. 33.3% were on a PPI, respectively (AOR 0.50, 95% CI 0.16–1.59).
Conclusion: Concomitant use of clopidogrel and PPIs was not associated with an increased risk of TIA or IS, suggesting that this interaction has no clinical effect on CVAs. However, larger and prospective studies are needed to confirm these results.

165. Clinical and economic outcomes of concurrent use of clopidogrel and proton pump inhibitors.
Kendra R. Manigault, Pharm.D., Candidate[1], S. Scott Sutton, PharmD[2]; (1)South Carolina College of Pharmacy, Moncks Corner, SC; (2)South Carolina College of Pharmacy - USC Campus, Columbia, SC
Objectives: This study will illustrate the impact concomitant use of clopidogrel and proton pump inhibitors have on clinical and economic

outcomes of stroke in South Carolina and the United States through conduction of an observational retrospective cohort analysis.
Methods: This study will evaluate approximately 5,000 patients receiving clopidogrel and proton pump inhibitors in the Veteran's Administration system. The primary endpoints will include mortality, stroke, emergency department visits, hospitalizations, time to progression, and medication management. Secondary endpoints will include follow-up by a neurologist and medication side effects. Multivariate modeling will be preceded by univariate descriptive statistics to assess the distributional properties of the study variables, and the functional forms of the relationships between the independent and dependent variables. Demographic characteristics and baseline medical conditions of the patients will be summarized by cohort using standard summary statistics. Inferential statistics will be used to describe and quantify inter-cohort differences in these parameters. All statistical tests performed will test a two-sided hypothesis of no difference between treatment groups at a significance level of 0.05.
Results: Research in Progress
Conclusion: Research in Progress

Adult Medicine

166. Investigating the association between quality of asthma care and socioeconomic status among adults diagnosed with asthma.
Barton N. Robbins, Pharm.D./MSCR, Candidate, Megan Ward, Pharm.D./MSCR Candidate, Brandon Jolley, Pharm.D./MSCR Candidate, Tina Tseng, Ph.D., MSPH, Melissa Johnson, Pharm.D., MHS, Melissa Holland, Pharm.D., MSCR; Campbell University School of Pharmacy, Raleigh, NC
Objectives: Associations between socioeconomic status (SES) and asthma diagnosis suggest that race and economic disparities may contribute to differences in asthma care. Identifying a population of asthmatic patients lacking counseling and/or a management plan may help providers better understand deficits in patient care. Our goal is to determine if associations exist between adult patients who participate in quality asthma care and markers of SES.
Methods: This was a retrospective, observational, cross-sectional study using the State and Local Area Integrated Telephone Survey (SLAITS) database and National Asthma Survey (NAS) module. Subjects who participated in the SLAITS NAS were included in our analysis if they were at least 18 years old and reported an asthma diagnosis. We expected at least 500 patients would meet these criteria. The primary end point was receipt of quality asthma care, defined as a positive patient response to any of the following: had been taught to recognize early signs of asthma exacerbation, taught what to do during an episode or attack, taken a class on asthma, taught how to use a peak flow meter to adjust daily medications, were advised to make environmental changes to control asthma. We also evaluated associations between receipt of quality asthma care and these variables: English fluency, health care coverage, location, and smoking history. Relationships were evaluated using the χ^2 statistic; variables showing statistical significance were further evaluated using logistic regression.
Results: Preliminary analysis indicated that patients more than 65 years old were less likely to have received quality asthma care. Full results will be presented.
Conclusions: The focus of this study will be adult patients with asthma and these results would be interesting to compare to the available pediatric asthma literature.

Ambulatory Care

167. Pharmacist-physician co-management of hypertension reduces blood pressure throughout 24-hours.
Genesis S. Sezate, B.S., Michael Ernst, Pharm.D., Cynthia Weber, Pharm.D., Barry Carter, Pharm.D.; College of Pharmacy, The University of Iowa, Iowa City, IA
Objective: To describe the effect of a physician-pharmacist collaborative model of hypertension management on the 24-hour blood pressure (BP) profile.
Methods: Prospective, cluster-randomised, controlled clinical trial.
Setting: Five primary care clinics in Iowa.
Patients: 179 patients with uncontrolled hypertension, aged 21–85 years, receiving 0–3 antihypertensive medications at baseline. Intervention: Patients were randomized by clinic to receive pharmacist-physician comanagement (intervention) or usual care (control). At intervention clinics, following BP measurement by a research nurse, patients met with a pharmacist. Pharmacists identified barriers to BP control, counselled on diet and lifestyle modifications, and adjusted antihypertensives in collaboration with the patient's primary care provider. At control clinics, patients met with a research nurse and BP measurements were forwarded to the patient's primary care provider for further action. Scheduled visits occurred in both groups every two months for a minimum of nine months. All patients underwent ambulatory BP monitoring (ABPM) at baseline and nine months. Baseline ABPM data was carried forward for patients not completing a final ABPM.
Results: ABPM data was available for 175 patients. At study end, the number of antihypertensives differed by only 0.5 per person (intervention: 1.5 ± 1.0 to 2.4 ± 0.9; control: 1.4 ± 1.0 to 1.9 ± 1.0). Mean (SD) ambulatory SBPs (mm Hg) were significantly reduced in the intervention compared to control group (daytime: -14.3 ± 11.6 vs -2.7 ± 11.6; nighttime -11.1 ± 14.4 vs -3.4 ± 13.3; 24-hour -13.2 ± 11.3 vs -2.9 ± 10.7; $P<0.001$ for all intervention vs control comparisons). Mean reductions in office SBPs were of higher magnitude (-28.9 mm Hg intervention vs. -17.3 mm Hg control) than ABPM readings. ABPM revealed that more patients receiving the intervention had a controlled 24-hour BP profile at the end of the study (73% vs. 42.3%; $p<0.001$).
Conclusion: Despite overestimation of BP differences by office measurements, pharmacist-physician comanagement achieved significantly greater reduction in BP throughout 24-hours as evidenced by ABPM readings.

168. Evaluation of exenatide in the management of diabetes.
Jennifer Berg, Pharm.D., Candidate, *Dana L. Chiulli, Pharm.D., Candidate*, Mariam Majidi, Pharm.D., Candidate, Amy M. Lugo, Pharm.D., BCPS, BC-ADM, Lilia Z Macias-Moriarity, Ph.D., MPH; South University School of Pharmacy, Savannah, GA
Objective: The purpose of this study was to evaluate the use of exenatide in the management of diabetes in a military treatment facility.
Methods: Patients receiving exenatide from July 2008 to June 2009 were randomly selected and evaluated by chart review. Data collection included demographics, pre- and post-exenatide HbA1c, attainment of HbA1c goal, change in weight, length of therapy, final exenatide dose, presence of nausea, and concomitant diabetes medications. The primary and secondary outcomes were change in HbA1c and associated weight loss, respectively.
Results: During the study period, fifteen patients received exenatide therapy and data was reviewed and analyzed using SPSS statistical software. The average patient age was 54 years and 60% were female. The mean pre and post exenatide HbA1c averages were 7.88% and 7.52%, respectively, with an average HbA1c decrease of 0.36%. Four patients (26.6%) achieved the goal HbA1C of < 7%. The average weight loss was 2.4 pounds. Patients received exenatide therapy for an average of 15.4 months and were taking an average 2.5 additional diabetes medications. Eleven patients (73.3%) completed the study on the exenatide 10 µg dose and 4 of those patients (36.4%) achieved their HbA1c goal. Results will be analyzed to detect statistical significance across doses and control for concomitant diabetes medications.
Conclusion: The addition of exenatide therapy in the management of diabetic patients lowered the HbA1c, as well as facilitated a reduction in weight. Although nausea was reported, therapy was not discontinued due to this adverse effect.

169. Doctor of pharmacy student implemented warfarin clinic database in a community health center.
Amanda S. Thompson, Pharm.D., Candidate, 2010[1], Tracy D. Mahvan, Pharm.D.[2]; (1)University of Wyoming School of Pharmacy, Laramie, WY; (2)Salud Family Health Center/University of Wyoming, Longmont, CO
Objectives: The clinic mainly serves migratory patients. The objective of this study is to establish a warfarin clinic database and pharmacist managed clinic that will bring continuity of care for

patients on anticoagulation therapy along with more closely monitored care. This database can be used off site when patients go to other branches of the clinic or if they are hospitalized and need access to their records. To avoid the heavy cost of a conventional database, we designed one with Access in Microsoft Office.
Methods: The clinic's current paperbound warfarin log book was utilized to establish patients on anticoagulation therapy. The Access database was created by pharmacy interns by calling current logged patients and recording names, indications, goal INRs, dose, INR readings, warfarin dose changes, medication/alcohol/smoking/dietary changes, and comments. For those no longer taking warfarin, a reason for discontinuation was determined. A follow-up appointment was assigned for patients still taking warfarin. The database will be loaded to the electronic records (EMR), and a color coordinated flag system will be implemented to alert the PharmD team of additional monitoring.
Results: Forty nine patients were called and entered into the Access warfarin database. Thirteen (n=13) patients were no longer on warfarin or getting care elsewhere. So far, thirty one (31) patients attended initial anticoagulation clinic appointments. Fifteen (n=15), (48%) of the total patients, had their INR's drawn >1 month ago. Detailed warfarin counseling was provided and appropriate educational material was distributed.
Conclusion: A warfarin clinic database that can be accessed by multiple providers through EMR and the internet is proposed to be an accurate way to monitor patients and reduce errors. It is predicted patients will experience decreased comorbidities and receive improved follow-up with the flagging system currently being designed. Further and ongoing data analysis will provide results to the outcome measures.

170. Medication discrepancies among older adults discharged from an acute care setting.
Benjamin W. Wunderlich, Pharm.D. Candidate,[1] J. Mark Ruscin, Pharm.D.[2]; (1)Southern Illinois University Edwardsville School of Pharmacy, Edwardsville, IL; (2)Southern Illinois University Edwardsville, School of Pharmacy, Edwardsville, IL
Objectives: In older adults, up to 30% of rehospitalizations are related to adverse drug events. Medication discrepancies during transitions increase the risk of adverse events and readmissions. The Medicare Payment Advisory Commission has recommended reducing repayments for hospitals with higher readmissions creating an incentive to development programs that reduce readmissions. The goals of this study are to identify the frequency and types of discrepancies experienced by older adults after discharge using home visits with a pharmacist and students. A cost savings model will be developed to justify another setting for clinical pharmacists.
Methods: Patients 65 and older discharged home were identified from general medicine wards at a community-based teaching hospital. Those taking five or more medications were invited to participate in a home visit. The discharge summary provided to the patients served as the 'discharge list'. During the home visit, the patient and caregiver(s) were interviewed to determine actual medication use at home. The 'patient list' derived from this interview was compared to the 'discharge list'. Discrepancies were described using the Medication Discrepancy Tool and were communicated to the patient's primary care provider.
Results: Currently, 17% of patients have been receptive to home visits. 90% of participants have been female between 70–74 years old. Participants have been experiencing an average of five discrepancies. The most common causes include: inaccurate and incomplete discharge instructions and conflicting information from different sources. The estimated annual cost of this service assuming a pharmacist completes three home visits daily would be $107,108. If the pharmacist reduces the amount of readmissions due to medication discrepancies by 10–25%, the service would save approximately $146,334–$365,836 yearly.
Conclusion: Pharmacists involved in transitions of care have the potential to identify and resolve medication discrepancies during home visits. Reducing discrepancies could reduce readmissions and health care costs creating a new setting for clinical pharmacists.

171. A proactive approach to identifying, monitoring, and providing bridge therapy to atrial fibrillation patients in an anticoagulation clinic.
Ted J. Turner, Pharm.D., Candidate, David B. Hwang, Pharm.D., Candidate, Matthew J. Milne, Pharm.D., Candidate, Jennifer A. Strohecker, Pharm.D., BCPS; University of Southern Nevada, College of Pharmacy, South Jordan, UT
Objectives: Chronic anticoagulant therapy is indicated for patients with atrial fibrillation patients with a $CHADS_2$ risk score >2 as it reduces stroke occurrence. While ACCP guidelines recommend perioperative bridging with enoxaparin, many patients fail to be bridged appropriately and are at increased risk of stroke. This program evaluated patients enrolled in an anticoagulation clinic to identify, stratify, and centrally document all patients diagnosed with atrial fibrillation according to their $CHADS_2$ risk score, and to proactively contact and educate patients concerning the need for proper bridge therapy before upcoming surgeries.
Methods: The medical records of 588 anticoagulated patients were reviewed to identify patients with atrial fibrillation, and a $CHADS_2$ risk score was calculated and documented in patient charts for efficient retrieval. Patients exhibiting a risk score > 2 were contacted via telephone by student pharmacists and educated concerning proper bridging and asked if they had any planned surgeries in the future. Responses to planned procedures were documented in a centrally located electronic database.
Results: Of the 588 patients screened, 480 had been diagnosed with atrial fibrillation. Ninety nine of the patients diagnosed with atrial fibrillation had a $CHADS_2$ risk score > 2. These patients were personally contacted and informed of the benefits that are derived from following the bridging guidelines. All of the patient responses were documented in a centrally located electronic database.
Conclusion: Marked improvements in patient care often start with small steps and rather simple interventions. By utilizing patient medical records, identifying patients at higher risk of stroke, and proactively educating patients concerning the proper bridging protocols, we successfully improved our clinic's patient understanding and quality of care.

Cardiovascular

172. The ezetimibe to colesevelam switch study.
Brian Greenberg, M.D.Candidate[1], Andrea N. Traina, Pharm.D.[2], Michael P. Kane, Pharm.D.[2], Robert S. Busch, M.D.[3], Gary Bakst, M.D.[3], Jill M. Abelseth, M.D.[3]; (1)Rosalind Franklin University of Medicine and Science, North Chicago, IL; (2)Albany College of Pharmacy and Health Sciences, Albany, NY; (3)The Endocrine Group, LLP, Albany, NY
Objectives: Diabetes patients have aggressive lipid targets which often require the use of multiple anti-cholesterol medications. Publication of the ENHANCE and SEAS trials has patients and clinicians concerned regarding the safety and efficacy of ezetimibe. This study evaluated the efficacy of colesevelam in diabetes patients switched from ezetimibe.
Methods: This retrospective review was approved by the ACPHS Institutional Review Board. Review of electronic medical records (EMRs) of three private-practice endocrinologists was conducted using the search terms ezetimibe or zetia and colesevelem or welchol. The study population included diabetes patients switched from ezetimibe to cholesevelam after a minimum of three months of ezetimibe therapy and remained on cholesevelam for three to six months without other changes in diabetes or cholesterol medications. Drug efficacy was evaluated by comparing baseline A1C and lipid profiles with data after switch therapy. Paired t-tests were performed to compare baseline data to follow-up; p-values less than 0.05 were considered statistically significant.
Results: An EMR review identified 289 records of patients receiving ezetimibe therapy, including 37 patients who were switched to colesevelam therapy for at least 3 months without other changes in cholesterol or diabetes medications. Patients had an average age of 63 (±11) years, a mean diabetes duration of 18 (±12) years, and an average BMI of 32.8 (±6.7); 51.4 % were men. The switch resulted in no significant change in A1C (7.34 ± 1.51 % vs. 7.4 ± 1.75 % or in lipid levels {(TC: 174 ± 47 mg/dL vs. 171 ± 41 mg/dL); (LDL-C: 91 ± 39 mg/dL vs. 92 ± 32 mg/dL); (HDL-C 52 ± 15 mg/dL vs. 50 ± 12

mg/dL); (TG 152 ± 87 mg/dL vs. 141 ± 66 mg/dL); all P >0.05}.
Conclusion: A switch from ezetimibe to colesevelam was associated with no significant changes in mean TC, LDL-C, HDL-C, TG or A1C levels.

173. Clinical outcomes associated with varying degrees of thrombocytopenia in the cardiac surgery population.
Kathryn V. Kropp, Pharm.D., candidate[1], Marcia L. Brackbill, Pharm.D.[2], Christine Sytsma, RN, MSN[3]; (1)Shenandoah University, Winchester, VA; (2)Shenandoah University, Bernard J. Dunn School of Pharmacy, Winchester, VA; (3)Winchester Medical Center, Winchester, VA
Objective: To evaluate clinical outcomes such as post-operative length of stay, receiving blood products, and bleeding events in cardiac surgery patients with varying degrees of thrombocytopenia.
Methods: A retrospective chart review will be performed on patients undergoing cardiac surgery at Winchester Medical Center from January 1, 2008 to June 30, 2009. Charts will be reviewed for platelet levels at baseline and during the post-operative period, use of blood products, length of post-operative hospital and ICU stay, and bleeding events. Degrees of thrombocytopenia were defined as a <50% drop (Class I), a 50-70% drop (Class II), and a >70% drop (Class III) from baseline.
Results: Data collection is currently in progress. Data available at this time demonstrates that 69 patients are Class I, 61 patients are Class II, and 15 patients are Class III. There is a significant difference in the mean post-operative stay (in days) between the groups. Class I patients have a mean stay of 6.4 ± 3.2 days, Class II have a mean of 8.2 ± 3.7 days, and Class III have a mean of 15.5 ± 11.9 days ($p<0.005$). There is a statistical difference between the 3 Classes of patients with respect to the requirement of a PRBC transfusion. Forty Class I, 50 Class II, and 15 Class III patients required a transfusion.
Conclusions: It is anticipated that this research will find that higher degrees of thrombocytopenia will lead to an increase in hospitals stays, blood product transfusions, and bleeding events.

174. Incidence of initiation of nicotinic acid in patients on statin therapy at low-density lipoprotein goal admitted for acute myocardial infarction.
Jerrica E. Shuster, Pharm.D., candidate, Sean M. Barclay, Pharm.D., BCPS, Ragini Bhakta, Pharm.D., BCPS, Meghan N. Jeffres, Pharm.D., BCPS; University of Southern Nevada, Henderson, NV
Objectives: The purpose of this study is to identify the incidence of nicotinic acid initiation in patients admitted for acute myocardial infarction (AMI) already at goal low-density lipoprotien (LDL) on statin therapy. A secondary outcome is to determine predictors of initiation of therapy.
Methods: Medical records of patients admitted to St. Rose Dominican Hosptials between December 1, 2007 and December 1, 2009 for AMI will be reviewed to determine the incidence of nicotinic acid initiation. Inclusion criteria are: statin listed as a home medication, lipid panel performed within 96 hours of admit, LDL <100 mg/dL, and high-density lipoprotein cholesterol (HDL) <50 mg/dL for men and <55 mg/dL for women. Baseline characteristics will also be collected to determine predictors of nicotinic acid initiation.
Results: Research-in-Progress, it is highly likely that this project will be completed by the presentation date.
Conclusion: Research-in-Progress

Clinical Administration

175. Characterization of non-steroidal anti-inflammatory drug (NSAID) administration from computerized physician order entry (CPOE) electronic order sets in post-gynecological surgery patients.
Kimberley A. Harris, Pharm.D., Candidate, Julie Applegate, Pharm.D., BCPS; Mission Hospitals, Asheville, NC
Objectives: Both intravenous ketorolac and oral ibuprofen are pain management options on electronic order sets used in post-gynecological surgery patients in the CPOE system at Mission Hospitals. Concomitant administration of ketorolac and ibuprofen is contraindicated as the combination increases the risk of NSAID-related gastrointestinal bleeds and renal dysfunction. Although CPOE-related safeguards are in place to guide appropriate dosing and prevent coadministration of the medications, it is possible for these to be bypassed by health care providers. This review will assess the effectiveness of the CPOE system's safeguards.
Methods: A retrospective observational chart review will be performed on all women aged ≥ 18 years admitted to the gynecology service at Mission Hospitals between 8/25/09 and 9/24/09 and ordered both ibuprofen and ketorolac through electronic order sets. The safeguards on these order sets will be assessed by measuring the occurrence of NSAID coadministration, frequency of co-administration, and appropriate dosing of ketorolac. Any additional interventions made by pharmacists and other health care providers to prevent co-administration will be reviewed. Furthermore, any NSAID-related adverse events related to co-administration will be evaluated.
Results: Results are expected in January 2010.
Conclusion: Expected January 2010.

Critical Care

176. Evaluating the effectiveness of electrolyte order sets in critical care patients.
Mikhail R.S. Arthur, Student, Pharmacist,[1] Marcia L. Brackbill, Pharm.D.,[1] Jeffery W. Spray, Pharm.D., BCPS[2]; (1)Shenandoah University, Bernard J. Dunn School of Pharmacy, Winchester, VA; (2)Winchester Medical Center, Winchester, VA
Objective: The use of electrolyte order sets (EOS) may be an effective means of providing uniform and timely treatment in patients with abnormal electrolytes. The primary outcome is to determine the number of patients, before and after protocol implementation, whose laboratory values fall into normal electrolyte range within twenty-four hours. A secondary outcome will be to determine how long it takes for the electrolytes to normalize before and after protocol implementation.
Methods: A retrospective, controlled chart review will be conducted at a 411 bed non-profit community hospital to evaluate the effectiveness of a newly implemented EOS protocol. Inclusion criteria will be either Medical Surgical Intensive Care Unit (MSICU) or Coronary Care Unit (CCU) patients who have abnormal potassium, magnesium, calcium and/or phosphorus values. Patients admitted in August-September will serve as the control group. Education and implementation of the EOS occurred in October. The intervention group will include patients who are admitted in November-December. Data recorded will include age, gender, date of admission, hospital unit, electrolyte values upon admission with corresponding date and time, date and time of subsequent abnormal electrolyte values, and the numbers of hours it takes for the electrolytes to return to normal range. Each abnormal electrolyte value will be evaluated in its own group for each patient and each event. Data will be statistically analyzed using SPSS.
Results: Data collection is in progress and will be completed by the end of January.
Conclusion: To be determined after statistical analysis.

177. Dexmedetomidine vs. propofol: sedation and secondary analgesia in the critically ill.
Liana N. Le, PharmD, Candidate[1], NaaDede Badger, PharmD, BCPS[2], Vanthida Huang, Pharm.D., BSPHM[1], Don Wright, PharmD[2]; (1)Department of Pharmacy Practice, Mercer University College of Pharmacy and Health Sciences, Atlanta, GA; (2)Piedmont Hospital, Atlanta, GA
Objectives: Propofol is the standard therapy for sedation in the intensive care unit (ICU). Dexmedetomidine is a sedative which reduces the need for adjunctive analgesia and sedatives. We evaluated the effectiveness and advantage of dexmedetomidine compared to propofol as a prolonged sedation therapy for critically ill patients.
Methods: A retrospective, observational study of ICU patients on dexmedetomidine (n=43) or propofol (n=42) at Piedmont Hospital, a 500-bed private facility from June to December 2009. Patients included were at least 18 years old and received study medications for at least 24 hours. Primary goals were to evaluate the sedation efficacy, pain documentation, and need for midazolam or fentanyl. Sedation level was assessed using either Richmond Agitation Sedation Scale (RASS) or Piedmont's Sedation Scale (PSS). PSS is scored from one

through four, one for agitation and four for an unarousable patient. Pain level was assessed with either Numeric Pain Score (NPS), Behavioral Pain score, (BPS), or specific pain indicators. Secondary goals were to compare the average length of ICU stay, rate of hemodynamic adverse events, mortality rate, and documentation of sedation holiday.
Results: Patients on dexmedetomidine were more agitated compared to the propofol group, 53.5% vs. 23.8% respectively (p=0.005). Pain was documented more in the dexmedetomidine group compared to the propofol group, 58.1% vs. 24.4% respectively (p=0.002). The use of adjunctive midazolam and fentanyl was not significantly different. There was no statistical difference in the length of ICU stay, rate of hemodynamic adverse events, mortality rate, and use of sedation vacation between the two groups.
Conclusions: Despite results from previous studies, our study revealed more agitation and pain in the dexmedetomidine group. As a prolonged sedation therapy, dexmedetomidine did not significantly reduce the use of adjunctive sedation or analgesia compared to propofol. However, further studies are warranted.

178. Impact of pravastatin therapy on outcomes in aneurysmal subarachnoid hemorrhage patients.
Abdulkhaliq J. Alsalman, M.S., Al M. Best, Ph.D., Saba W. Masho, M.D., M.P.H, Dr.PH., John F. Reavey-Cantwell, M.D., M.S., Donald F. Brophy, Pharm.D., M.S., FCCP, Gretchen M. Brophy, Pharm.D., FCCP; VCU Medical College of Virginia, Richmond, VA
Objectives: To further evaluate whether pravastatin 40 mg/day decrease the incidence of cerebral vasospasm during hospitalization and determine whether pravastatin improve patients outcomes at discharge after aneurysmal subarachnoid hemorrhage (aSAH).
Methods: This was a retrospective cohort study of adult aSAH patients admitted to the neuroscience intensive care unit between January 2000 and June 2008. Patients were divided into two groups, those who received pravastatin (PRAV group) 40mg per day and those who did not (NP group). Data were analyzed using multivariate logistic regression.
Results: Eighty-one patients met inclusion criteria and 39 of them received pravastatin. There was no significant difference in WFNS scores for each group (p=0.18). The proportion of patients undergoing aneurysm clipping was higher in NP group (98% NP vs. 51% PRAV, p<0.0001). Approximately 74% of the study patients experienced vasospasm, of which 62% (n= 37) were in the NP group. There was a statistically significant decreased in the incidence of vasospasm in the PRAV group; however, this association did not retain significance after adjusting for WFNS scores, race, elevated WBC, and surgical clipping (59% PRAV vs. 88% NP, p=0.08). There was no statistically significant difference in proportion of severe radiological vasospasm (22% PRAV vs. 30% NP, p=0.82) or mortality (23% PRAV vs. 12% NP, p=0.46) between groups. However, there was a trend towards a decreased median length of stay (12 days PRAV vs. 17 days NP, p=0.06), and a significantly higher proportion of survivors discharged to home in the PRAV group (95% PRAV vs. 37% NP, p<0.0001).
Conclusion: There was a trend towards a decrease in the incidence of vasospasm in the aSAH patients receiving pravastatin, but this trend did not achieve statistical significance after adjusting for potential confounders. Pravastatin therapy was not associated with a reduction in mortality in aSAH patients; however, pravastatin was associated with other favorable clinical outcomes.

Drug stability and formulation

179. Stability testing and formulation development of cardioplegic solution.
Gagan Kaushal, Ph.D.; University of Charleston, Charleston, WV
Objectives: The purpose of this project is to determine the 30-day stability of routinely used cardioplegic solutions in hospitals and to work on the future recommendations for the formulation development of the highly concentrated cardioplegic solutions without compromising on the stability.
Methods: The additives and their respective doses used for the aseptically compounded cardioplegic solution are as follows; Potassium Chloride: 50 mEq, Sodium Chloride: 55 mEq, Magnesium Chloride: 15.95 mEq, Calcium Chloride: 1.23 mEq, Procaine 1 percent: 130 mEq and Sodium Bicarbonate: 9 mEq. Each cardioplegic bag was then compounded to a final volume of 516.5 mL with sterile water. Each cardioplegic bags was stored under refrigeration (2–6 degrees Celsius) and were assessed for physical and chemical stability over 30 days. Highly concentrated cardioplegic solutions were also prepared by the procedure outlined above and the final concentration of each ingredient was increased to achieve a final ratio of blood to cardioplegia as 16 to 1 with each bag containing a final volume of 172.12 mL.
Results: No precipitation, cloudiness, or color change was observed in the original cardioplegic formulation. The assay content revealed that all the electrolytes were at least 90% of the initial concentrations for 30 days. The highly concentrated cardioplegic solution showed no potential visual signs of incompatibility after mixing.
Conclusion: The original formulation was found to be stable for 30 days under refrigerated conditions. Electrolytes can be added in high concentration to achieve a hemodilution of 16 parts of blood to one part of cardioplegia. There are currently no data on the stability of these highly concentrated cardioplegic solutions in the literature. Thus, we believe that there is a need to research this further. These highly concentrated bags will be further analyzed for extended stability by the procedure outlined in our methods.

Education/Training

180. Clinical pharmacy practice project thesis.
Qamar Munawar, Pharm.D; Department of Pharmacy, University of Peshawar, Pakistan, Muharraq, Bahrain
Objectives: To learn, practice and document different areas of clinical pharmacy in a teaching hospital.
Methods: Different wards were visited daily. Data were gathered and updated regularly. Then various findings were documented and inferences or results were drawn and statistical presentations were made.
Results: From the recorded medication histories, it was deduced that 47.94% patients had good compliance, 24.65% had satisfactory while 26.02% were complaining poorly to their therapies. Similarly, in context to different levels of understanding of therapy, it was found that most of the patients i.e. 42.20% had poor understanding, 1.36% had very poor while ratio in case of good and satisfactory levels of understanding of therapy was similar (i.e., 26.02%). On the other hand, while deducing drug statistics from the recorded data, it was found that most the drugs noted in the medication histories were antibiotics (14.71%); the second highest percentage was of analgesics, which made up 12.94%. A major portion of recorded drug-related problems was various drug interactions comprising 47.36% of the total drug related problems found. The second highest percentage was occupied by untreated conditions scoring 14.28% of total drug related problems. The third place in this category was shared by therapeutic duplication and cost-related problems scoring 6.76% each. It was noted that a great number of pediatric hospital admissions were because of to medication errors.
Conclusion: It is concluded that such learning can be made better if government employs clinical pharmacists in the hospitals, not only for the sake of such learning but mainly for the sake of patients and society to ensure rational use of medicines i.e safe, appropriate & cost-effective. It will not only help in minimizing the government's budget of health department regarding pharmacotherapy but will also help in preventing the wastage of a lot of valuable resources including time and money.

181. A teaching method to enhance student preparation in therapeutics using case-based assignments.
Genesis S. Sezate, B.S., Erika J. Ernst, Pharm.D.; College of Pharmacy, The University of Iowa, Iowa City, IA
Objective: The objective of this initiative was to develop a formative assessment model designed for students to practice applying lecture material to patient-specific situations and increase preparedness for class discussions without a substantial increase in grading burden on the professor or teaching assistant.
Background: At The University of Iowa, the Infectious Disease (ID) Therapeutics module is taught in the third-professional year. We first initiated problem-based learning (PBL) into the ID course in 2003 as

case discussions to increase class participation and improve critical thinking skills. The PBL format has undergone several modifications over the past seven years.
Methods: From 2003 to 2007, we modified our assignment model based on student evaluations and professor experience. In 2003, cases were presented during class, and students were asked to participate in case discussions. Online quizzes and case assignments were added to class discussions in 2005 as part of the final grade. The current model, implemented in 2007, utilizes case assignments that can be submitted twice. The first submission occurs before discussion and is graded for completeness while the second submission occurs after the in-class discussion and is graded for correctness. Case-based assignments are the key active learning component of the course. We have developed a submit/resubmit model that requires students to prepare for class and practice practical applications of knowledge without being penalized for incorrect answers on their first attempt.
Results: Since the initiation of assignments student evaluations indicate that assignments are beneficial to the learning process and encouraging practical applications of lecture material. The percent of students who strongly agreed this course emphasized problem solving increased from 32% in 2005 to 60% in 2009.
Conclusion: Problem-based learning and class discussion can be implemented in a lecture-based course to promote class preparedness and active learning while not penalizing student grades during practice.

182. Describing the Wingate University School of Pharmacy's American College of Clinical Pharmacy student chapter.
Melanie L. Siv, Pharm.D. Candidate, Carolyn Steber, Pharm.D. Candidate, Bryan Love, Pharm.D., BCPS, Angie Veverka, Pharm.D.; Wingate University School of Pharmacy, Wingate, NC
Objectives: The School of Pharmacy's ACCP chapter was established in 2004 and is currently composed of two faculty advisors and 40 student members, including three elected student officers. The chapter participates in a variety of service activities and offers opportunities for professional development. The purpose of this project was to describe the membership and activities of a newly formed ACCP student chapter.
Methods: In October 2009, active student members were asked to describe their involvement in ACCP by completing a survey. Survey questions focused on demographics, areas of interest within pharmacy practice, and participation in the organization. A link to the electronic survey was provided by e-mail, and individual student responses were blinded from investigators. Descriptive statistics were used to compare survey data.
Results: The survey was distributed to 40 student members, and 28 students (70%) responded. Most respondents were women (64.3%), and 78.6% were aged 20–25 years. The two most common reasons for joining ACCP were interest in postgraduate opportunities (89.3%) and clinical pharmacy practice (92.9%). The practice setting/role students selected as most desirable upon completion of training were hospital clinical services (46.4%) and ambulatory care (25%). Greater than 50% of responders indicated involvement in each of the following activites: brown bag medication reviews (78.6%), postgraduate information session (64.3%), and clinical pharmacy discussion panel (57.1%). Only 35.7% of students indicated knowing about ACCP PRNs, and only 14.3% of students have joined an ACCP PRN. Most ACCP student members are actively involved in other organizations, with ASHP (60.7%) and APhA (75%) being the most common.
Conclusion: Survey results reflect active involvement and a strong desire of student members to pursue careers in clinical pharmacy settings. Further analysis of survey responses will be used to guide future plans and educational efforts.

183. Assessing the effectiveness of roundtable discussions to engender an atmosphere of inclusiveness among student members of the Northern California College of Clinical Pharmacy.
Maureen Shelley, Pharm.D., Candidate[1], Christine Guirgius, Pharm.D. Candidate[1], Becky Chang, Pharm.D., Candidate[1], Nga Nguyen, Pharm.D. Candidate[1], Cecilia Pham, Pharm.D., Candidate[1], Josephine Quach, Pharm.D. Candidate[1], Tina H. Denetclaw, Pharm.D., BCPS[2]; (1)California Northstate College of Pharmacy, Rancho Cordova, CA; (2)University of California at San Francisco School of Pharmacy, Department of Clinical Pharmacy, San Francisco, CA
Objectives: The Northern California College of Clinical Pharmacy (NCCCP) Student Member Division seeks to engender an atmosphere of community, inclusiveness, and respect among students in the various Northern California Schools of Pharmacy and among future pharmacists in various venues of practice. NCCCP utilizes roundtable discussions to achieve these objectives. The purpose of this study is to assess the effectiveness of roundtable discussions for engendering an atmosphere of inclusiveness among student NCCCP members from differing schools and among differing class years.
Methods: Student members from four schools of pharmacy, and from all class years, were invited to attend a "Residents' Panel Discussion" program that began with roundtable discussions led by pharmacists. Student seating was pre-assigned so each table had students from multiple class years and schools. Survey sheets distributed to attendees contained four questions that addressed engendering an atmosphere of inclusiveness among student members from differing schools and class years. Survey scores were based on a scale of one to five, where one = not at all satisfied and five = very well satisfied. Evaluations were anonymous, except table number was requested.
Results: Forty-one of 55 students (75%) completed the survey. Median, mode, and 75th percentile scores for all questions among all respondents was five, and 25th percentile score was four. At least one score of 3 or lower was given by a total of four individuals (9.8%). Two respondents (4.9%) gave multiple scores of three or lower; these occurred among one of ten tables and one participant who did not indicate a table number. These individuals did not offer written comment.
Conclusion: Roundtable discussions are an effective means of promoting an atmosphere of inclusiveness among student NCCCP members from differing schools and differing class years.

184. Evaluation of communication apprehension among first year and final year pharmacy undergraduates.
Ejaz. MA, M.Pharm[1], Azmi S, Pharm. D.[1], Tahir.M Khan, M.S.[2]; (1)University Sains Malaysia, Penang, Malaysia; (2)Island college of technology, Penang, Malaysia
Objectives: The goal of the present study was to assess and compare the level of communication apprehension (CA) among pharmacy undergraduate.
Methods: To accomplish this aim a modified version of Zimbardo's scale was used. A cluster random sampling method was used to approach the potential participants. Two clusters were defined on the basis of types of participants; one pharmacy undergraduates first years and final years. Those willing to participate were the part of study. Ethical approvals from the research ethics committee of University Sains Malaysia were taken for this study. Moreover, a verbal consent was also taken from the respondents to ensure the confidentiality of the information. The research protocol was approved by the school of pharmacy, USM. A verbal consent was taken from the respondents. Moreover, keeping in view the ethical requirements no personal information of the respondents was obtained. For the purpose of data analysis, the Statistical package for social sciences (SPSS13.0) was used. A parametric statistics has been used. In order to compare the difference in CA in gender and among the first year pharmacy students and final year pharmacy students' student t-test was applied. However, in order to compare the CA level among the ethnic groups One way ANOVA was used. Moreover, to identify the communication among the different racial groups post hoc analysis was conduced.
Results: A total of 268 pharmacy students showed participation in this study. A higher participation was observed from the respondents from the age group 21–25 years. Findings show a high level of CA among pharmacy first-year students.
Conclusion: Overall, Chinese female students were at high risk of CA. Race, age, gender, and year of study were the factors associated with CA.

185. Pharmacy residents; ability to evaluate medical literature and biostatistics.
Danielle L. Tice, Pharm.D. Candidate, P. Brandon Bookstaver, Pharm.D., LeAnn B. Norris, Pharm.D., April D. Miller, Pharm.D., BCPS, S. Scott Sutton, Pharm.D.; South Carolina College of Pharmacy – USC Campus, Columbia, SC
Objectives: The primary objective is to evaluate current pharmacy

residents' understanding of medical literature and biostatistics through a multi-program assessment of post-graduate year one (PGY1) accredited residency programs. The secondary objective is to assess the Residency Program Directors' (RPDs) attitude and confidence in both their program's and residents' ability to utilize biostatistics/ evidence-based medicine training.
Methods: This study was approved by the University of South Carolina IRB before commencement. This is a survey-based study that involved two surveys: one for 2008-2009 PGY1 residents and one for RPDs of ASHP-accredited programs. The Dillman method was used in survey development and dissemination and will be scored on a 5-point Likert scale (strongly agree to strongly disagree). Surveys were distributed through the web-based survey program, SurveyMonkey, to maintain anonymity. Basic demographic data and institution characteristics were collected. Survey responses were recorded to evaluate attitude, confidence, and knowledge questions. Missing values will not be utilized in the results and missing knowledge values will be scored as incorrect. Correlation analyses will be conducted to relate PGY1 confidence responses to scores of the knowledge questions. Bivariate analyses will be performed to evaluate variables that might be associated with confidence and knowledge scores.
Results: 168 PGY1 residents and 157 RPDs completed this study. The overall mean knowledge score of the residents was 49%. 17 out of 168 residents passed the knowledge test (≥70%). 67% of RPDs were confident in their residents ability to appropriately critique medical literature by analyzing statistical methods while 48% of residents were confident in their ability to critique medical literature. Residents who were confident and non-confident had a mean knowledge score of 41% and 40% respectively.
Conclusion: The results of our study showed poor knowledge in biostatistics and interpretation of EBM from PGY1 pharmacy residents and the need for further evaluation of biostatistics and EBM training in residency programs.

186. Use of VARK questionnaire to assess learning styles of pharmacy students and educators.
Travis Plumley, PharmD, Candidate, Kenneth Mueller, Pharm.D., Candidate, Sandra Earle, Pharm.D., Debra Parker, Pharm.D., Laura Perry, Pharm.D., Lori Ernsthausen, Pharm.D.; The University of Findlay College of Pharmacy, Findlay, OH
Objectives: The primary objective was to use the VARK learning style questionnaire to assess learning styles of fourth year professional pharmacy students and their experiential educators. The secondary objective was to assess performance of students with similar learning styles to their educator(s) to those with dissimilar learning styles from their educators.
Methods: Participants (students and experiential educators) will be asked to complete the VARK learning style questionnaire online and submit results via Google docs . Completed Advanced Practice Pharmacy Experience grading rubrics will be assessed to determine students with a learning style similar to that of their educator score higher in pre-selected fields. (IRB approval pending).
Results: To be presented at Spring Forum
Conclusions: To be presented at Spring Forum

187. Effect of a pharmacy-directed educational intervention on *clostridium difficile* infection treatment in the inpatient setting.
Laura A. Swanson, Pharm., D., candidate[1], Martha F. Healy, Pharm., D.[2]; (1)The University of Findlay, Findlay, OH; (2)St. John Westshore, Westlake, OH
Objective: This study examined the pharmacotherapy administered to inpatients with a documented *Clostridium difficile* infection (CDI) to analyze adherence to current treatment guidelines. The objective is to compare the guideline based adherence rate after a pharmacy directed educational intervention at this facility pursuant to the release of new guidelines in the winter of 2010.
Methods: A total of 43 patients were admitted between December 25, 2008 and October 28, 2009 with a subsequent CDI diagnosis. Medical records were reviewed for each patient and information was documented pertaining to the severity of the infection, recurrence of infection, concurrent antibiotic use, pharmacotherapeutic management, and adherence to guidelines with regards to choice of treatment.
Results: The pre-intervention population consisted of 16 men and 27 women with a mean age of 77.5 years. Overall, 67.4% and 34.9% of patients had severe and recurrent CDI, respectively. A total of 95.3% of the population had documentation of receiving treatment for CDI in the inpatient setting. The most commonly administered treatment was vancomycin 250mg po qid, with 51.2% of the population receiving this therapy. Although 62.8% were administered therapy that would adequately cover for a CDI, only 14% were treated according to current guidelines.
Conclusion: The current rate of guideline adherence for the treatment of CDI is low at this institution, with only 14% of patients being treated appropriately. It is proposed that this rate will improve vastly after an educational intervention regarding treatment guidelines for CDI.

Endocrinology

188. Hemoglobin A1c: bio-marker for diabetes prediction?.
Divyesh K. Raval, M.Pharm; Svkm's Nmim's, Mumbai, India
Objectives: Diabetes is a metabolic disorder in which glucose level in the body is elevated may be due to impaired insulin secretion or insulin resistance or increased glucose production. Various tests can be used glucose estimation in the body during diabetes, one of which also include estimation Hb A1c% which gives precise level of glucose over a period of two to three months.
Methods: The hemoglobin A1c test—also called HbA1c, glycated hemoglobin test, or glycohemoglobin—is an important blood test used to determine how well diabetes is being controlled. Hemoglobin A1c provides an average of blood sugar control over a six- to 12-week period. Hemoglobin is a substance within red blood cells that carries oxygen throughout body. When diabetes is not controlled (meaning that blood sugar is too high), sugar builds up in blood and combines with hemoglobin, becoming "glycated." Therefore, the average amount of sugar in blood can be determined by measuring a hemoglobin A1c level. If glucose levels have been high over recent weeks, hemoglobin A1c test will be higher.
Studies suggest that the lower the hemoglobin A1c level, the lower the incidence of diabetic complications (eye, kidney, heart, blood vessel, and nerve disease). The American Diabetes Association (ADA) recommends keeping the hemoglobin A1c less than 7%. The result of hemoglobin A1c test can also be used to estimate average blood sugar level.
Results: The table below shows hemoglobin A1c with estimated average glucose.

Hemoglobin A1c (%)	Estimated average glucose (mg/dL)
6%	126
7%	154
8%	183
9%	212
10%	240
11%	269
12%	298

Conclusion: Since Hb A1c level remains normal for long duration of about two to three months, its level increase with glucose elevation in body, can be used as a bio-marker for prediction of diabetes.

Gastroenterology

189. Drug utilization review of pantoprazole at a large teaching hospital.
Stephen M. Creasy, Pharm.D., Candidate; Shenandoah University, Jarrettsville, MD
Background: Proton pump inhibitors (PPIs) have been found to be prescribed in up to 52% of hospital admissions and are often prescribed without an appropriate FDA-approved indication. Recent studies are revealing data about the long term adverse effects associated with PPI use.
Objectives: The primary objective was to identify the frequency of PPI use at York Hospital. Secondary objectives included identifying if there was an appropriate indication, concomitant use of clopidogrel, calcium, iron, and diagnoses of pneumonia and Clostridium difficile.
Methods: A retrospective chart review was conducted on adult internal medicine patients discharged between April 1 and June 30

2009. All patients received oral or intravenous pantoprazole during their hospital stay. Descriptive statistics were used and the results were compared to similar studies.
Results: During the studied period, 2213 patients of 6575 discharges were prescribed a PPI during their stay; 294 charts were reviewed, and 165 (56.1%) did not have an indication for PPI therapy. In addition, 35.8% of the patients not taking a PPI before admission were discharged with a PPI prescription without an indication. Patients were prescribed calcium, iron, or clopidogrel on discharge at rates of 17.7%, 13.3%, and 11.6%, respectively. Of these respective subgroups, 86.5%, 84.6%, and 85.3% were also discharged on a PPI.
Conclusions: PPIs are often prescribed to patients on admission to the hospital and often prescribed without an appropriate indication. With new data regarding the long-term adverse effects of PPI therapy, it is important that a valid FDA-approved indication exists.
Health Services Research

190. What characteristics of comprehensive physiotherapy attract patients with low back pain?—a qualitative study in Zhuhai, China.
Yan Zhang, Graduate, student; University of Macau, Taipa, Macau
Background: Physiotherapy is regarded as an effective therapy for low back pain (LBP), whereas in some general hospitals in Chinese mainland, massage and acupuncture are also provided in the progress of physiotherapy. So it is difficult to tell what the attractive characteristics of this kind of physiotherapy from the perspective of patients.
Objective: To identify what are the main factors influence LBP patients' preference for comprehensive physiotherapy and to explore the perceptions of physiotherapy among the patients with LBP in Chinese Mainland.
Methods: A qualitative methodology was applied in the study. Patients with LBP, aged 18 years old or above, visiting physiotherapy doctors were invited in the semi-structured, face-to-face interviews. The patients were asked questions in the aspects about the perception of physiotherapy, whether physiotherapy was their first choice, and their former experience, etc. And the patients were encouraged to talk about other factors which contributed to the visits. The contents of the interview were record with the agreement of the patients.
Results: Twelve patients with LBP participated in the study. None of the interviewers had a clear understanding of the efficacy of physiotherapy for LBP, only one patient showed a strong preference for massage therapy. Among all the factors contributing to the visits, the former experience, the reference of acquaintances and the reputation of the hospital are important causes. The influence of transportation and monetary factors are complicated, because although some patients took the convenience or low cost as the main reasons for the visits, some others did not take the traffic inconvenience and price into consideration. Besides, the guidance of counselling nurses contributed much to the use of physiotherapy.
Conclusion: Patients do not realize the efficacy of Physiotherapy for LBP, and do not understanding the comprehensive effect of the combination of Traditional Chinese Medicine and physiotherapy.

191. Improving timeliness of first dose intravenous antibiotic administration through targeted staff education.
Lily Phuong, Pharm.D., Candidate[1], Monica Chan, Pharm.D. Candidate[1], Homa Mirzazadeh, PharmD, Candidate[2], Tina H. Denetclaw, Pharm.D., BCPS[1]; (1)University of California at San Francisco School of Pharmacy, San Francisco, CA; (2)Touro University College of Pharmacy (Mare Island), Vallejo, CA
Objectives: Improvement in first dose intravenous antibiotic administration timeliness is assessed following staff education resulting from previously reported baseline performance analysis.
Methods: After 4 months of targeted staff educational efforts, 11 new antibiotic orders were randomly identified over a period of 5 days and followed in blinded manner through the entire process of handling each order, from time of order writing to time of drug administration. Causes for avoidable delay were noted, as were unavoidable causes for delay. Performance measures are compared to pre-education baseline performance.
Results: After staff education efforts, median time from writing to drug administration improved from two hr (1.47, 4.08) to 0.83 hr (0.52, 1.5). Interval from writing to scanning order to pharmacy improved from median 0.3 hr (0.09, 3.9) to 0.19 hr (0.02, 0.87). The longest interval for drug administration after drug available to nurse improved from 5.3 hrs to 1.69 hrs. Delays were no longer observed for patients transferring between units or being housed in the emergency department. Although 82% of the antibiotics in the post-education phase were not ordered STAT, 55% were given within 1 hr of writing, and all were given within 2 hrs, which met or exceeded hospital standards for non-STAT antibiotic administration. Ten of 11 orders were administered within hospital standards for STAT and non-STAT orders. One STAT order was administered 2.92 hr after order writing, which did not meet hospital standards. This compares to 5 of 11 orders in the pre-education phase failing to be administered within hospital standards.
Conclusion: Staff education decreased variability in time to first dose intravenous antibiotic administration and resulted in 91% of the sampled orders being administered at times that met or exceeded hospital standards.

Hematology/Anticoagulation

192. Comparison of physician-directed warfarin dosing with a pharmacist-directed warfarin dosing service in patients on significant interacting medications.
John Dougherty, MBA, Pharm.D., BCPS[1], Scott King, Pharm.D.[2], *Nicolas T. Terranova, PharmD, Candidate*[3]; (1)Heart of Florida Regional Medical Center, Davenport, FL; (2)Dr. P. Phillips Hospital, Orlando, FL; (3)University of Florida, Orlando, FL
Objectives: To assess the ability of a pharmacist-directed inpatient warfarin dosing service to manage INRs within goal ranges for patients that concurrently received significant interacting medications compared to physician-directed dosing. Additional assessments took place evaluating INRs $\geq$ 4.0 and 6.0.
Methods: A retrospective review was conducted for 246 patients that received warfarin and significant interacting medications known to increase INR admitted between November 2006 and July 2009 to a community hospital. Information on patients' warfarin management including warfarin indication, goal INR range, home warfarin use, dates monitored, warfarin doses administered, INRs, and interacting medications administered were assessed.
Results: The proportion of INRs within goal range was 39% in the pharmacist group versus 28.1% in the physician group ($p<0.0001$). For pharmacist-directed dosing, 3.8% of INRs were 4.0 or greater versus 9.2% for physician-directed dosing ($p<0.0001$). The proportion of INRs 6.0 or greater was 0.7% in the pharmacist group versus 1.7% in the physician group ($p=0.029$). In the pharmacist group, a smaller percentage of patients had an INR greater than 4.0 or more (19.0%) than in the physician group (37.5%) ($p<0.01$). The pharmacist group had 4.0% of patients with an INR greater than 6.0 versus 10.0% in the physician group ($p=0.062$).
Conclusions: Pharmacist-directed inpatient warfarin dosing was associated with a significantly greater proportion of therapeutic INRs for patients who concurrently received significant interacting medications compared with physician-directed dosing. In addition, the pharmacist group had a significantly lower proportion of INRs of 4.0 or greater and 6.0 and patients achieving an INR $\geq$ 4.0. These findings translate into improved quality of care and potentially significant cost savings (i.e., reduced length of stay and decreased resource utilization) for the institution.

193. Effect of delayed pharmacologic prophylaxis on venous thromboembolism (VTE) rates.
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Objectives: Pharmacologic VTE prophylaxis decreases risk of VTE in hospitalized patients. However, potential bleeding risks or a perceived low risk of VTE often delay its initiation. Many doses are held for administrative or clinical reasons. The effects of delays in therapy and missed doses on VTE rates are unknown. The primary objective of this study was to compare VTE rates in patients receiving

early versus delayed pharmacologic VTE prophylaxis. The secondary objective was to compare VTE rates among patients with held or omitted doses.
Methods: This retrospective, case control study consists of fifty case patients with hospital-acquired VTE as a discharge diagnosis matched with 200 controls based on age and reason for admission. Medical records will be reviewed and the rate of the early (within 48 hours of admission) versus delayed (≥48 hours of admission) initiation of pharmacologic prophylaxis and the rate of missed doses will be compared between groups. This sample size will provide 82% power to detect a 20% difference using a Chi square analysis to compare VTE rates in patients receiving early versus delayed pharmacologic prophylaxis.
Results: To date, data on time of pharmacologic prophylaxis has been collected for all case patients. One-third of case patients had orders for pharmacologic VTE prophylaxis 48 hours or more of admission. Data collection on control patients and missed doses is ongoing and will be complete by April 2010. We anticipate that delayed pharmacologic prophylaxis will increase VTE rates.
Conclusion: The results from this study could guide practitioners in balancing both bleeding and VTE risk in choosing when to initiate pharmacologic prophylaxis. They can also help raise awareness of the importance of administering all ordered doses.

HIV/AIDS

194. AIDS drug assistance program (ADAP) enrollment and use of highly active antiretroviral therapy (HAART) in a cohort of HAART-eligible women.
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Objectives: To evaluate whether enrollment in ADAP, including state differences in ADAP eligibility criteria, was associated with HAART use by comparing HAART-eligible women enrolled in ADAP with women who rely on other forms of health insurance for HAART medication coverage.
Methods: Cross-sectional analyses nested within the Women's Interagency HIV Study (WIHS) longitudinal study were performed on data primarily collected in 2008. HAART-eligible, defined by having a prior CD4 cell count less than 350 or an AIDS-defining illness, women enrolled in the California (n=439), New York (n=487) and Illinois (n=168) sites of the WIHS were included. Unadjusted and adjusted logistic regression measured the association between demographic, behavioral, and health service factors and non-use of HAART in clinically eligible women.
Results: Most women were older than 40, African American, unmarried, and unemployed, with an average annual income of $12,000 or less. In unadjusted analyses, older age, white race, higher education, employment, higher income, lack of depressive symptoms, no drug or alcohol use, nonsmoker, and enrollment in ADAP were associated with being on HAART ($p<0.05$). In the final analyses adjusted for age, race, alcohol use, and income, women without ADAP coverage were less likely to use HAART than women with ADAP (odds ratio = 2.2, 95% confidence interval = 1.4–3.4). More women in California were enrolled in ADAP (45%) compared with New York (11%) and Illinois (15%) because New York and Illinois do not allow Medicaid and ADAP coinsurance. However, there was no significant difference of HAART use between states.
Conclusion: ADAP enrollment increased the likelihood of HAART use in HAART eligible, HIV-infected women while site location did not. To increase HAART use among those who are eligible for ADAP enrollment but are not using HAART, improved outreach is needed especially to people who are younger, of ethnic minority, and low-income.

195. An evaluation of published international antiretroviral reports in African resource-limited settings from 2000–2008.
Christine U. Oramasionwu, Pharm.D., M.S., BCPS, Ph.D. Student,[1] Jonathan M. Hunter, M.A.,[2] Christopher R. Frei, Pharm.D., M.S., BCPS,[1], Alice K. Pau[3]; (1) The University of Texas at Austin and The University of Texas Health Science Center San Antonio, San Antonio, TX; (2) The University of Texas Health Science Center San Antonio, San Antonio, TX; (3) National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, MD
Objectives: Scale-up of antiretroviral therapy (ART) initiatives has begun in several sub-Saharan African countries. To track the progress of these initiatives, in a region that bears the greatest burden of HIV/AIDS worldwide, we conducted a review of published reports from 2000 to 2008 that provide informative data needed for such an assessment. This review was also designed to identify key areas for future research in sub-Saharan Africa.
Methods: Using Ovid Medline Database, we searched for English-language articles related to the use of ART in sub-Saharan Africa, published between January 2000 and December 2008. The data collected included study themes, funding sources, and study countries. The search was limited to 14 key peer-review medical journals that publish HIV-related studies.
Results: We identified 215 publications between 2000 and 2008. The number increased from 2 in 2000 to 45 in 2008. Publications were from 18 countries, the top six of which were Uganda (26%), Côte d'Ivoire (18%), South Africa (17%), Kenya (6%), Malawi (6%), and Botswana (5%). Frequent themes included drug resistance (26%), prevention of mother-to-child transmission (PMTCT, 15%), therapy adherence (11%), virologic outcomes (10%), mortality (7%), and adverse drug effects (7%). We found an increasing trend in reports using CD4+ count and HIV-RNA as surrogate markers for treatment responses. The United States government was the dominant source of funding (44%).
Conclusion: From 2000 to 2008, there was an increase in published reports documenting the effects of ART scale-up initiatives in sub-Saharan Africa, highlighting the outcomes, hurdles, and efficacy of such programs. Publication of these results allows for exchange of experiences and knowledge of the efficacy of ART in this region, where the drugs are most needed. Future research also needs to address other smaller countries, vulnerable populations, and innovative treatment programs that were not represented in this review.

Infectious Diseases

196. Evaluate the relationship between vancomycin MICs and treatment failure in patients with bacteremic methicillin-resistant *Staphylococcus aureus*.
Lida M. Valentine, Pharm.D., Candidate[1], Vanthida Huang, Pharm.D., BSPHM[1], NaaDede Badger, Pharm.D., BCPS[2], Todd Parker, Pharm.D.[2]; (1)Department of Pharmacy Practice, Mercer University College of Pharmacy and Health Sciences, Atlanta, GA; (2)Piedmont Hospital, Atlanta, GA
Objectives: Vancomycin is the treatment of choice for methicillin-resistant *Staphylococcus aureus* (MRSA), yet recent vancomycin failure rates of 22%, 27%, and 51% have been reported with minimum inhibitory concentrations (MICs) of 0.5, 1.0, and 2.0 μg/ml, respectively. We sought to investigate the correlation between failure rates and vancomycin MIC using microbroth dilution and Etest methods at Piedmont Hospital, a 500-bed private hospital.
Methods: Eighty clinical MRSA, blood isolates were obtained from March 2007 to October 2009. MICs were determined via microbroth dilution and Etest methods per CLSI guidelines. Retrospective, cohort chart review was performed on 80 patients with MRSA collected. Treatment failure was defined as any death within 30 days of initial vancomycin dose, MRSA positive blood culture obtained 10 days after the initiation of vancomycin therapy, or recurrent MRSA from any sources within 60 days after discharge. Alternative therapy, length of stay, and intensive care unit (ICU) admission were also evaluated.
Results: Treatment failure MIC_{50} was 1.0 μg/ml (0.5–2.0 μg/ml) and 1.5 μg/ml (0.5–2.0 μg/ml) for microbroth dilution and Etest methods, respectively. Overall vancomycin failure rate was 17.5% (14/80). Failure rates for Etest MIC of 2.0, 1.5, 1.0, and 0.75 μg/ml were 45.5%, 17.9%, 8.3%, and 7.7%. Failure rates for microbroth dilution MIC of 2.0, 1.0, and 0.5 μg/ml were 33.3%, 21.4%, and 4.8%. Failure

can be attributed to death within 30 days (28.6%), positive blood culture >10 days (14.3%), and recurrent MRSA infections (64.3%). Successful alternate therapy was observed in 37.5% (30/80) of patients. Average length of stay (15.9 vs. 15.6 days, p=0.924) and admission to the ICU (37.9% vs. 57.1%, p=0.537) were no different between success vs. failure groups, respectively.
Conclusion: Increased vancomycin MIC result in higher treatment failures in MRSA bacteremic patients. Etest methods detected higher MICs within susceptible range where microbroth dilution did not. Further investigation is warranted.

198. Does de-escalation from an echinocandin to fluconazole result in inferior outcomes when used as empirical treatment of *Candida albicans*?
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Objectives: To characterize the use of anti-fungal medications to treat candidiasis in an ICU setting and determine the impact of de-escalation strategies.
Methods: This study took a retrospective look at 668 patients who were treated for candidiasis in a major hospital in the southeastern United States between January of 2007 and September of 2009. Basic demographic and treatment information was recorded for each subject, and their antifungal treatment regimens were classified as either compliant or non-compliant with candidiasis guidelines published by the IDSA. Whenever available, lab culture reports were used to determine treatment efficacy. Outcomes were then defined as having either clinically failed, regressed, improved, relapsed, resolved or not changed.
Results: In a subset of 102 patients having an average of 3.3 risk factors for Candidiasis (STDEV=1.65) and an average length-of-stay of 37.2 days (STDEV=28.3), 38% were treated with echinocandins only, 8% were treated with azoles only, and 54% were treated with a combination of azoles and echinocandins. In the latter group, 62% were escalated from an azole to an echinocandin (n = 34), 20% were de-escalated from an echinocandin to an azole (n=11), 7% were both escalated and de-escalated (n=4), and 11% were neither escalated nor de-escalated (n=6). Six patients died in the "escalated" group, 1 died in the "neither" group, and no patients died in the "de-escalated" and "both" groups.
Conclusion: It appears there is no increased risk of mortality when appropriately assessed patients are deescalated to azole antifungals from empiric broad echinocandin therapy. However, the population in these data is not large enough to make absolute determinations.

199. Investigating the emergence of multidrug resistant *proteus mirabilis*.
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Objective: *Proteus mirabilis* causes clinically significant infections that are usually susceptible to most antibiotics including broad-spectrum beta-lactams, fluorouqinolones, and aminoglycosides. This study evaluated the susceptibility profile of eight antibiotics against *P. mirabilis* in a community hospital.
Methods: We evaluated all hospitalized adult patients discharged from a private health care system in San Antonio, Texas, from January 2008 to November 2009. Duplicate isolates according to CLSI were removed. Susceptibility results for ampicillin (AMP), ampicillin-sulbactam (ASM), aztreonam (AZT), cefazolin (CEF), ceftriaxone (CRO), levofloxacin (LEV) or ciprofloxacin (CIP), gentamicin (GEN), and trimethoprim-sulfamethoxazole (SXT) were obtained. Multidrug resistance (MDR) was defined as nonsusceptible to three or more antibiotic classes. In addition, the following data were collected: patient age, culture site (i.e., urine, wound, blood, and respiratory) and patient arrival location (i.e., home, another hospital, long-term care facility).
Results: Overall, 372 patients (age 68.8±17.6 yrs) were identified. Most of the isolates were from the urine (66%), followed by wound (21%), blood (12%), and respiratory (1%). The percent susceptibility (% S) was: ASM (95%), GEN (81%), AZT (64%), CAZ (64%), AMP (63%), FQ (62%), CRO (58%), and SXT (57%). Overall, 40% of the isolates were MDR. Long-term care patients were 3 times more likely to have an MDR isolate than either patients admitted from home or another hospital. There were no significant differences in MDR based on source (wound 35%, urine 40%, or blood 44%). Below is the % S based on the presence of MDR.

Antibiotic	Not MDR	MDR
ASM	100%	86%
AMP	100%	7%
AZT	100%	10%
CEF	100%	8%
CRO	100%	11%
GEN	99%	54%
FQ	87%	25%
SXT	86%	12%

Conclusion: MDR *Proteus mirabilis* is a major problem at this health care system with only the β-lactam/β-lactamase inhibitors maintaining in vitro activity. The clinical utility of these antimicrobials needs further investigation while additional evaluation for the presence of ESBL is necessary.

200. The rise in hospitalizations for community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA) skin and soft tissue infections across the U.S., 1996–2006.
Christine U. Oramasionwu, Pharm.D., M.S., BCPS, Ph.D. Student,[1] Sumalee Thitinan, Ph.D. Student,[2] Kenneth A. Lawson, Ph.D.,[2] Kelly R. Daniels, Pharm.D. Candidate,[1] Christopher R. Frei, Pharm.D., M.S., BCPS[1]; (1)The University of Texas at Austin and The University of Texas Health Science Center San Antonio, San Antonio, TX; (2) The University of Texas at Austin, Austin, TX
Objectives: Community-associated methicillin-resistant *Staphylococcus aureus* (CA-MRSA) is a leading cause of skin and soft tissue infections. This study chronicles the rise of CA-MRSA as a predominant cause of skin and soft tissue infections within a cohort of hospitalized patients across the United States.
Methods: Hospital records from the 1996-2006 National Hospital Discharge Surveys (NHDS) were utilized to identify adult patients (20 years or older) with a principal ICD-9-CM diagnosis for a skin and soft tissue infection. Discharges were excluded if source of admission was from another hospital, health facility, or skilled nursing facility. Survey weights were incorporated into statistical analyses to generate national estimates. A multivariable logistic regression model was constructed to identify risk factors for the acquisition of a CA-MRSA skin and soft tissue infection.
Results: A total of 4.2 million hospital discharges with a diagnosed skin and soft tissue infection were identified from U.S. hospitals between 1996 and 2006. The number of *S. aureus* infections increased throughout the study, with 22,289 (7% of cases) in 1996 and increasing to 104,487 (20% of cases) in 2006. The rise in resistant isolates was more pronounced; CA-MRSA accounted for 1184 discharges (less than 1% of cases) in 1996, rising to 59,694 discharges (12% of cases) in 2006. The highest number of cases occurred during the months of August, October, and November. This rise in cases was most pronounced in the Southern region of the United States; this region also accounted for 50% of all CA-MRSA infections. Independent risk factors for CA-MRSA included gender, race, survey year, geographic region, hospital size, and insurance status ($p<0.001$ for all risk factors).
Conclusion: The number of hospitalizations for CA-MRSA skin and soft tissue infections across the US are increasing. Several demographic factors may place patients at higher risk for these types of infections.

201. High-dose daptomycin use in suspected meningitis secondary to methicillin-sensitive Staphylococcus aureus.
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Army Medical Center, Fort Gordon, GA
Objective: To report a case of suspected methicillin-sensitive *Staphylococcus aureus* (MSSA) meningitis treated with high-dose daptomycin with documented concurrent serum and cerebrospinal fluid (CSF) concentrations.
Methods: Literature review reveals that daptomycin use in meningitis is limited to few case reports. A retrospective chart review of patient data was conducted spanning a 16-day hospitalization. Concurrent CSF and serum daptomycin concentrations were obtained during therapy.
Results: We report a case of a 54-year-old man who presented to the emergency department with weakness. Chest radiograph revealed a patchy infiltrate in the right lung. The patient was empirically initiated on vancomycin, levofloxacin and piperacillin/tazobactam for probable pneumonia. Blood cultures revealed *Staphylococcus aureus* negative for penicillin-binding protein pan-susceptible including oxacillin, daptomycin (MIC equal to 1 μg/ml), and vancomycin (MIC equal to 2 μg/ml). Vancomycin was discontinued and nafcillin was initiated. On day eight, the patient's serum creatinine level was 4.1 mg/dl, increased from 1.2 mg/dl the previous day and 0.8 mg/dl on admission. The nephrotoxicity was partially thought to be nafcillin-induced interstitial nephritis. On day nine, the patient developed bradycardia, then asystole. The patient's glascow coma score was three with a normal CT scan 72 hours after cardiac code. Because of suspected metastatic source of infection to the CNS, nafcillin was discontinued and on day 11, daptomycin 800 mg (9 mg/kg) daily was initiated for suspected meningitis and continued until patient's expiration on day 16. Daptomycin serum and CSF trough concentrations were 11.21 μg/ml and 0.52 μg/ml, respectively, before the third dose. The creatine phosphokinase (CPK) concentration was 35 IU/L on day nine. CPK concentrations were not reassessed further. Subsequent lumbar puncture results were benign and blood and CSF cultures were negative.
Conclusion: Daptomycin may be a viable treatment option in meningitis due to its bactericidal activity and lack of cell lysis. Future studies should further evaluate efficacy and toxicity of high-dose daptomycin.

Medication Safety

202. An evaluation of prescription medication recalls from 2004 to 2008 in the United States.
Mary G. Daniel, B.S., Jaime P. Gilligan, Pharm.D., Tina Tseng, Ph.D., MSPH, Melissa Holland, Pharm.D., MSCR, Melissa D. Johnson, Pharm.D., MHS; Campbell University, Morrisville, NC
Objectives: Medication recalls by the FDA occur frequently. No systematic investigation has studied prescription medication recalls in the United States. The purpose of this study is to evaluate characteristics of recalled prescription drug medications in the United States. Our primary objective is to compare the proportion of prescription drug recalls among brand name versus generic medications in the United States, as reported by the FDA. In addition, we will assess recalls according to manufacturer, recall class, partial or total lot recall, and the therapeutic class to determine whether recalls are more likely to occur with a specific manufacturer or class.
Methods: Recall data on prescription and over-the-counter medications will be collected from FDA enforcement reports 2004–2008. A Microsoft Access database will be used to capture medication recall data including: name of medication, recall ID code, year, national drug code, therapeutic class, recall classification, and recall of full or partial lots. A Chi square statistical analysis will be performed for variables of interest to determine if there is a difference in recalls by brand name vs. generic medications.
Results: Research is still in progress, with data collection and analysis anticipated to be complete in March 2010.
Conclusion: The results of this study will shed light on the most common characteristics of recalled prescription medications, and allow health care providers, government agencies, and consumers to make more informed decisions about prescription medications.

Oncology

203. Alternative use of plerixafor as a rescue for failed chemo-mobilization in two patients with multiple myeloma.
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Objectives: The purpose of our case report is to describe the use of plerixafor as a rescue for failed chemo-mobilization in two patients.
Methods: A computer-based search for patients receiving plerixafor was performed.
Results: Patient One. A 63-year-old man with multiple myeloma received cyclophosphamide 4g/m^2 plus G-CSF 10 μg/kg/d for stem cell mobilization but was never apheresed as the total white blood cell count (WBC) never exceeded 2.4/μL. Four weeks after the initial chemo-mobilization, remobilization was performed with a reduced dose of cyclophosphamide (2.4 grams/m^2) plus G-CSF 10mcg/kg/d, started 72 hours later and given daily for seven days. Poor G-CSF response was observed, and so one dose of plerixafor 0.24mg/kg was administered. WBC count increased to 19.5cells/μL and CD34+ count to 48 cells/mcL. Patient successfully apheresed the next day allowing for an infusion of 4.98 x 10^{6}cells/kg during the autologous transplant three weeks later. Patient Two. A 62-year-old man with multiple myeloma was mobilized with cyclophosphamide 4g/m^2 and G-CSF 10 μg/kg initiated 72 hours later. WBC failed to respond after 11 days. He received one dose of plerixafor 0.24 mg/kg resulting in a substantial increase in WBC (11.0–24.2 cells/μL) and CD34+ count (20-63 cells/μL) allowing for apheresis sessions over the next two days. An autologous stem cell dose of 3.73 x 10^6 CD34+ cells/kg was infused on the day of transplant five weeks later.
Conclusion: Two patients failed initial attempts at chemo-mobilization with high dose cyclophosphamide plus G-CSF. One patient was remobilized with chemotherapy, G-CSF, and plerixafor, while the second underwent plerixafor mobilization following inadequate CD34+ cell response to G-CSF and cyclophosphamide. Both patients met CD34+ cell collection goals and subsequently underwent successful autologous transplant. These cases represent off-label use of plerixafor demonstrating that plerixafor can be used in alternative regimens as a rescue of otherwise inadequate attempts at mobilization.

Pain Management/Analgesia

204. Pharmacotherapeutic treatment of anxiety disorders: Investigating the correlation between GAD-7, PHQ-9, and brief pain inventory scores.
Andrea L. Leone, Pharm.D., Candidate[1], Timothy J. Ives, PharmD, MPH, BCPS, FCCP, CPP[2], Susan J. Blalock, Ph.D.[2]; (1)University of North Carolina Eshelman School of Pharmacy, Asheville, NC; (2)University of North Carolina Eshelman School of Pharmacy, Chapel Hill, NC
Objectives: Published studies show evidence of comorbidities between anxiety, somatization, and chronic pain in population studies. Studies also show a significant link between the treatment of psychopathology, commonly depression, and improvement in chronic pain. The primary objective of this study is to determine if concurrent pharmacotherapeutic management of anxiety, as measured by the GAD-7, will improve chronic pain patients' Brief Pain Inventory (BPI) scores. The secondary objective is to determine if the pharmacotherapeutic management of co-morbid depression, as measured by the PHQ-9, will also affect BPI scores.
Methods: Current, IRB-approved studies contain preliminary patient data, which was used to pool part of this study's subjects using initial GAD-7, PHQ-9, and BPI scores. The prospective portion encompassed collecting both initial and subsequent values from these screening tools. Patients 18 years and older, referred because of chronic pain, and GAD-7 score of 8 or higher were included. The GAD-7, PHQ-9, and BPI were administered at the initial visit and at one, three, and six months. Morphine equivalency, at onset and at closure, was also monitored. Quantitative data analysis will use a paired *t*-test with the primary endpoints being a change in BPI and GAD-7 scores. Power analysis was performed with $\alpha = 0.05$, and power = 0.80, for an anticipated change in outcome (BPI and GAD-7) of 0.5 standard deviation units of the mean pre-treatment scores. Power analysis indicates that 34 subjects would provide sufficient power.
Results: Total study intake is 49 subjects. Data analysis is to be

completed by February 2010.
Conclusions: At present, data analysis is incomplete.

Pediatrics

205. Retrospective analysis of continuous intravenous insulin infusion for hyperglycemia in patients without diabetes in a pediatric intensive care unit.
Danielle R. Baskin, Pharm.D., candidate, A. Jill Thompson, Pharm.D., BCPS; Medical University of South Carolina Medical Center and South Carolina College of Pharmacy, Charleston, SC
Objectives: Critical illness hyperglycemia is associated with increased morbidity and mortality in adults and children. The Medical University of South Carolina's (MUSC) Pediatric Intensive Care Unit (PICU) does not have a standard insulin protocol for managing critical illness hyperglycemia. The purpose of this study is to describe the dosing and monitoring strategies utilized for treating critical illness hyperglycemia in the MUSC PICU population. A secondary objective is to identify potential risk factors for hypoglycemia.
Methods: A retrospective chart review was performed for all PICU patients (without diabetes) who received continuous insulin infusion over a 12-month period. Data collected included demographics, admitting diagnoses, insulin infusion data, blood glucose values, and treatments for hypoglycemia.
Results: Twenty-eight patients were included; 54% were men. The median age was 7.8 years. The most frequent reason for PICU admission was neurologic insult; 32% of all patients underwent a surgical procedure. Overall hospital mortality was 29%. The median starting insulin dose was 0.02 unit/kg/hour, and the target blood glucose range was 80–150 mg/dL. The median insulin infusion duration was 2.2 days, and the median time to achieve the target blood glucose was 8.2 hours. Thirty-two percent of patients had a hypoglycemic event; younger patients and overweight patients appeared to be at higher risk of becoming hypoglycemic. Results will be presented in April 2010.
Conclusion: Preliminary results have identified areas for improvement in our insulin dosing and monitoring strategies, especially the high rate of hypoglycemia. Data from this study will be used to develop and implement a protocol to improve patient outcomes.

206. Oral ammonium chloride for the treatment of metabolic alkalosis in three pediatric patients.
Jennie T. Mathew, Pharm.D.Candidate, Laura L. Bio, Pharm.D., BCPS; Cooper University Hospital, Camden, NJ
Objectives: Among the treatment options for metabolic alkalosis, intravenous (IV) ammonium chloride is efficacious but poorly tolerated due to infusion reactions and adverse effects. Currently, there is a lack of sufficient data demonstrating the effect of oral administration of ammonium chloride, a possible alternative route with increased tolerability. The purpose of these three case reports is to evaluate the efficacy and describe the safety of orally administered ammonium chloride in pediatric patients with metabolic alkalosis.
Methods: During January to December of 2009, three pediatric patients received ammonium chloride orally for the treatment of metabolic alkalosis. The medical records of these patients were obtained and the patient's history and hospital course are being reviewed. Data to be collected includes the dose of ammonium chloride administered, serum bicarbonate, serum chloride, arterial blood gases (base excess, pH), and clinical symptoms of metabolic alkalosis such as hypoventilation, nausea, vomiting, diarrhea, and confusion. Lab values will be collected in relation to the time of drug administration. If multiple doses of ammonium chloride were administered, lab values and symptoms of toxicity, including encephalopathy and altered mental status, will be collected for each dose. The resolution of metabolic alkalosis, defined as normalization of serum bicarbonate to < 33 mEq/L and arterial pH within 7.35 to 7.45, will be analyzed to determine the efficacy of orally administered ammonium chloride. In addition, time to resolution and respiratory compensation of each patient will be reviewed. Descriptive statistics will be used to describe the characteristics of the three patients.
Results: Pending
Conclusion: Pending

Pharmaceutical Marketing

207. PhRMA guiding principle amendments effects on direct-to-consumer advertising of prescription and over-the-counter pharmaceuticals.
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Background: Drug utilization is driven by a patient's need for and physician knowledge of pharmacologic therapy. Pharmacists serve as a safeguard to further ensure the appropriateness of pharmacologic therapies. For decades, pharmaceutical representatives have provided prescriber-targeted specific information detailing products. Since the January 2009 Pharmaceutical Research and Manufacturers of America's (PhRMA) guideline amendments, many physician offices have closed their doors to pharmaceutical representatives. This decreased representative face time may prompt pharmaceutical manufacturers to focus their attention on direct-to-consumer advertising to counter balance these changes. Direct-to-consumer advertising found in television, internet, radio, and printed material genres increase patient-initiated conversations with physicians addressing medical management. Thus, advertisements serve as a viable channel for direct prescribing patterns. Therefore, PhRMA guideline amendments may prompt an influx of direct-to-consumer advertisements in mainstream media.
Objective: To evaluate the impact of recent PhRMA guideline amendments on the magnitude of direct-to-consumer advertisements within weekly and monthly nationally published magazines.
Methods: The magazines within the study were chosen to represent women's interest, men's interest, and current events, providing a variety of potential direct-to-consumer advertisement exposures. Advertisements were tallied for prescription medications, over-the-counter medications, and herbal supplements. Herbal supplements are not regulated by the Federal Drug Administration (FDA); thus, serve as a control. Descriptive statistics were used to calculate percentages of advertisements, defined as pages per issue, published per category, per issue, and per magazine. Previous collection within data fields were obtained between November 2007 and February 2008. The second set of data collection will contain advertisements published between November 2009 and February 2010.
Results: Pending
Conclusions: Pending

Pharmacoepidemiology

208. Retrospective, cross-sectional evaluation of the changing use of antibiotics for upper respiratory tract infections in ambulatory practice in the United States between 2002 and 2006.
Jamie L. Nelson, Pharm.D., MSCR, Candidate[1], Ginger D. Watlington, Pharm.D., MSCR, Candidate[2], Tina Tseng, Ph.D., MSPH[1], Melissa D Johnson, Pharm.D., MHS[1], Melissa Holland, Pharm.D., MSCR[1]; (1)Campbell University, Raleigh, NC; (2)Campbell University, Morrisville, NC
Objectives: Infections caused by resistant bacteria that fail to respond to antibiotic treatment result in prolonged illness and greater risk of death. The vast majority of upper respiratory tract infections (URIs) are viral in origin, however, an alarming number of patients are still prescribed antibiotics for colds, upper respiratory tract infections, and bronchitis.
Methods: Patients with primary diagnosis of URIs (including colds, allergies, and bronchitis) were identified from the National Ambulatory Medical Care Survey (NAMCS) database for 2002 and 2006. Subjects with secondary or tertiary concomitant diagnoses of any type of bacterial infection were excluded. Subjects with chronic lung diseases, congestive heart failure, and diabetes mellitus were also excluded. Antibiotic prescribing was subsequently determined for subjects meeting inclusion/exclusion criteria and compared for 2002 versus 2006. Other covariates, including age, sex, race, ethnicity, time spent with provider (<10 minutes or ≥ 10 minutes) and primary care provider were considered with year (2002 vs. 2006) in a multivariable logistic regression model.
Results: Preliminary analysis indicated that there was a significant

difference in the proportion of antibiotics prescribed for URIs between 2002 and 2006. Antibiotics were prescribed inappropriately 44.4% of the time for URIs in 2002 and 43.5% of the time in 2006. Secondarily, multivariate analysis showed when office visits lasted less than 10 minutes, the odds of inappropriate prescribing were reduced, and a patient seen by his/her primary care provider had increased odds of receiving an antibiotic inappropriately. Full results will be presented.
Conclusion: Inappropriate prescribing of antibiotics for URIs continues to be a problem in ambulatory care clinics in the United States. Factors such as age, race, time spent with physician and patient-provider relationship can impact antibiotic prescribing for URIs.

Pharmacogenomics/Pharmacogenetics

209. Aldosterone escape in heart failure and atrial natriuretic peptide precursor A (NPPA) genotype.
Yana Blekhman, Pharm.D., candidate, Shitalben R. Patel, M.S., Vicki L. Groo, Pharm.D., Thomas D. Stamos, M.D., Larisa H. Cavallari, Pharm.D.; University of Illinois at Chicago, Chicago, IL
Objectives: Aldosterone contributes to heart failure pathophysiology by promoting sodium retention and cardiac fibrosis. In a phenomenon referred to as aldosterone escape, aldosterone is elevated in some heart failure patients despite optimal therapy including an angiotensin converting enzyme (ACE) inhibitor or angiotensin receptor blocker (ARB). Atrial naturetic peptide suppresses angiotensin II-stimulated aldosterone production. We sought to determine whether atrial natriuretic peptide precursor A (NPPA) genotype is associated with aldosterone escape in heart failure.
Methods: Blood samples were collected from aldosterone antagonist-naïve patients with heart failure and left ventricular systolic dysfunction treated with an ACE-inhibitor or ARB. The NPPA rs5068, rs198358, and rs632793 genotypes were determined by PCR and pyrosequencing. Aldosterone was determined by radioimmunoassay. Genotype frequencies were compared between patients with (aldosterone >150 pg/mL; n=39) and without (aldosterone ≤150 pg/mL; n=79) aldosterone escape.
Results: Consistent with having higher aldosterone, potassium supplementation was more common among patients with aldosterone escape (54% vs 34%; p=0.04). Other clinical characteristics and drug therapy were similar between those with and without aldosterone escape. Both the NPPA rs198358 and rs632793 GG genotypes, but not the rs5068 genotype, were overrepresented in those with aldosterone escape (Table).

	Genotype Aldosterone ≤150 pg/mL	Aldosterone >150 pg/mL	p value
rs5068 CT or CC	0.09	0.10	
NS rs198358 GG	0.13	0.32	0.01
rs632793 GG	0.30	0.53	0.03.

Conclusion: The NPPA rs198358 and rs632793 genotypes were correlated with elevated aldosterone despite standard treatment with an ACE inhibitor or ARB. Further analysis is required to elucidate the mechanism underlying these associations. Ultimately, the ability to detect patients at risk for aldosterone escape based on genotype could lead to individualized use of aldosterone antagonists for heart failure.

210. CALU and GGCX genotype associations with warfarin dose requirements in African Americans.
Gelson Taube, Pharm.D., candidate, Nancy L. Shapiro, Pharm.D., Edith A. Nutescu, Pharm.D., Shitalben R. Patel, M.S., Marlos A. Viana, Ph.D., Larisa H. Cavallari, Pharm.D.; University of Illinois at Chicago, Chicago, IL
Objectives: Warfarin exerts its anticoagulant effects by inhibiting vitamin K epoxide reductase (VKOR) and preventing reduction of vitamin K, which is necessary for γ-carboxylation of clotting factors II, VII, IX, and X. Both γ-glutamyl carboxylase (GGCX) and calumenin (CALU) are involved in clotting factor γ-carboxylation. We sought to determine whether common GGCX and CALU polymorphisms influence warfarin dose requirements in African Americans, a group underrepresented in warfarin pharmacogenomic studies.
Methods: Genetic samples were collected from 161 African Americans on a stable dose of warfarin, defined as the same dose for 3 or more consecutive clinic visits. Patient on potent CYP2C9 inducers or inhibitors were excluded. The GGCX rs12714145 G>A, CALU p.R4Q (rs2290228), VKORC1 c.G-1639A, and CYP2C9*2, *3, *5, *6, *8, and *11 genotypes were determined by PCR and pyrosequencing. Associations of the GGCX and CALU variants with warfarin dose requirements were examined by linear regression analysis including age, body surface area (BSA), and *VKORC1* and *CYP2C9* genotypes.
Results: Age, BSA, VKORC1, CYP2C9, and CALU were significant factors ($p<0.02$) in the joint linear prediction of logarithmically transformed warfarin dose. Together, these factors explained 37% of the interpatient variability in warfarin dose requirements. In the prescence of these factors, there was no association between GGCX and warfarin dose.
Conclusion: Our data suggest that the CALU R4Q genotype, but not the GGCX rs12714145 genotype, significantly contributes to warfarin dose requirements in African Americans.

Pharmacokinetics/Pharmacodynamics

211. Stability of famotidine injection in polypropylene syringes at three different temperatures.
MIllion Y. Woldemariam, Pharm. D., candidate[1], Terrence Prettyman, RPh[2], Brian Sayre, Pharm.D.[2], Gagan Kaushal, Ph.D.[1]; (1)University of Charleston School of Pharmacy, Charleston, WV; (2)CAMC Solutions, Charleston, WV
Objectives: Famotidine, a histamine H_2-receptor antagonist, is routinely diluted in injections and used in hospital settings since the final working concentrations are commercially unavailable. Although different studies indicate short-term stability data of famotidine in various solutions; long-term stability data at different temperature conditions are lacking. In this study, we have determined the stability of aseptically compounded famotidine injections to final concentration of 2mg/ml in sterile water and stored at room temperature, refrigerated and frozen conditions in 10 ml polypropylene syringes.
Methods: Famotidine 2 mg/ml was prepared under sterile conditions in accordance with United States Pharmacopeia (USP) Chapter 797 standards using an automatic dispensing robot. To test the stability, syringes were kept for 30 days under three different temperature conditions: room temperature (22–25°C), refrigerated (2–6°C) and frozen (-20°C). Three injections from each temperature were withdrawn and were assessed for stability on days 0, 7, 15, 22 and 30 as per the USP guidelines for famotidine. The assay of famotidine was examined by a novel stability-indicating high-performance liquid chromatography (HPLC) method at each time point and significant loss of stability was defined as 10% or greater decrease in the famotidine content over time. Physical stability was assessed by visual examination, visible absorption, and pH values.
Results: No precipitation, cloudiness or color change was observed during this study at all temperatures. The assay content by HPLC revealed that famotidine injections retain greater than at least 90% of the initial concentrations for 30 days when stored at room temperature and frozen; and 15 days when refrigerated.
Conclusion: When stored at room temperature or frozen, diluted famotidine injections (2mg/ml in sterile water) in 10 ml polypropylene syringes were stable for at least 30 days and when refrigerated, famotidine syringes were stable for 15 days.

212. Evaluating the effect of population based volume of distribution and estimated glomerular filtration rate models on elimination rate constant (Ke) in predicting serum vancomycin concentrations.
William M. Parker, Pharm.D. Candidate, S. Scott Sutton, Pharm.D., P. Brandon Bookstaver, Pharm.D.; South Carolina College of Pharmacy, Columbia, SC
Objective: The purpose of this study was to determine which volume of distribution and estimated glomerular filtration rate (GFR) models most accurately predict serum vancomycin concentrations in the studied population.
Methods: The elimination rate constant (Ke) for vancomycin was calculated, using glomerular filtration rate (GFR) and population based volume of distribution models: Ambrose, Bauer, Matzke variation, Moellering, and Winter. The GFR used for this calculation was estimated using Cockcroft-gault, MDRD, six-variable MDRD, and Jelliffe equations. The estimated Ke was used to predict serum

vancomycin concentrations, which where compared to vancomycin trough levels obtained from the studied population. Statistical analysis was conducted by calculation of the mean squared error (MSE) and the associated, 95% confidence interval. A model-to-model comparison was also calculated by the difference of MSE.
Results: Evaluation of the MSE calculations showed the following as the top model combinations: Ambrose/Cockcroft-Gualt (MSE 95.65; CI 57.33, 135.98), Bauer/Cockcroft-Gualt (MSE 173.68; CI 54.98, 292.37), Matzke/six-variable MDRD (MSE 69.17; CI 46.94, 91.41), Winter/MDRD (MSE 270.23; CI 80.73, 459.73), and Moellering/six-variable MDRD (MSE 227.76; CI 165.39, 290.14). A direct comparison of the two model combinations with the lowest MSE showed: Ambrose/Cockcroft-Gualt versus Matzke/six-variable MDRD (difference of MSE 27.48; CI, -13.10, 68.10).
Conclusions: The Matzke model using the six-variable MDRD was determined to have the lowest MSE, however, this finding was not statistically significant. No one model was shown to accurately predict serum vancomycin concentrations; therefore, these models should not be used instead of therapeutic monitoring of serum concentrations in this population.
Originally presented at the 44th ASHP Clinical Midyear Meeting and Exhibition held December 6–10, 2009, in Las Vegas, NV.

213. Pharmacokinetic analysis of tobramycin in cystic fibrosis patients in an academic medical center to determine the feasibility of once daily dosing.
Rashi Chandra, Pharm.D.,candidate, Clark Lee, Pharm.D. candidate, Kalen B. Porter, Pharm.D., BCPS, AE-C; University of Georgia College of Pharmacy, Augusta, GA
Objectives: The purpose of this retrospective analysis was to determine the pharmacokinetic parameters of the cystic fibrosis population at MCG Health Inc. and the MCG Children's Medical Center to decide on the appropriateness of once-daily tobramycin dosing in these patients. A once-daily tobramycin dosing algorithm was developed and approved by the MCG Health, Inc. P & T Committee in October 2008. Since that time, the algorithm has been rarely used. The current study will help to determine baseline characteristics of patients treated with tobramycin at our institution to determine whether they are candidates for once-daily tobramycin.
Methods: Information was collected from the medical records of 55 cystic fibrosis patients with 108 admissions for exacerbations between October 1, 2007 and September 30, 2009. Information gathered included age, weight, length of hospital stay, sputum culture results, tobramycin dose (mg/kg/dose), tobramycin MIC, additional antibiotics used for gram negative organisms, peak and trough serum concentrations, pulmonary function tests (FEV_1 and FVC), and serum creatinine levels.
Results: Elimination rate (k), half life, and AUC will be calculated for each patient for each encounter. The results will be pooled to determine the population pharmacokinetic parameters of the patients as well subgroups within the population (children younger than 13 years, adolescents 13–18 years, and adults older than 18 years).
Conclusions: The results of this study will be used as baseline data for a prospective study where patients will be initiated on once-daily tobramycin and followed utilizing the approved algorithm. The pharmacokinetic data will again be collected and compared to retrospective data collected in the current study.

Transplant/Immunology

214. The effects of thymoglobulin as induction therapy post liver, kidney and simultaneous liver/kidney transplantation.
Matthew Kalisieski, Pharm.D., Candidate, 2011[1], Iman Bajjoka, Pharm.D.[1], Yun Wang, M.S.[2], Marwan Abouljoud, M.D.[1]; (1)Henry Ford Health System, Detroit, MI; (2)Eugene Applebaum College of Pharmacy and Health Sciences, Detroit, MI
Objectives: The objective of this study was to determine the outcomes of simultaneous liver and kidney transplant (LK) compared to liver (L), and kidney (K) alone that received Thymoglobulin (rATG) induction therapy.
Methods: Retrospective evaluation of consecutive patients who received L (n=35), K (n=30), and LK (n=26) from deceased donors and who received at least one dose of rATG post transplant. At time of transplant all patients received a calcineurin inhibitors, mycophenolate mofetil and steroids. We evaluated patients serum creatinine (SCr) values at one, six, and twelve months post-transplant, outcomes such as hospital readmission, and return to operating room (OR) within 30 days post-transplant, delayed graft function (DGF), defined as the need for hemodialysis within seve days post-transplant, infections within 30 days, and death at time of follow up.
Results: There were no differences in patient mean age or gender. Besides return to the OR [23% vs. 46% (p=0.0009)] within 30 days there was no difference between L vs. LK. There was a statistical significant difference in K vs. LK in SCr values at 1 [2.08 ± 1.2 vs. 1.40 ± 0.97 (p=.002)], 6 [1.83 ± 0.63 vs. 1.37 ± 0.38 (p=0.003)], and 12 [2.23 ± 1.78 vs. 1.43 ± 0.35 (p=0.044)] months and for the development of DGF [63% vs. 27% (p=0.001)]. The rate of death, infections, hospital readmissions, return to the OR, and rejection was the same between all groups. Two of the K patients lost their grafts.
Conclusion: Simultaneous LK transplants seems to offer an advantage to patients with respect to renal function up to one year posttransplant and graft survival up to one year.

Urology

216. Treatment of interstitial cystitis-long term results.
Sanjay A. Parmar, M.S.(Pharm.)[1], Palak Panchal, M.Pharm[1], Nagendra Mishra, M.S., DNB.(URO)[2], Anita A. Mehta, Ph.D.[1]; (1)L.M. College of Pharmacy, Ahmedabad, India; (2) Kindney & Urology Hospital, Ahmedabad, India
Objectives: To evaluate long term effectiveness of current treatments of interstitial cystitis (IC).
Methods: Protocol of the study was approved by ethics committee of the hospital. This was retrospective, exploratory clinical study. The hospital database of the IC patients from 2001 to June 2009 was reviewed. Out of 150 patients 82 were available for telephonic interview. The effectiveness of therapy was evaluated on the basis of Global response assessment (GRA). Tolerability of the treatment was assessed on the basis of four point scale. The protocol for the treatment is divided in stages. All the patients are initially subjected to cystoscopy and therapeutic hydrodistention under anesthesia. On failure of first stage, oral therapy is added in second stage. If patients do not respond to second stage, they are treated with intravescical cocktail therapy. And if nothing works, botox is injected as a fourth stage therapy.
Results: The mean age of IC patients was 43.36 ± 10.93 yr. Out of 82 patients 38 were treated in stage one, 32 patients in stage two, 10 in stage three and two in stage four. 29 patients improved by stage one therapy, 23 improved by stage two therapy, eight improved by stage three and none improved after stage four therapy.
Conclusion: Sixty of 82 patients improved after following a fixed protocol. This study proves that judicious use of various therapeutic options available, good results can be obtained in the long term.

Women's Health

217. Impact of emergency contraception status on unintended pregnancy: observational data from a pharmacy practice.
Cherri Houston, Pharm.D. Candidate, Nalin Payakachat, Ph.D., Denise Ragland, Pharm.D.; University of Arkansas for Medical Sciences College of Pharmacy, Little Rock, AR
Objectives: Unintended pregnancy is a public health issue with significant physical, psychological, and economic costs. Emergency contraception (EC) is one method of decreasing the rate of unintended pregnancies. The objectives of this study are to assess women's knowledge of EC and to determine the impact of nonprescription EC availability on the self-reported unintended pregnancy rate in our pharmacy practice.
Methods: This study surveyed a convenience sample of patients receiving prenatal care at the University Women's Clinic in Little Rock, Arkansas. A five question questionnaire was verbally administered by pharmacy students to individual patients during the course of a routine clinic visit. A brief counseling session was provided immediately following the survey based on the answers from each patient. The collected data was divided into two groups: 1) surveys done between August 2003 and December 2006 (before

nonprescription EC availability); and 2) surveys done between January 2007 to October 2008 (after EC became widely available without a prescription).
Results: A total of 272 patients were surveyed. Eighty-five percent of all women were not using any form of birth control at the time of conception. There was no significant improvement in women's knowledge of EC or the self-reported unintended pregnancy rate since the change in nonprescriptive status of Plan B. Among participants who were unaware of EC, 61% reported that they would consider EC use in the future after a brief counseling session by a pharmacy student.
Conclusion: Although EC is available without a prescription to those 17 years and older, lack of patient knowledge is still a barrier to EC use. Based on the patient answers about their future use of EC, counseling by pharmacists and pharmacy students has great potential to improvepatient knowledge, which may subsequently decrease unintended pregnancies in this patient population.

LATE BREAKERS

ADR/Drug Interactions

218. Angioedema after non-steroidal anti-inflammatory drug initiation in a patient stable on an angiotensin-converting enzyme inhibitor.
Roda Plakogiannis, B.S., Pharm.D., BCPS, CLS,[1] Lendita Prlesi, Pharm.D.[2]; (1) Arnold & Marie Schwartz College of Pharmacy, Brooklyn, NY; (2) Montefiore Medical Center, Bronx, NY
Objectives: To report a case of angioedema associated with the initiation of a Non-Steroidal Anti-Inflammatory Drug (NSAID) in an elderly man stable on an angiotensin-converting enzyme inhibitor (ACEI).
Methods: A 68-year-old man presented with angioedema of the lips and tongue after initiation of naproxen. The patient was taking other medications chronically, in addition to ACEI therapy. ACEI-associated angioedema precipitated by NSAIDs was suspected. His condition improved after naproxen was discontinued and steroid taper was initiated.
Results: Literature has described ACEI and NSAID concurrent use and the potential to precipitate or worsen angioedema. In a review of multiple cases, ACEIs and NSAIDs were the most common contributing medications (88%). In patients who were otherwise stable on medications, the addition of another drug often led to the development of angioedema. A different case report, highlighted an increased risk of developing angioedema post-NSAID administration in a patient on chronic ACEI therapy with a previous history of angioedema.
Conclusion: NSAID use in patients stable on ACEI therapy should be used with caution due to the increased risk of moderate to severe angioedema. As outlined in the study conducted by Banerji et al[1], the addition of a second or third drug known to potentiate angioedema often led to the development of moderate to severe angioedema in stable patients. Therefore, caution should be emphasized when taking these medications concomitantly, and discontinuation of the NSAID should be considered in patients receiving concomitant therapy, before discontinuing the ACEI in the scenario of angioedema.

Cardiovascular

219. Collaborative management of heart failure (HF) patients at the Portland Veterans Affairs Medical Center (VAMC).
Harleen Singh, Pharm.D., BCPS[1], Jessina C. McGregor, Ph.D.[1], Lisa Perry, B.S.[1], Sharon Shiraga, B.A.[1], Sydney Holt, B.S.[1], Greg C. Larsen, M.D.[2]; (1)Oregon State University/Oregon Health & Science University College of Pharmacy, Portland, OR; (2)Portland Veterans Affairs Medical Center (VAMC), Portland, OR
Objectives: The Portland VAMC HF clinic offers a unique three month practicum for primary care physicians (PCPs). The objective of the practicum is to facilitate the PCPs ability to manage HF patients according to the current guidelines. The goal of this project is to help PCPs manage HF patients by reviewing patient charts and offering recommendations for improving care by optimizing drug or device therapy.
Methods: Electronic medical records were audited for every HF patient managed by six HF-trained PCPs. A specialized audit form was developed and used by a HF pharmacist and pharmacy students to evaluate HF care for all patients with an ejection fraction (EF) <40 %. A cardiologist, hospitalist and pharmacist who regularly work at the Portland VAMC HF clinic then reviewed each patient's audit form to determine if an opportunity to improve care existed. Results: Of the 266 patient charts reviewed, 73 patients were identified with EF<40%. Among the 67 patients (92%) who were receiving beta-blocker therapy, only 35 (52%) were at target doses. Among the 49 (67%) patients receiving ACE-inhibitor therapy, only 29 (59%) were at target doses. Additionally, among those patients not receiving ACE-inhibitor therapy (n=24 (33%), 14 (58%) patients were receiving ARB therapy but only four (29%) were at target doses. ICD device therapy was being utilized by 15 (21%) patients. Yet an additional 13 patients on optimal drug therapy were identified as potential beneficiaries of device therapy based on prior EF <35%. Overall pharmacist audits resulted in 37(51%) therapeutic recommendations.
Conclusion: Medical record-based audits of HF patients by specialist pharmacists helped PCPs management of HF by identifying potential targets for drug optimization and device therapy. The initial response by PCPs has been encouraging.

Critical Care

220. Assessment of subcutaneous insulin on glycemic control in the intensive care setting using a computerized GlucoStabilizer© program.
Serena A. Harris, Pharm.D., Sarah A. Nisly, Pharm.D., BCPS, Laura E. Aykroyd, Pharm.D., BCPS, Rattan V. Juneja, MBBS, M.D., MRCP, Brian J. Ulmer, MD, Joni T. Carroll, RN, CDE; Clarian Health Partners, Indianapolis, IN
Objectives: This study evaluates the efficacy of subcutaneous insulin administration utilizing a computerized program, GlucoStabilizer©, on glycemic control in the intensive care setting (ICU).
Methods: Patients age ≥ 18 years, admitted to an ICU, and initiated on the subcutaneous GlucoStabilizer© program were included. Eligible patients were divided into one of four groups based on initial insulin sensitivity factor (ISF) and carbohydrate ratio (CR). Comparison of initial settings, blood glucose, frequency of blood glucose checks, and glucose range were performed.
Results: Primary endpoints included: time to target glucose, time in target glucose range, percentage of glucose readings within target range, hyperglycemic events, and hypoglycemic events. Secondary endpoints included: length of ICU stay, length of hospital stay, hospital mortality, occurrence of treatment failure, adjustments in insulin settings, and utilization of basal insulin. During January 2009 to June 2009, 1384 patients were identified. When compared to settings outside the recommended ISF and CR, patients initiated with one of the three predefined settings had more glucose readings within the target range of 100–150 mg/dl (ISF 60 CR 15: 52% vs. ISF 30 CR 10: 46% vs. ISF 15 CR 8: 54 % vs. other: 40%; $p<0.0001$). Additionally, mean glucose within these groups was lower (ISF 60 CR 15: 135 mg/dl vs. ISF 30 CR 10: 140 mg/dl vs. ISF 15 CR 8: 134 mg/dl vs. other: 143 mg/dl; $p < 0.0001$).
Conclusion: Use of a subcutaneous insulin program with predefined insulin sensitivity factor and carbohydrate ratio settings leads to tighter glycemic control in adult ICU patients compared to prescriber specified initial settings.

Education/Training

221. Evaluating pharmacy student understanding of literature evaluation to improve drug information application.
Jean E. Cunningham, Pharm.D., *Laura Perry, Pharm.D.*; The University of Findlay College of Pharmacy, Findlay, OH
Objectives: To investigate if a two-step performance task, composed of a written journal club and a verbal presentation of trial pearls, would improve pharmacy student understanding and application of drug information.
Methods: The primary objective was to analyze pharmacy student

understanding and application of drug information during the first module based drug information assignment. Assessment was based on change in scores from journal club (at baseline) to trial pearls presentation (at endpoint). Sixty-one second professional year pharmacy students enrolled in a pharmacology, pathophysiology, and therapeutics course at The University of Findlay College of Pharmacy were required to complete a journal club. To facilitate the student's first exposure to a journal club assignment, templates and articles were provided. Performance on the written journal club assignment highlighted weaknesses in student understanding. A second assignment in the form of a performance task was designed to allow further practice application of literature evaluation in the form of presenting trial pearls.
Results: Fifty-six students completed the written journal club assignment with an average score of 56.38 of a possible 80 points, or a 70.48%. The minimum score was 36 and the maximum was 79. Six student scores were excluded from the analysis due to failure to follow assignment instructions. After assignments were returned with feedback, a recitation session was offered. A total of 61 students participated in the trial pearls. Trial pearls results were much improved with an average score of 81.62 out of 91.50, or an 89.20%. The minimum score was 71.83 and the maximum was 86. Overall, the two-step performance task average scores improved by 18.73%.
Conclusion: Student understanding and application of literature evaluation skills are often identified as an area of needed improvement and practice. Our evidence supports the two-step performance task as one method to improve student understanding and application of literature evaluation.

Family Medicine

222. Survey of patients' and physicians' satisfaction with a pharmacist managed anticoagulation program in a family medicine clinic.
Lisa D. Bishop, BSc(Pharm), Pharm.D., *Stephanie W. Young, BSc(Pharm)*, Pharm.D., MSc(Med), Carla M. Dillon, BSc(Pharm), Pharm.D., Laurie Twells, PhD, John J. Hawboldt, BSP, Pharm.D.; School of Pharmacy, Memorial University, St. John's, NF, Canada
Objectives: The first pharmacist managed anticoagulation service in Newfoundland and Labrador was initiated in a multi-physician family medicine clinic in December 2006. Patients and family physicians were surveyed to determine the level of satisfaction with the patient education and service provided by the pharmacist.
Methods: A self-administered, mailed survey was conducted on all eligible patients receiving warfarin and physicians prescribing warfarin between December 2006 and May 2007. The patient survey collected information including patient demographics, satisfaction with warfarin education and daily warfarin management. The physician survey collected data about the satisfaction with patient education and daily anticoagulation management by the pharmacist.
Results: Seventy-six of 94 (81%) patients completed the survey. Fifty-nine percent were men with a mean age of 65 years (range: 24–90). Most (95% or more) agreed that the pharmacist did a good job of teaching the importance of warfarin adherence, why INR tests were necessary, and the risks of bleeding. Eighty-five percent agreed that the risk of blood clots was well explained, 79% felt the pharmacist did a good job teaching about dietary considerations, and 77% agreed the pharmacist explained when to see a doctor. All patients felt the pharmacist gave clear instructions on warfarin dosing and INR testing. Four of nine physicians (44%) completed the survey. The physicians agreed the pharmacist was competent in the care provided, were confident in the care their patients received, would like the pharmacist to continue the service and would recommend this program to other clinics.
Conclusion: Patients and family physicians were satisfied with the pharmacist managed anticoagulation program and recommended continuation of the program. Areas for improvement include ensuring all patients know when to seek medical help and understand dietary considerations. Expansion of this program to other family medicine clinics and collaborative management for other chronic disease conditions should be explored.

Hematology/Anticoagulation

223. Risk of venous thromboembolism as a function of international normalized ratio in total hip replacement.
Sumesh Kachroo, Ph.D., M.S.[1], Beth L. Nordstrom, Ph.D., MPH[1], Edith A. Nutescu, Pharm.D.[2], Jeff Schein, DrPH, MPH[3], Alan Fisher, DrPH[3], Brahim Bookhart, MBA, MPH[3]; (1)United Biosource Corporation, Lexington, MA; (2)University of Illinois at Chicago, Chicago, IL; (3)Ortho-McNeil Janssen Scientific Affairs, LLC, Raritan, NJ
Objectives: To investigate the relationship of international normalized ratio (INR) to incidence of venous thromboembolism (VTE) following total hip replacement (THR).
Methods: A retrospective cohort analysis was conducted using an electronic medical record database. Data were obtained for patients undergoing THR between January 1, 2004 and January 31, 2009 who initiated warfarin within 3 days after surgery, had ≥2 INR measurements, and had no history of VTE. Subjects were followed through their continuous warfarin therapy for up to 90 days. INR levels were categorized according to the American College of Chest Physicians (ACCP) guidelines (i.e., INR range 2–3). For subjects experiencing VTE, INR levels before the event were used. Using a Cox proportional hazards model adjusted for baseline characteristics, the incidence rate of VTE was calculated and compared with subjects with INR levels below the ACCP-recommended range and those achieving the ACCP-recommended range. The distribution of time to event was examined, with VTE during hospitalization coded as occurring on the discharge date.
Results: Of 1375 eligible subjects, 41 (3.0%) experienced VTE (deep vein thrombosis, 19; pulmonary embolism, 17; other VTE, 5). Of these 41 events, 27 (66%) occurred during the THR hospitalization. Among the total subject population, 54.2% had only below-range INR levels, which were associated with risk of VTE (adjusted HR 5.29; 95% CI 2.64–10.61, $p<0.0001$).
Conclusion: Subjects undergoing THR were more than 5 times as likely to have a VTE event if their INR values were below the ACCP-recommended range. Target INR values <2 may be placing patients at increased risk for VTE. Further research is warranted to validate these findings.

Infectious Diseases

224. Evaluation of *Acinetobacter* infection.
Sarah B. Nelson, Pharm.D., Teresa G. Potter, PharmD, MPH; Virginia Commonwealth University Health System, Richmond, VA
Objectives: The *Acinetobacter calcoaceticus-baumannii* complex is a gram-negative, aerobic, coccobacillus demonstrating rapidly increasing resistance to available treatment options. The purpose of this study was to characterize *Acinetobacter* infections, identify empiric and tailored antimicrobial regimens, and to determine effectiveness of identified treatments.
Methods: This was a retrospective chart review of adult inpatients that had at least one positive culture of *Acinetobacter calcoaceticus-baumannii* complex or *Acinetobacter baumannii* and received antimicrobial treatment for ≥ 48 hours. Patient records were reviewed to gather demographic, specimen, antibiotic, and laboratory information. Evaluated efficacy was specified by a favorable or unfavorable response.
Results: A total of 127 patients met inclusion criteria. 112 medical charts were available for review and inclusion in the assessment. Patient characteristics include an average age of 52.6 ± 18.3 years and average length of stay of 39.3 ± 37.5 days, with 20% having more than one site of infection with Acinetobacter species studied. The most common sites of infection included lung (42%) and blood (18%). Most patients were located in the surgery/trauma intensive care unit (25%) and medical/respiratory intensive care unit (19%). Initiation of appropriate empiric antimicrobials at time of culture was associated with a significant increase in favorable outcome ($p<0.0001$). Those treated empirically with piperacillin-tazobactam all showed a favorable outcome. Initiation and use of inappropriate empiric antimicrobials were highly associated with an unfavorable outcome ($p<0.0001$). Colistin was used in 17 patients, with demonstrated efficacy in 10 patients. Of those treated with colistin, 3 three (18%)

experienced a doubling of baseline serum creatinine, and four (23%) experienced a doubling of baseline BUN.
Conclusions: Infection with multidrug-resistant *Acinetobacter calcoaceticus-baumannii* complex and *Acinetobacter baumannii* is prevalent within VCUHS. It may be postulated that empiric treatment with piperacillin-tazobactam produces more favorable outcomes. If necessary, colistin is a safe and effective treatment option.

Oncology

225. Development of chemotherapy protocols in an integrated healthcare delivery hospital.
Yu-Hsuan Yen, M.S.; Taipei Medical University - Wanfang Hospital, Taipei, Taiwan
Objectives: Protocols for chemotherapy regimens were developed and coordinated in an integrated health care delivery hospital. Compliance rate of chemotherapy protocols were compared through pharmacist intervention for two years.
Methods: Two interdisciplinary groups reviewed the existing practice guideline and protocols, proposed recommendation to be implemented in computerized-based order entry system and intranet. Patients are under Parenteral chemotherapy because of breast cancer without metastatic stage in before intervention group from October, 2007 to March, 2008 and after intervention group from January, to June, 2009. The compliance rate was evaluated including select regimens, dosing, and courser interval.
Results: A standard protocol format and a pharmacist-coordinated protocol system were developed. Of 59 prescriptions, 18 (86%) and 37 (97%) prescriptions adhere to the chemotherapy protocols in before and after intervention groups. The CEF protocol for adjuvant regimen dramatically increased from seven (44%) in before intervention group to 30 (79%) in after intervention group. The analysis shows increased health care professionals satisfaction and the preferred regimen use.
Conclusions: The standardized chemotherapy protocols improve protocol compliance, and centralized-use regimen, and chemotherapy delivery and safety. The project enhances the pharmacist profile and credibility in hospital.

Pain Management/Analgesia

226. Hospital pain management: identifying system failures and demystifying pain control.
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Objective: This study explored safety issues related to pain management in hospitalized adult patients to construct a safe, effective, and well reasoned approach to pain control.
Methods: An interdisciplinary team, including representatives from pharmacy, nursing and physicians from Medicine, Family Practice, Surgery and Anesthesia, conducted a Failure Mode Effects Analysis to assess the prevalence and seriousness of multiple patient scenarios. The team identified system failures which presented the greatest risk to patient safety and to successful pain management.
Results: The taskforce concluded that it is very possible for multiple physicians to order pain medications on the same patient and 1) fail to categorize the indication for low, moderate, or severe pain, 2) order different pain medications with the same indication, or 3) order the same medication with different dosages and frequencies. With no lead physician assuming responsibility for pain management, clarification of orders was time consuming and often resulted in under- or over-prescribing pain medication. Nursing attempted to determine the most effective pain medication to administer, often with unsatisfactory results. In addition, patient satisfaction scores for pain management were consistently low.
Conclusion: Pathways were developed for patients receiving oral and intravenous pain medications and those receiving PCA or epidural infusions. The pathways identify the lead physician in charge of pain management and include a pain order form that specifies medication dosages, both intravenous and oral, based on mild-moderate-severe pain. The form highlights the analgesic potency of each progressive dosage by indicating its equivalency to intravenous morphine. Revising a patient's pain regimen automatically discontinues all previous pain medications. This evidence-based process has been well received by all hospital committees and is being initiated hospital wide.

Pediatrics

227. Improving prophylactic treatment of patent ductus arteriosus in premature neonates.
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Objectives: Because of the perceived increased incidence of intestinal perforations and abdominal surgery with INDO, patent ductus aretriosus prophylaxis was changed to IBU. We evaluated the effect of this change on various neonatal outcomes in a tertiary neonatal intensive care unit.
Methods: A retrospective case control study of infants born prematurely at 28 weeks or less gestation were treated prophylactically with INDO (from September 2006 to April 2007, n=20) or IBU (from June 2007 to September 2008, n=24) within first 24 hours of life.
Results: Infants in the IBU (N=24) and INDO (N=20) groups had similar gestational age (mean ± SD) (25.7 ± 1.2 vs. 25.9 ± 1.2 weeks, p=0.557), frequency of white, male and inborn infants, prenatal steroids and birth at the study hospital. The frequency of PDA rescue medical treatment (IBU24% vs. INDO20%, p=1.0) was similar in both groups, but there was a significantly lower frequency of surgical ligation (IBU3% vs. INDO30%, p=0.008). The difference in frequency of death (29% vs. 15%, p=0.329) intestinal perforation (6% vs. 25%, p=0.087) necrotizing enterocolitis (12% vs. 20%, p=0.45), severe intracranial hemorrhage (21% vs. 25%, p=0.744), and sepsis (44% vs. 35%, p=0.576) was not statistically significant between the two groups. Infants in the IBU group had a significantly lower rate of abdominal surgeries (6% vs. 30%, p=0.04). The duration of mechanical ventilator support (26 ± 23 vs. 34 ± 28 days, p=0.368) or total hospital LOS for surviving infants with available data (IBU n=22; 83 ± 23 days vs. INDO n=17; 96 ± 32 days, p=0.223) was not significantly different.
Conclusion: Prophylactic PDA treatment with IBU was associated with fewer surgical ductal ligations and abdominal surgeries compared to INDO suggesting that IBU was a better choice for PDA prophylaxis in the population studied in our neonatal unit. Neonatal units that use a prophylactic PDA regimen should monitor their local outcome data to implement potentially better clinical practices.

Pharmacoeconomics/Outcomes

228. Pharmaceutical costs management: thalidomide tablets' use in patients with multiple myeloma.
Anna Bianca Calzona[1], Daniela Chequolo[2], Rossella Distilo[2], Simona Ferraiuolo[2], Giovanni Guarany[2], *Grazia Mingolla*[2], Renato Lisitano[2], Gerardo Miceli Sop[3], Daniela Scolaro[2], Roberto Tazza,[2]; (1)ASL ROMA B, Rome, Italy; (2)Sandro Pertini Hospital, Rome, Italy; (3)ASL ROMA D, Ostia, Italy
Objectives: In Italy, since March 4th 2009, Thalidomide is used to treat multiple myeloma in combination with Melphalan and Prednisone in patients who have not been treated for multiple myeloma before. It is used in patients aged over 65 years, and in younger patients if they cannot be treated with high-dose chemotherapy. Thalidomide must be prescribed and dispensed only in hospitals and similars. Because the number of patients with multiple myeloma is low, the disease is considered 'rare', and Thalidomide was designated an 'orphan medicine'. In Italy, Thalidomide is one of the drugs in the ADR's list. The aim of this study was to compare the cost of the therapy with the use of Thalidomide galenic tablets vs branded Thalidomide tablets.
Methods: Before March 4, 2009, the use of thalidomide in multiple myeloma treatment was "off-label". In Sandro Pertini hospital, the use of Thalidomide has been of 40 g in 2007 and of 180 g in 2008. The next to come legislative changes, may increase the use of Thalidomide in 2009. Thalidomide is available on sale in branded 50 mg tablets and in powder for galenics. The price of branded drug has been compared with the price of the galenic one.

Results: 50 mg Thalidomide branded tablets have a cost of 9,25 €. Considering that Thalidomide's recommended dose is of 4 tablets/day, the branded's defined daily dose (DDD) has a cost of 37 € for each patient. Thalidomide raw material costs 4 €/g. This means that the price of galenic's DDD is of 0,8 €.
Conclusions: Preparing thalidomide tablets in the clinical galenical laboratory of Sandro Pertini hospital determines a spare of 36,2 €/each patient's DDD. This would lower pharmaceutical costs by about 97% (32.580€/year).

229. Methadone syrup prepartion in pharmacy: costs management.
Checquolo Daniela[1], Distilo Rossella[1], Ferraiuolo Simona[1], Guarany Giovanni, [1] Lisitano Renato, [1] Miceli Sopo Gerardo, [2] *Grazia Mingolla,*[1] Scolaro Daniela,[1], Tazza Roberto, pharmacy[1]; (1)Sandro Pertini Hospital, Rome, Italy; (2)ASL RMD, Rome, Italy
Objectives: Methadone syrup 0.5% is used to treat people with opioid drug dependency. The opioid class of drugs includes the commonly known morphine and codeine which are obtained by a doctor's prescription. In this study we compared the cost of methadone syrup preparation in Sandro Pertini Hospital's Galenic Pharmacy with the use of branded methadone syrup.
Methods: The hospital operative units of Asl RmB are provided with 1000 ml methadone syrup at 0,5%. The aim of this project is to analyse the cost of the preparation of Methadone syrup 0,5% in Sandro Pertini hospital's Central Unit of Pharmacy.The analysis of costs was estimated considering the actual branded drug annual use and consists of: raw materials (active ingredient and excipients) and packages. The total cost is of about 26.000 €/year + the necessary production equipment: an iron dissolver on sale at about 30.000 € (the cost of the plant will be amortized over few years).
Results: Asl Roma B's consumption of 1 litre Methadone 0,5% is of about 3.000 bottles/year, with a total cost of 171.000 €. Purchasing raw materials and bottles in the same quantity determines a cost of 26.000 €.
Conclusions: Preparing Methadone 0,5% in Sandro Pertini Hospital's Pharmacy determines a 145.000 € annual save. Such a saving can warrant the investment both in the production equipment and in other technological updatings, both in human capital.

230. Impact of computerized physician order entry (CPOE) on the use of levalbuterol.
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Objective: To examine the impact of a computerized physician order enty (CPOE) order-set on the use of levalbuterol.
Methods: An order-set was developed using Eclipsys Sunrise Medication Manager® to improve compliance with our hospital guidelines for use of levalbuterol. Levalbuterol is restricted to patients who experience intolerable side effects to albuterol, specifically, a sustained heart rate (HR) ≥ 120 beats per minute (bpm), an increase in HR from baseline by 40 bpm, or if the patient experienced a life-threatening arrhythmia attributable to albuterol. A retrospective chart review was conducted evaluating all patients with new orders for levalbuterol one month prior and one month after order-set implementation. The primary objective was to quantify the number of new orders for levalbuterol pre- and post-order-set implementation.
Results: A total of 113 patients were evaluated, 71 patients with new orders for levalbuterol in the pre- versus 42 patients in the post-order-set period (40.8% reduction in new orders after order-set implementation). 16 patients (27.6%) were therapeutically interchanged to albuterol through the order-set as compared to 42 patients (72.4%) with new orders for levalbuterol. In the pre-order-set period, there were 32 patients (45%) who did not receive albuterol before levalbuterol being ordered, compared with 14 patients (33.3%) in the post-order-set period. Physicians stated that patients had an increase in heart rate (HR) by 40 beats per min (bpm) 29 times, sustained HR > 120 bpm 28 times, developed a life-threatening arrhythmia 14 times, and other reason for levalbuterol use 16 times.
Conclusions: Creating customized order-sets through CPOE can help educate prescribers on hospital guidelines for use of restricted medications, such as levalbuterol. By increasing adherence to hospital guidelines, a decrease may be seen in the use of restricted medications which in turn may show pharmacoeconomic cost-savings.

231. Hospital production of custom vascular endoprothesis: an economical perspective.
Luc Nguyen-Kim, Pharm.D., Julien Molina, Pharm.D., Catherine Fargeot, Pharm.D., Caroline Desjardins, Resident, Robert Farinotti, Pharm.D., PHD, Marie E. Joel, Pharm.D., Fabien Koskas, MDPHD; Groupe hospitalier de la Pitié Salpetrière, Paris, France
Objectives: Open surgery is standard procedure for treating abdominal aortic aneurysms (AAAs). Implantation of vascular endoprothesis (VE) may be an alternative for specific patient with high risk profile (cardiac or pulmonary dysfunction). These VE are usually standardized (SVE) or customized (CVE). Sizing the VE to a specific patient induces substantial acquisition costs. The question of making CVE at the hospital (internal production) or buying them on the market (outsourcing) is of major importance. Our aim is to provide information for making a rational choice.
Method: Our vascular surgery department has a dedicated production unit. Based on process and production inputs, we identified production costs and thus we defined the production cost function in the hospital perspective. We deduced the average production costs and marginal costs of our production level and compared them to the average acquisition cost of commercial VE. The difference represents either the cost or the gain per VE for market resorting.
Results: The average cost of hospital production was €6.461 for 50 VE a year. The optimal marginal cost was €4.327 for 16 grafts. The cost of buying on the market was the acquisition cost (average price + hospital delivering process). The average acquisition cost was €10.216.
Conclusion: Such thematic is directly linked to the "make or buy" decisions, emphasized by institutional economics and organi-zational theories. Vertical integration (self making) is an alternative organisational form to outsourcing and the producer's choice will be guided by its production, transaction and opportunity costs. In this study, we only addressed the production problematic. In this study, internal production appears cost-reducing at our production level compared to external acquisition. Other advantages to internal production may be identified: delivery time reduction, no contract surveillance costs, surgeon control over the device, pharmacist's implication in hospital production.

Pharmacoepidemiology

232. The role of clinical team pharmacist of San Giovanni Battista Hospital in a retrospective study invasive fungine infections: management and appropiateness.
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Objectives: This study aimed at evaluation of Invasive Fungine Infections (IFI) epidemiology and treatment approach and at assessment of Clinical Team Pharmacists' (CTPs) role in management of systemic antifungal drugs (SADs) in Hematology I Ward of San Giovanni Battista Hospital.
Methods: CTPs acted as data-managers, reviewing medical records of 208 patients admitted between May 2008 and July 2009 (397 admittances), and of 39 Acute Myeloid Leukemia (AML) patients admitted in 2006–2009 triennium (81 admittances). CTPs analyzed SADs' use as Defined Daily Dose (DDD) number and calculated Number Needed to Treat (NNT) for IFI prevention for some drugs in subsets with different hematological malignancies.
Results: From May 2008 to July 2009, incidence of probable/proven IFI, according to EORTC criteria, was 3,02% referred to hospitalizations and 5,29% referred to number of patients (11 cases). Analysis of AML patients in 2006–2009 triennium highlighted an incidence of probable/proven IFI of 23,7% (9 cases / 38 patients in induction-phase chemotherapy). From May 2008 to July 2009, SADs were prescribed during 59.95% of hospitalizations. Prophylaxis was widely adopted (91.60% of antifungal treatments); empirical, pre-emptive and target therapy were established during 13.02%, 7.56% and 5.04% of hospitalizations, respectively. Shift to therapy was necessary in

15.55% of primary prophylaxis cases. DDD analysis for 2006–2009 triennium confirmed leading role of fluconazole and showed moderate use of amphotericin-B, voriconazole and posaconazole. NNT of posaconazole for IFI prevention was found to be 7 for AML patients, but it resulted much more higher for other subsets.
Conclusions: Data allowed to identify different levels of risk according to underlying hematological malignancies, rising out of different incidence on general population, mainly with multiple myeloma, and on AML patients. Prophylaxis is widely used, but pre-emptive approach represents an emerging strategy. CTPs and clinicians will use these data to elaborate differential treatment algorithms.

Pharmacokinetics/Pharmacodynamics

233. A revised vancomycin dosing protocol to meet new IDSA guidelines.
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Objectives: We describe a vancomycin dosing protocol designed to reach target troughs 15–20 µg/mL within 24 hours from initiation, without overshooting, and minimize the occurrence of any trough less than 10 µg/mL.
Methods: Initial vancomycin dosing is chosen as 15 mg/kg every six, eigh, or twelve hours to provide a first 24-hour cumulative dose suggested by renal clearance cutoffs extrapolated from Matzke (1984). Initial levels are measured 30 minutes before the third dose; dosing adjustments are then made to avoid supra-therapeutic levels at steady state. All pharmacy protocol monitoring sheets adhering to this protocol within the study period were analyzed retrospectively. Cases with first measured trough levels falling within individual targets were compared to cases with first measured trough levels falling outside of individual targets.
Results: Thirty-three of 60 first trough levels fell within target ranges, median 17.4 mcg/mL (15.4, 20.25); median time to first level 17.5 h (15, 23.5); median SCr 1.2 (0.89, 1.45); average estimated CrCl 46 mL/min ± 23.9. Twenty-seven first troughs fell outside target ranges; 25 were >10mcg/mL, median 11.9 (9.65, 13.1); median time to first level 23 h (15.5, 23.5); median SCr 0.9 (0.7, 1.5); average estimated CrCl 41 ± 16.5 (SCr<1 was rounded up to 1). Eleven of 13 cases with SCr ≥ 1 exhibited improving renal function, 1 worsening renal function, and 1 was morbidly obese. Ten of 14 cases with SCr<1 would have been in range if actual SCr were used to calculate estimated CrCl, 3 exhibited improving renal function, and one was receiving the highest dosing level (15 mg/kg every 6h).
Conclusion: This protocol performs reliably for patients not morbidly obese, and if actual SCr is used to estimate CrCl and determine dosing frequency. Patients with improving renal function were brought into target range within the first 48 h.

Primary Care

234. Addition of oral antibiotics to incision and drainage for outpatient management of bacterial skin and soft tissue abscesses: a systematic review.
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Objectives: The Infectious Diseases Society of America recommends incision and drainage (I&D) as monotherapy for uncomplicated skin and soft tissue abscesses (SSTA). However, prior literature shows concomitant antibiotics are often prescribed. Our objective was to systematically review the evidence for empiric treatment with antibiotics after adequate outpatient I&D of SSTA.
Methods: We performed a search of 12 databases of published and grey literature, supplemented with citation tracking and targeted handsearching. Included studies were randomized, controlled trials comparing I&D plus oral antibiotic therapy to I&D alone in outpatients with SSTA completed after 1990. Primary outcomes were clinical cure, defined as resolution of signs and symptoms of infection, or treatment failure, defined as progression of infection requiring hospitalization, intravenous antibiotics and/or additional I&D procedures. All study selection, quality analysis and data abstraction was performed by at least two investigators.
Results: 12,332 citations were screened for relevance, 17 articles reviewed for inclusion, and 2 studies met inclusion criteria. Meta-analysis was not possible due to heterogeneity of populations. In a 2007 study, 166 adults with SSTAs underwent I&D, followed by randomization to cephalexin or placebo. Clinical cure was achieved in 84% of patients receiving cephalexin (95% CI 0.74–0.91) and in 90.5% of those receiving placebo (95% CI 0.82–0.96). In 2009, 149 pediatric emergency department patients with SSTAs underwent I&D followed by randomization to trimethoprim/sulfamethoxazole (TMP/SMX) or placebo. Noninferiority was defined as <7% difference of treatment failure between groups. In the TMP/SMX arm, 4.11% experienced treatment failure, versus 5.26% of the placebo group, with a difference of 1.15% (95% CI 1.15–6.8).
Conclusion: There is currently no high-level evidence to support the initial addition of antibiotics to I&D for uncomplicated abscesses after incision and drainage. Randomized, controlled trials in outpatients are needed to compare failure rates of I&D alone versus I&D plus empiric antibiotic therapy.

Transplant/Immunology

235. Single nucleotide polymorphisms of new diabetes-susceptible genes and post-transplant diabetes mellitus in kidney transplant patients.
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Objectives: to identify the association between PTDM and gene polymorphisms of HHEX, SLC30A8, CDKAL1 and GJB7 in kidney transplant patients.
Methods: A total of 1662 patients who have received kidney allograft at St. Vincent Medical Center between 2000 and 2006 were retrospectively reviewed. Among them, 322 PTDM patients and 458 non-PTDM patients were included in this genotype association study. But, the patients who had diabetes before transplant or who had multi-organ transplant were excluded. For this study, 4 single nucleotide polymorphisms(SNPs), rs1111875, rs13266634, rs7754840, and rs440296 were selected from hematopoietically expressed homeobox protein(HHEX), solute carrier family 30 member 8(SLC30A8), cclin-dependent knase 5 rgulatory sbunit asociated potein 1-like 1(CDKAL1) and gap junction protein beta 7(GJB7). These four new genes are recently reported to be involved in insulin gene expression or insulin signaling. Genotyping was performed using the TaqMan allelic discrimination assay on an ABI-7900HT Real Time Polymerase Chain Reaction (RT-PCR) system. The final p value and odds ratio were adjusted with major clinical risk factors through the stepwise multivariate logistic regression.
Results: In the univariate analysis, CC carrier of SLC30A8 rs13266634 (p=0.018), CC or GC carrier of CDKAL1 rs7754840 (p=0.017) and GG carrier of GJB7 rs440296 (p=0.001) showed higher risks of PTDM. Finally, to adjust the influence of other clinical risk factors including age, BMI, virus infection, acute rejection, and immunosuppressant, stepwise multivariate logistic regression analysis was performed. After this final regression, only GJB7 remained significant (p=0.009, OR = 1.78; 95% CI, 1.09–4.28). But HHEX, SLC30A8 and CDKAL1 did not reach significance.
Conclusion: This study suggests that the mutation of GJB7 is significantly associated with PTDM and they can be a potential candidate of biomarkers to predict PTDM.