1. **Title:** Comparing teach-back method and standard method for new prescription education during simulated counseling sessions by pharmacy students  
**Project Advisor(s):** Jeannie Lee, PharmD  
**Student(s):** Ryan G Pett, David Andersen, Sierra Vig  
**Specific Aims:** The aim of this study was to compare memory retention between two methods (the teach-back method and the standard method) of educating subjects about mock prescription medications during a simulated counseling session.  
**Methods:** Men and women ages 18 to 89 years located on the University of Arizona main campus were recruited to participate. Blinded subjects were randomly placed into either the teach-back method or standard counseling method group. The standard method involved telling the subject eight counseling points about two separate fictitious medications while the subject handled mock prescription bottles. The teach-back method added to the standard method by asking three open-ended questions to recall what was taught and correct any misunderstandings. Memory retention was assessed within 5 minutes by a blinded investigator who asked 6 questions concerning the first hypothetical drug. The total score of correct answers between subjects in the two groups were compared using the Mann-Whitney U test. Also, demographic characteristics (age, sex, education, current prescription use) were compared.  
**Main Results:** A total of 62 subjects were enrolled in the study. Subjects in the teach-back method remembered one more counseling point on average compared to those in the standard method (median 6 vs 5, mode 6 vs 5, teach-back and standard respectively; Mann-Whitney U test: Z = -3.08, p=0.0021).  
**Conclusion:** The teach-back method is a quick and easy counseling method health care providers can use in their daily practice to improve memory retention by patients who receive new medications.

2. **Title:** Motivations for Medication Disposal at Take-Back-Rx Events  
**Project Advisor(s):** Keith Boesen, PharmD  
**Student(s):** Matthew Andrews, William Heath, William Lewis  
**Specific Aims:** The purpose of the study is to describe the reasons for medication disposals at Take-Back-Rx events and make inferences regarding medication adherence.  
**Methods:** Participants at Take-Back-Rx were invited to complete a survey that collected information on the participants current medical conditions, associated medications, unwanted medications, and demographic information.  
**Main Results:** The majority of participants were non-Hispanic White (89.2%) on Medicare (87.8%) with at least some college education (72.1%). The mean number of reasons listed for disposal was 2.25 and the majority of medications were expired (70%) or the dose/agent changed (47%).  
**Conclusion:** This study effectively described the reasons for medication disposals at Take-Back Rx events, but applicability to further patient populations may be limited due to shortcomings of the instrument.

3. **Title:** Impact of Pharmacist Intervention on Knowledge of Diabetes and Among Diabetic Patients  
**Project Advisor(s):** Amy Kennedy, PharmD  
**Student(s):** Sara Azizian, Amanda Boysen  
**Specific Aims:** To further explore the relationship between patient’s diabetes knowledge and pharmacist intervention in patient care related to diabetes management. Study participants included diabetic patients being seen at the El Rio Health Clinic East campus. Subjects were patients being seen only by their primary care providers for diabetes management as well as patients being managed by a clinical pharmacist in addition to their primary care provider.  
**Methods:** Questionnaires were administered to eligible patients at the time of their clinic visit. Knowledge was assessed in various areas of diabetes management including diet, exercise, blood glucose management, overall diabetes control, and insulin therapy where applicable. HbA1C was self-reported as a secondary measure.  
**Main Results:** Questionnaires were completed by a total of 78 subjects. The pharmacist group included 48 subjects (mean age = 54; SD = 11.9; 60% Caucasian; 65% female) and the non-pharmacist group included 30 subjects (mean age = 52; SD = 9.5; 66% Caucasian; 57% female). Overall, there was no statistically significant difference in diabetes knowledge (p = 0.17) between the two groups.  
**Conclusion:** Survey data from this study, although limited and not adequately powered, showed no statistically significant difference in diabetes knowledge between the pharmacist group and non-pharmacist group.
4. Title: The Role of Patient Characteristics in Reducing 30-day Hospital Readmissions  
Project Advisor(s): Terri Warholak, PhD  
Student(s): Amelia Bennett, Robert Schuman, Nathan Smith  
Specific Aims: The purpose of this study was to determine what characteristics are most often associated with patients who are readmitted to a hospital for care within a 30-day time period for one of the five applicable conditions listed in the Hospital Readmissions Reduction Program, including heart failure, pneumonia, myocardial infarct, vascular procedures, and chronic obstructive pulmonary disease.  
Methods: This study was a retrospective chart review of patients who had a 30-day inpatient hospital readmission to a tertiary referral teaching hospital in Tucson, Arizona during the period from January 1, 2012 to June 30, 2012. Patient demographics and other characteristics thought to influence readmission were collected, including sex, age, race, type of insurance, number of applicable diagnoses at first admission, and number of medications prescribed at first discharge. "Applicable diagnoses" included: congestive heart failure (CHF); pneumonia (PN); myocardial infarct (MI); vascular procedures (VP); and chronic obstructive pulmonary disease (COPD).  
Main Results: Of the 1,102 patients included in this study, only 5% were readmitted for one of the five applicable conditions. The largest proportion of patients who were readmitted for the same diagnosis were in the 21 to 40 year old category, whereas the largest proportion of patients who were readmitted for different diagnoses were in the greater than 40 year old category. The results of the multiple regression analysis showed that none of the independent variables predicted 30-day readmissions with the exception of Asian race (p=0.008, n=8) and other race (p=0.012, n=57). In addition, the only significant predictor of 30-day readmission was the diagnosis at initial admission (p<0.05).  
Conclusion: In our sample, only 5% of patients readmitted at 30-days were readmitted for an applicable condition. This means the majority of readmissions include diagnoses that are not currently affected by the changes to Medicare reimbursement, though other diagnoses are likely to be added to the list in the coming years. Our study provides evidence that specific patient demographic characteristics are not closely linked to 30-day readmissions. Therefore, it may be necessary to turn the focus away from targeting specific patient populations and towards improving efforts in the areas of discharge planning and quality of care for all patients.

5. Title: Efficacy of alendronate and risedronate on bone mineral density in men with osteoporosis or osteopenia: a meta-analysis  
Project Advisor(s): Marion Slack, PhD; Jeannie Kim Lee, PharmD  
Student(s): Karen Jehle, Olivia Brown  
Specific Aims: To determine efficacy of alendronate (ALN) and risedronate (RIS) for treatment of osteoporosis and osteopenia in men.  
Methods: Literature search was primarily via PubMed. Inclusion criteria were: randomized controlled trials or observational studies assessing treatment of osteoporosis in men, either of primary or secondary etiology. Exclusion criteria were: minority population with baseline osteoporosis, inclusion of women, lack of control group. Primary outcomes were bone mineral density (BMD) of femoral neck (FN) and lumbar spine (LS); secondary outcomes were vertebral or non-vertebral fractures incidence. Data were synthesized using a random effects meta-analysis.  
Main Results: Eleven ALN and six RIS studies were included; most provided LS and FN data, but trials longer than 1-year were infrequent (ALN 3, RIS 4) as were fracture data (ALN 4, RIS 3). For both FN and LS BMD, both drugs showed significant treatment effects at one and two-years (p<0.001). For FN BMD, 2-year treatment effects were ALN: SDM= 0.638, p<0.001; RIS: SDM= 0.391, p<0.001; heterogeneity was insignificant (p>0.05). For LS BMD, treatment effects were: 2-year ALN: SDM= 1.206, p<0.001; 1-year RIS: SDM= 0.574; p<0.001; heterogeneity was insignificant (p>0.05). For fracture, both drugs showed significant treatment effects at vertebral sites: ALN: OR 0.450, p<0.05; RIS: OR 0.423, p=0.001; heterogeneity was insignificant (p>0.05). RIS also showed a promising effect at non-vertebral sites (p<0.05), however only two studies provided data at this site.  
Conclusion: Both ALN and RIS are effective to increase BMD and decrease vertebral fracture occurrence in men with osteoporosis or osteopenia.

6. Title: Identifying Drug Therapy Problems through Patient Consultation at Community Pharmacies  
Project Advisor(s): Terri Warholak, PhD  
Student(s): Michael Campbell, Mobeen Moslem, Preston Spriggl  
Specific Aims: The objective of this quality improvement project is to evaluate if drug therapy problems in a community pharmacy setting can be identified via patient counseling at the time of prescription pick up. The central hypothesis of the project is that patient consultation will aid in identifying drug therapy problems and reduce the amount of negative effects posed by these problems.  
Methods: This project will assess data obtained through a medication therapy intervention report utilized in multiple community pharmacy environments in Arizona. Any consultation provided to a patient by a pharmacist or pharmacy intern regarding a new or transferred prescription will be eligible for data collection. The primary dependent variable is the number of drug therapy problems identified during consultation. Drug therapy problems will be assessed via expert opinion to identify the potential negative impact they may have posed to patients. Data analysis will involve the frequency and type of drug therapy problems identified during data collection.  
Main Results: A total of 1305 prescriptions were screened during the data collection period. A total of 29 drug therapy problems were identified upon patient consultation. This yielded a 2.2% drug therapy problem occurrence during data collection. The most commonly occurring drug therapy problem involved a patient drug allergy or sensitivity issue.  
Conclusion: Future research is warranted on the effects that drug therapy problems have on patients and the healthcare system. This project is descriptive in nature and may not be applicable to every community pharmacy in Arizona.
8. Title: Systematic Review of Type 2 Diabetes Interventions in Native Americans: An Emphasis on Reported Limitations, Funding Sources, and Community Involvement  
Project Advisor(s): Elizabeth Hall-Lipsy, JD  
Student(s): Teri L. Corrales  
Specific Aims: This study assessed the extent to which American Indians were involved in the research process (i.e. design, implementation, analysis, and dissemination) in relationship to funding sources and reported limitations in research interventions that addressed diabetes, as well as research method or design.  
Methods: Systematic searches of The Cochrane Library, PubMed, CINAHL, International Pharmaceutical Abstracts (IPA), Web of Science, ERIC, and PsychINFO identified studies focused on type 2 diabetes in American Indians published between October 5, 2010 and April 30, 2012. Studies selected for inclusion were those that were interventional or programmatic in nature, used a comparison group for statistical analysis and reported patient level or patient related outcomes. Data were extracted and analyzed for study characteristics, reported limitations, funding sources, and extent to which the community was involved in the research process.  
Main Results: A total of 6 studies were included. There was no difference between American Indian involvement in the research process with respect to funding sources and reported limitations (p = 0.17 and p = 0.23, respectively). The majority of studies were conducted in a clinic setting (33.3%) on tribal/sovereign land (66.7%). Study design was evenly split between randomized controlled trials and observational studies (50% for each). The most frequently reported intervention was combination/multimodal (50%).  
Conclusion: American Indian involvement in the research process was not impacted by either funding sources or reported limitations.

9. Title: Retrospective analysis of direct inpatient charges and mortality of leukemia pediatric patients with methicillin-resistant Staphylococcus aureus, Candida, or Aspergillus infections in the United States  
Project Advisor(s): Grant Skrepnek, PhD  
Student(s): Tagg Daugherty  
Specific Aims: The purpose of this study was to assess risk factors that are associated with inpatient charges and mortality rates with methicillin-resistant Staphylococcus aureus (MRSA), Aspergillus, and Candida in children with leukemia. The hypotheses is MRSA and opportunistic fungal infections are associated with higher inpatient charges and worse outcomes relative to those without. Children with leukemia are especially at risk due to underdeveloped and compromised immune systems. The rational is that identifying the risk factors that affect mortality and inpatient charges of these infections should add to the current knowledge of treating and preventing these infections in immune compromised patients.  
Methods: Retrospective cohort study using the Agency for Healthcare Research Quality (AHRQ) KIDS 2009 database. Inclusion criteria was defined as 17 years of age or younger and a ICD-9 code for an active infection with MRSA, Aspergillus, or Candida. Regression analysis’s were performed to identify factors that had an impact on mortality, length of stay, and direct patient charges.  
Main Results: Values that were significant (p<0.05) for predicting an increase in mortality were Age (year), MRSA, Aspergillus, Candida, and Deyo-Charlson comorbidity scores. Significant predictors of increased Inpatient Charges (p<0.05) was Age (year), MRSA, Aspergillus, Candida, Female Sex, Deyo-Charlson comorbidity scores, Urban Hospitals, and the Southern Region. Significant predictors of Increased Length of Stay (p<0.05) MRSA, Aspergillus, Candida, Female Sex, Deyo-Charlson, Urban Hospitals, Teaching Hospitals, and the Southern Region.  
Conclusion: Although uncommon in leukemia cases involving pediatrics or young adults, statistically significant and large risks of higher mortality, length of stay, and inpatient charges were noted in cases involving MRSA, aspergillus, and candida. Increasing Deyo-Charlson comorbidities scores were also consistently important predictors for poor outcomes in these leukemia patients and, with certain outcomes, increasing age and female sex.

10. Title: Evaluation of a pharmacist-led medication education group on patient-reported attitudes and knowledge, including a Rasch analysis of the questionnaire used  
Project Advisor(s): Lisa Goldstone, PharmD; Terri Warholak, PhD  
Student(s): Erica Davis, Sarah Norman  
Specific Aims: To assess the effect of a pharmacist-led education group on psychiatric patient-reported attitudes, knowledge, and confidence in self-managing medications. The reliability and validity of the questionnaire given to patients who attended a pharmacist-led medication education group was also evaluated.  
Methods: A retrospective pre-post questionnaire was distributed patients and collected variables collected including patient self-reported medication knowledge and attitudes, demographics, previous psychiatric hospitalizations, length of group attended, and outpatient pharmacist relationships. Knowledge and attitude items were measured on a 4-point Likert-type scale with response options ranging from “agree” to “disagree.” Rasch analysis was conducted to ensure all items measured the same construct and the probability of the person responding to an item was not dependent on other assessment items. Rasch measurement includes several diagnostic indices that allow item-specific and person-specific examinations of data reliability and measurement fit. In addition, the Rasch technique makes it possible to evaluate the contribution of each person’s measures on each item. A z-test was used to evaluate for instrument content gaps and a dependent t-test was performed to measure for statistical differences before and after the intervention.  
Main Results: Sixty patients responded to the Medication Attitude and Knowledge Questionnaire over a 16-week period. Gaps identified were not statistically significant (p=0.1064 and 0.5305) indicating that content validity is comprehensive. On a group level, no significant differences were identified in patient answers before and after the intervention (p=0.2162, p=0.8292). When each patient was analyzed separately, only one patient out of 60 showed a significant difference in answers after the intervention. Results also demonstrated that after attending a group, 100% of patients indicated they intended to adhere to their medication regimen post-discharge.  
Conclusion: This evaluation was unique because patient attitudes were explored before and after medication education group attendance. Medication Attitude and Knowledge items were valid and reliable.
11. Title: Perspectives of faculty on the entry-level Pharm. D. degree  
Project Advisor(s): Daniel Malone, PhD  
Student(s): Piya Debnath, Jacob Maki, Kimberly Tran  
Specific Aims: In 2000 the Accreditation for Pharmacy Education began accrediting only pharmacy education programs that awarded an entry-level PharmD degree. The purpose of this study is to assess pharmacy faculty opinions concerning the transition to the all-PharmD degree as compared to post-baccalaureate PharmD degree.  
Methods: This study was a national survey of clinical pharmacy faculty attitudes and opinions toward training of clinical pharmacists. An email invitation was sent to participate in the survey and data was collected over a two month period. Questions included opinions on pharmacist’s ability to counsel patients, recommend drug therapy, make dosage adjustments, and solve problems based on their PharmD training among other questions. Demographic data was also collected. Wilcoxon Rank Sum tests were used to determine if significant differences were present between clinical faculty with either entry-level versus post-baccalaureate PharmD degrees with respect to opinions related to skills of entry-level PharmD pharmacists.  
Main Results: A total of 2738 individuals were sent email invitations to participate in the survey; 493 subjects started the survey of which 420 provided complete responses. All questions were scored on a five point scale from strongly disagree (1) to strongly agree (5) with a neutral option (3). Entry-level PharmD’s agreed that they are equally skilled to post-baccalaureate PharmD’s in conducting a physical exam (3.3 versus 2.9), recommending drug therapy (3.5 versus 2.9), identify problems in drug therapy (3.5 versus 3.0), and counseling patients (3.8 versus 3.5) than post-baccalaureate PharmD’s (P≤0.0022).  
Conclusion: Post-baccalaureate PharmD faculty are less likely to believe that entry-level pharmacists are similar to themselves with respect to clinical services.  

12. Title: Identifying causes of electronic prescription error: is the software or physician at fault?  
Project Advisor(s): Michelle Soble-Lemor, RPh  
Student(s): Erin McCusker, Ashley DeSefano  
Specific Aims: The purpose of this study was to investigate areas of ambiguity or error in the content of prescriptions generated using DrFirst’s electronic prescribing software Rcopia determines whether these quality issues are attributed to the software, physician, or both.  
Methods: Electronic prescriptions generated by DrFirst electronic prescribing software, Rcopia, from July 2012 through September 2012 were analyzed regarding the following metrics: number of free text prescriptions, quantity unit mismatches, and SIG issues. These metrics were expressed as a percentage of the total number of prescriptions generated for each month and used for descriptive analysis.  
Main Results: The total number of prescriptions generated were 12,043,268, of which 363,142 (3%) were free text (uncoded) and 11,680,126 (97%) were non-free text. SIG as directed was identified in 227,732 prescriptions, of which 11,208 (3.1%) were free text and 216,524 (1.9%) were non-free text. Double SIG was identified in 174,625 prescriptions, of which 75,336 (20.1%) were free text and 1,746,250 (14.1%) were non-free text. A total of 830 (0.23%) of free text prescriptions contained a Latin abbreviation. Of 621,816 prescriptions containing a quantity unit error, 7,684 (2.1%) were free text prescriptions and 614,132 (5.3%) were non-free text prescriptions.  
Conclusion: The authors concluded that the software and physician are responsible for error. There were errors associated with selections made by the prescriber in the drop down menus and coded medications in Rcopia. Furthermore, errors were found in free text prescriptions which must be manually entered by the physician or their staff.  

13. Title: Medication Therapy Management: Methods to Increase Comprehensive Medication Review Participation  
Project Advisor(s): Kevin Boesen, PharmD  
Student(s): Melissa Diaz, Yanina Ortega  
Specific Aims: To compare the Comprehensive Medication Review (CMR) rate for Workflow Model #1 (used in 2010) to the CMR rate for Workflow Model #2 (used in 2011) at the Medication Management Center (MMC).  
Methods: A retrospective database analysis was completed in which Comprehensive Medication Review (CMR) completion rates for 2010 and 2011 were assessed. Comparison included only Center for Medicare and Medicaid Services (CMS) contracts that the Medication Management Center (MMC) provided Medication Therapy Management (MTM) services for both in 2010 and 2011. Data was used to determine the effect a process change had on CMR participation rate at the MMC and best practices for improving the rate of Medication Therapy Management Program (MTM) beneficiaries participating in a CMR.  
Main Results: In 2010, patient participation and response to a CMR offer letter was low (0.2%). The changes in process yielded an increase in the CMR completion rate (6.93%); this in turn yielded higher performance measurements for prescription drug plans.  
Conclusion: Workflow modifications, including a pro-active secondary CMR offer, led to a marked increase in member participation and CMR rates. Patients were more apt to consent to a CMR if they are called for a specific medication related problem. It is recommended to continue to convert TMR calls to CMRs whenever possible, monitor CMR rates at least quarterly, and make cold calls where needed to increase CMR percentages.
14. Title: Marginal Tax Rates and Innovative Activity in the Biotech Sector  
Project Advisor(s): Grant Skrepnek, PhD  
Student(s): Pedro Diaz  
Specific Aims: To assess the association between marginal tax rates (MTR) and innovative output of biotechnology firms. The MTR plays an important role in firms’ financing choices. Assessment of a firm’s tax status may reveal how firms decide on investment policies that affect R&D.  
Methods: A retrospective database analysis was used. Subjects included were firms within the biotechnology sector with the Standard Industrial Classification code of 2836 from 1980 - 2011. MTR Data was obtained from the S&P Compustat database, and Patent data was obtained from the U.S. Patent and Trademark Office. Changes in MTR’s on outcomes of patents were analyzed by performing an inferential analysis. Generalized estimating equations (GEE) were used, specifically utilizing a GEE regression with a negative binomial distributional family with log link, independent correlation structure and robust standard error variance calculation. Patents were regressed by the lagged change in MTR, after interest deductions.  
Main Results: The lag years 2 and 5 of the MTR change were statistically significant, (p = 0.031) and (p = 0.026) for each model respectively. Every one unit increase in the change of the MTRs was associated with large and significant drops in patents 78.8% (IRR = 0.212), 90.7% (IRR = 0.093), 92.7% (IRR = 0.073) at year 2 lag and 84.6% (IRR = 0.152), 92.6% (IRR = 0.074) at year 5 lag.  
Conclusion: An increase in the change of the MTR results in significant drops in patenting activity.  

15. Title: Effect of Blood Glucose in the Emergency Department on Hospital Length of Stay  
Project Advisor(s): Asad Patanwala, PharmD  
Student(s): Jessica DiLeo, Michaela Johnson-Clague, Jennifer Prze  
Specific Aims: The objective of this study is to evaluate the effect of early blood glucose correction in the Emergency Department (ED) on hospital length of stay.  
Methods: This study has received institutional review board approval. This is a retrospective cohort study conducted in an academic medical institution. Diabetic patients with hyperglycemia in the ED between June 1st, 2011 and June 30th, 2012 were included. Patients were excluded if they were less than 18 or greater than 89 years of age, not admitted, had diabetic ketoacidosis or hyperglycemic hyperosmolar state, treated with insulin for hyperkalemia, trauma patients, or had an initial blood glucose value of 200 mg/dL or less. Patients were categorized into two groups based on blood glucose control achieved within the first 24 hours from triage. The primary outcome of this study was to compare hospital length of stay between the groups.  
Main Results: A total of 161 patients were included in this study. Baseline demographics between groups were statistically similar with the exception of gender (p=0.635), ethnicity (p = 0.149), and co-morbidities calculated by the Charlson Co-Morbidity Score (p = 0.112). Blood glucose values in the ED did not statistically correlate to hospital length of stay (p = 0.299), however, co-morbidities were predictive of hospital length of stay (p = 0.025).  
Conclusion: Early correction of blood glucose values in the ED are not associated with hospital length of stay.  

16. Title: Impact of Inpatient Metastatic Thyroid Cancer on the United States Healthcare System  
Project Advisor(s): Grant Skrepnek, PhD  
Student(s): Alex Dong  
Specific Aims: To assess associations between clinical and economic outcomes of metastatic thyroid cancer within inpatient settings in the United States from 2001-2010. To determine the direct inpatient burden of and describe the characteristics of patients and hospitals associated with metastatic thyroid cancer.  
Methods: A multivariate retrospective cohort study was performed on the Healthcare Cost and Utilization Project-Nationwide Inpatient Sample database, for the years 2001-2010, focusing on three main outcomes: inpatient mortality, inpatient charges, and inpatient length of stay. Regression analyses controlled for patient demographics, hospital characteristics, payer, clinical comorbidities, and site of metastases. Inclusion criteria included: age ≥ 18 years, any listed diagnosis of thyroid cancer, and any listed secondary malignancy.  
Main Results: Overall, 84,191 inpatient cases were observed for metastatic thyroid cancer with 3,032 resulting in mortality (3.6%). The total charges were $3.1 billion (USD 2012) for overall inpatient hospitalizations with average inpatient charges at $38,292 (SD±56,135) for each overall case and $80,948 (SD±117,645) for each mortality-only case. Higher inpatient mortality, charges, and length of stay were significantly associated with central nervous system and lung metastatic cancer sites (p < 0.01) and deficiency anemias, coagulopathy, fluid and electrolyte disorders, pulmonary circulation disorders, and weight loss comorbidities (p < 0.01).  
Conclusion: There is a considerable national inpatient burden of metastatic thyroid cancer. The analyses in this study quantify the associations and outcomes, and as such can be used to assist in the prediction of those outcomes and clinical decision-making.
17. Title: Incidence of and frequency of monitoring for hyponatremia associated with SSRIs: a retrospective chart review at one institution

Project Advisor(s): Amy Kennedy, PharmD
Student(s): Kristen Ellis, Stephanie Pavone

Specific Aims: To describe the incidence of hyponatremia in patients using SSRIs and to assess how often health care professionals obtain electrolyte panels after SSRI initiation. Also, to identify the most recent sodium level in patients and to compare sodium levels in a patient group using an SSRI and a control group not using an SSRI.


Methods: An electronic medical record database was used to identify potential patients through medication records reflecting SSRI use or diagnosis of low back pain, obesity, pruritis, rash, or fibromyalgia. The following data was collected: patient gender, age, weight, height, use/non-use of SSRI, plasma sodium level, and documented past hyponatremia diagnosis. Plasma sodium levels and hyponatremia incidence were compared from the SSRI group to the non-SSRI group. In addition, the SSRI group was analyzed for incidence of documented hyponatremia. Monitoring of sodium levels after SSRI initiation was also investigated.

Main Results: Overall, 500 charts were reviewed. After inclusion and exclusion criteria were applied, 118 patients were included in the study (38 in the SSRI group, 80 in the control group). The incidence of hyponatremia in the SSRI group and control group was 2.63% and 1.25% respectively. There was no significant difference between groups (p=0.542). Sodium levels were monitored 19.2% of the time after SSRI initiation.

Conclusion: The incidence of hyponatremia was similar between groups. Physicians are not adequately monitoring for hyponatremia after SSRI initiation.

18. Title: The Effect of Drug Formulation on in vitro Performance Indices for Metered-Dose Inhalers with Regards to Varying Mouth-Throat Models

Project Advisor(s): Paul Myrdal, PhD; Poonham Sheth, PharmD
Student(s): Mohammad Fazel

Specific Aims: To elucidate the effect of the use of three different inlet configurations, percent ethanol in formulation, and propellant used on the percent respirable drug and MMAD of aerosolized particles from MDIs that contained beclomethasone dipropionate (BDP).

Methods: The inlet configurations assessed in this study were the United States Pharmacopeia (USP) throat, the Alberta idealized mouth-throat replica (biological throat), and a large volume spacer (globe). ACI analyses were conducted on four different MDI formulations with regards to each of the three inlet configurations in quadruplicate. The two hydrofluoroalkane propellants assessed were HFA-134a and HFA-227. All four solution formulations contained 0.3% (w/w) beclomethasone dipropionate (BDP), two of which contained 8% (w/w) ethanol (one each with HFA-134a and HFA-227) and two contained 20% (w/w) ethanol (one each with HFA-134a and HFA-227). All experiments were conducted at a flow rate of 28.3L/min using an actuator with an orifice diameter of 0.29mm and a 50μL metered-valve. After each ACI test, the drug collected on each stage of the impactor was rinsed with known volumes of diluent and quantified by high performance liquid chromatography (HPLC). The MMAD was determined by using DistFit to lognormally fit the ACI data. The respirable fraction was calculated as the mass of the drug collected on stages 3 through filter of the ACI divided by the total mass of the drug aerosolized. The two-sided student’s t-test was the statistical test utilized, with an a priori alpha-value of 0.05.

Main Results: The USP and biological throats had significantly lower percent respirable drug compared to the globe regardless of concentration of ethanol or propellant (p<0.05). The MMADs were significantly lower for configurations with the USP and biological throats as compared to the globe (p<0.05). The only formulation with a significant percent respirable drug difference between the USP and biological throats regarding the 20% ethanol/HFA-227 formulation (20.9±/-0.15 and 16.8±/-1.3 respectively, p=0.005), with the USP throat having the significantly greater percent respirable drug. The USP throat had significantly larger MMADs compared to the biological throat regardless of formulation (p<0.05). For both propellants, the 8% ethanol formulation had significantly greater percent respirable drug compared to the 20% formulation for all three inlets (p<0.05). The 20% ethanol formulations had significantly higher MMADs compared to the 8% ethanol formulations in both the USP throat and globe, and with both propellants (p<0.05). Only the 20% ethanol formulations demonstrated a significant difference when varying propellant while keeping all else constant, with the HFA-134a formulations having higher percent respirable drug with all inlets as compared to HFA-227 (p<0.05). When propellant used was varied with all else kept constant, the HFA-227 formulations had significantly higher MMADs compared to the HFA-134a formulations (p<0.05).

Conclusion: It was found that significant differences in percent respirable drug and particle size (MMAD) resulting from varying inlet configurations was a function of formulation parameters, most notably, ethanol concentration. The differences may be attributed to factors that increased the time necessary for the evaporation of atomized particles prior to deposition in the impactor, the initial atomized droplet diameter, and/or the likelihood of particle impaction with regards to the mouth-throat inlet utilized. Further assessment is needed to evaluate the correlation of this data with in vivo analyses.
19. **Title**: Predictive value of a medication adherence screening tool on hospital readmission rates in patients with congestive heart failure  
**Project Advisor(s)**: Edina Hall, MS, PharmD; Ferena Salek, PharmD; Jon J. Glover, PharmD  
**Student(s)**: Serena Felix, Veronica McGowan  
**Specific Aims**: To examine the relationship between hospital readmission rates and responses to a medication adherence questionnaire (Morisky) in patients with congestive heart failure (CHF).  
**Methods**: The Morisky questionnaire, assessing medication adherence, was administered to all CHF patients admitted from September 15, 2012 to March 7, 2013. Information collected from the electronic medical record (EMR) for all patients with complete Morisky questionnaires included: age, sex, ethnicity, insurance, height, weight, marital status, tobacco use, alcohol use, number of home medications, all-cause and CHF admission in the previous 365 days from when the questionnaire was administered as well as the following events/disease states: myocardial infarction, hypertension, atrial fibrillation, stroke, diabetes mellitus, peripheral vascular disease, chronic obstructive pulmonary disease, congestive heart disease and chronic kidney disease.  
**Main Results**: Of the 120 patients enrolled, 52% scored 1-5 on the Morisky questionnaire indicating some problem with medication adherence while 48% scored 0 (no problems). There was no correlation between the Morisky score and age (95% CI: -3.3-5.7), number of medications (95% CI: -0.26, 2.85), or number of comorbidities (95% CI: -1.02,0.03). The Morisky questionnaire was not predictive of all cause readmissions (95% CI: 0.35, 2.01) p = 0.691). For CHF readmissions the Morisky score was not significant (95% CI: 0.6, 4.11, p=0.358) but the confidence interval suggests a trend.  
**Conclusion**: There is no correlation between Morisky scores, age, comorbidities, and medication number. Readmission rates were not predicted by Morisky scores; with more participants a trend may be detected for CHF readmissions.

20. **Title**: Use of double anaerobic coverage and its implications  
**Project Advisor(s)**: Kathryn Matthias, PharmD; David Nix, PharmD  
**Student(s)**: Eddie Gomez, Gaurav Shinde, Niyat Patel  
**Specific Aims**: Metronidazole and clindamycin can be prescribed for anaerobic infections; however, patients are periodically prescribed a second agent with duplicate anaerobic coverage. The purpose of this project was to evaluate the frequency, appropriateness, and potential consequences of combination therapy against anaerobic organisms in patients prescribed metronidazole or clindamycin.  
**Methods**: In this IRB approved project, adult patients who were prescribed either intravenous metronidazole or intravenous clindamycin with or without another agent with anaerobic coverage for at least 48 hours at an academic medical center between May 2010 and April 2012 were evaluated. Subjects were excluded if documented Clostridium difficile associated diarrhea within 14 days prior to intravenous metronidazole, if use of oral vancomycin within 14 days prior to intravenous metronidazole, or if presence of diarrhea with more than six unformed stools 48 hours prior to intravenous metronidazole. Data collected includes demographic information, site of infection, surgical interventions, antibiotic therapy prescribed, therapy outcomes, and reported adverse events. The odds ratio for combination anti-anaerobic therapy was calculated for metronidazole and clindamycin. The appropriateness of combination anaerobic coverage therapy was evaluated based on expert opinion and guideline statements. The frequency of potential complications such as adverse drug events, Clostridium difficile infection, other diarrheal illness and superinfections associated with enteric organisms within 30 days after starting anaerobic therapy will be reported  
**Main Results**: In Progress  
**Conclusion**: To be determined

21. **Title**: Modafinil as an adjunct agent in the treatment of major depressive disorder: a meta-analysis  
**Project Advisor(s)**: Marion Slack, PhD; Jennifer Martin, MA  
**Student(s)**: Amber Gustin, Heather Magsarili  
**Specific Aims**: To assess the effectiveness of modafinil as an adjunct agent in the treatment of major depression and depression-related fatigue.  
**Methods**: Seven databases were searched for articles that met predetermined inclusion criteria and reported sufficient data. Meta-analysis was employed to synthesize study findings, with standardized mean difference (SMD) being the primary summary measure. The I-squared statistic was used to evaluate heterogeneity among studies. Additionally, publication bias was assessed via funnel plots and Kendall’s tau.  
**Main Results**: Ten studies (N = 848) were included in the Hamilton Depression Rating Scale (HAM-D) meta-analysis, composed of 5 RCTs and 5 pre-post studies. The pooled SMD was -0.67, a moderate effect indicating an improvement in depression scores. However, the overall SMD varied when stratified by study design; pre-post studies showed a large pooled effect (SMD = -1.54) that reached significance, whereas RCT’s displayed a moderate effect (SMD = -0.41) that was not significant. Additionally, heterogeneity was substantial (I-squared = 91.54) among all studies, and publication bias was suggested by the funnel plot and Kendall’s tau. Regarding modafinil and fatigue, the Epworth Sleepiness Scale (ESS) meta-analysis had a small but statistically significant overall SMD (-0.23; p = 0.03), and the Fatigue Severity Scale (FSS) meta-analysis yielded an overall SMD which was not significant (p = 0.24). Similar to the HAM-D analysis, the overall SMD varied between study designs.  
**Conclusion**: The effect of modafinil on major depressive disorder is unclear, as the findings are largely variable and the impact of modafinil was stratified by study design.
22. Title: Comparison of characteristics of patients who received posaconazole or voriconazole for the treatment of coccidioidomycosis  
Project Advisor(s): Kathryn Matthias, PharmD  
Student(s): Christine Hackman, Dory Hardy  
Specific Aims: To describe the characteristics of patients who were switched to or prescribed posaconazole or voriconazole for the treatment of coccidioidomycosis including duration of previous anti-fungal treatment and rationale for changing from the first-line agents to posaconazole or voriconazole. 
Methods: This was a retrospective medical chart review of all patients admitted to an academic medical center with a diagnosis of coccidioidomycosis and prescribed posaconazole or voriconazole between January 2008 and December 2011. Subjects for the study were identified by ICD-9 codes for coccidioidomycosis (114.0-114.9) and through the pharmacy system for orders for posaconazole or voriconazole. Data collected included demographic information, antifungal prescription data, and outcome of fungal infection, if available.  
Main Results: A total of 41 subjects were identified as being prescribed either voriconazole or posaconazole for a diagnosis for coccidioidomycosis. The majority of subjects were prescribed voriconazole (93%) rather than posaconazole. While the majority of subjects were diagnosed with only pulmonary disease, 44% of subjects coccidioidomycosis diagnoses were classified as disseminated and 46% were admitted to an intensive care unit. The median (range) duration of first-line antifungal therapy was 3 (2-10) days for the posaconazole group and 3 (0-25) days for the voriconazole group. Overall, the reason(s) for switching antifungal therapy was listed as: failure of first-line therapy (26%), adverse drug event (4.3%), other (35%), and unknown (35%).  
Conclusion: There was no significant difference in baseline or disease characteristics between patients who were prescribed voriconazole or posaconazole for coccidioidomycosis. The main limitation of this retrospective evaluation is that the reason for use of voriconazole or posaconazole rather than first-line agents was often not easily determined based on the documentation in the medical records.

23. Title: Student confidence and knowledge pre and post a capstone course  
Project Advisor(s): Jeannie Lee, PharmD; Richard Herrier, PharmD  
Student(s): Courtney Hanauer, Dani Schiefer, Natalee Tanner  
Specific Aims: To determine the impact of a capstone course, Pharmacy Practice (PhPr) 811 entitled Advanced Patient Care, on preparing third-year University of Arizona College of Pharmacy (UA COP) Doctor of Pharmacy (Pharm.D.) students for their advanced pharmacy practice experiences and their future responsibilities as members of interprofessional healthcare teams.  
Methods: This study used pretest-posttest design. A survey was utilized to assess both the student’s self-confidence and knowledge in managing eight, commonly-encountered acute and chronic disease states. The students’ level of self-confidence in clinically managing patients with the specified disease states was measured using 17 questions on a 5-point Likert-type scale, while their knowledge was assessed using eight multiple-choice questions.  
Main Results: A total of 83 students participated in the study by completing both the pre- and post-course surveys (87.4% response rate). Following completion of the course, mean confidence score increased significantly to 4.01 (±0.80, p<0.001), while mean knowledge score increased slightly to 6.85 (±1.08). Positive change scores were determined for each self-assessed confidence item (0.90 ± 0.90), which indicated a significant increase in students’ overall level of confidence (p <0.001). On the other hand, the change in knowledge resulted in an overall positive change (0.47 ±1.19), which was not statistically significant (p= 0.47).  
Conclusion: The Advanced Patient Care course, PhPr 811, positively impacted the students’ self-assessed level of confidence. Even though the level of knowledge did not change significantly due to high baseline level, the students’ confidence level for clinical management increased significantly after participating in the capstone course.

24. Title: Artemisinin-Based Combination Anti-malarials Do Not Enhance Anti-melanoma Activity of Artemisinin-Monotherapy  
Project Advisor(s): Georg Wondrak, PhD  
Student(s): Suesan Jacobs, Amanda Vonderfecht  
Specific Aims: To determine if melanoma cells are more vulnerable to Amodiaquine (AQ) or Lumefantrine (LF)-based artemisinin combination therapy compared to artemisinin monotherapy.  
Methods: Tested anti-malarials in vitro for anti-melanoma activity, which contained 100,000 of the A375 human metastatic melanoma cells that were repeatedly treated independently three times.  
Main Results: Dihydroartemisinin (DHA) monotherapy induced significant cell death in melanoma cells. However, artemisinin combination therapy (ACT) did not enhance DHA-induced cell death. AQ protected against DHA-induced cell death causing morphological changes detected by electron microscopy. As for LF, it did not affect DHA-induced cell death.  
Conclusion: The results demonstrated that ACT does not display enhanced anti-melanoma activity compared to artemisinin monotherapy. It suggests that AQ may have anti-oxidant properties, but would need to be explored further in the context of anti-oxidant cyto-protection.
25. Title: Value of Aseptic Technique  
Project Advisor(s): David Lee, RPh  
Student(s): Casey Smith, Tiara Patten, Maria Herran  
Methods: Five stations at varying degrees of aseptic technique evaluated the purity of transfers into two different growth media. Stations included a control using proper aseptic technique under a laminar flow hood, "Clean Nurse" used proper aseptic technique on sanitized counter-top, "Sloppy Nurse" used no aseptic technique on un-sanitized counter top, "Clumsy Nurse" dropped the syringe on the floor, used no aseptic technique on un-sanitized counter top, and "The Paramedic" used proper aseptic technique on outdoor picnic table. Fluid was transferred from a dextrose and sodium solution 10 times, each time with a new needle, into TSB growth media bags. Then, 1 mL growth media was pulled from GrowMed media vial with 1 mL volume room air and agitated. The remaining room air was ejected from media re-injected back into vial, and repeated ten times using same needle and syringe. Samples placed in an incubator at 29°C and visually checked for signs of bacterial growth after 14 days. The experiment was repeated once.  
Main Results: Out of the five scenarios that were prepared in duplicate, only one sample yielded contamination. The one positive result was from one sample attained from the "Clumsy Nurse" station. There were 20 samples taken with a total contamination rate of 5%, utilizing the Yates’s chi-square test generated a p value of > 0.01.  
Conclusion: Although proper aseptic technique is a valuable practice for patient safety, the overall risk to the patient is relatively low.

26. Title: Prophylactic levetiracetam for the prevention of posttraumatic brain injury seizures  
Project Advisor(s): Brian Erstad, PharmD  
Student(s): Michelle C. Hines  
Specific Aims: Guidelines developed by the Brain Trauma Foundation recommend the use of prophylactic anticonvulsants, particularly phenytoin, for the prevention of early posttraumatic seizures for patients with severe traumatic brain injuries. The purpose of this study is to evaluate the effectiveness of levetiracetam, a newer anticonvulsant, for posttraumatic seizure prevention in patients with severe traumatic brain injury.  
Methods: This study was approved by the University of Arizona Medical Center Institutional Review Board. The project consists of a retrospective cohort analysis from January 1, 2010 to September 30, 2011. We have abstracted data from all patients with traumatic brain injuries over this time period from the University of Arizona Medical Center Trauma Registry, and have matched these patients with their records in the pharmacy database to determine who received levetiracetam versus no prophylaxis. Patients younger than 18 years of age, pregnant women, patients who were deemed to be nonsalvageable, and patients who had a seizure prior to initiation of levetiracetam were excluded from the study. The following data was collected: age, gender, ethnicity, mechanism of injury, injury severity score, ED GCS, ED SBP, ED pulse, ED RR, blood alcohol level, ICU length of stay, number of ventilator days, hospital length of stay, FIM score at discharge (totals, and by component), diagnosis, surgery and complication type, anticonvulsant given, type of beta-blocker given, maximum and minimum dose used, cumulative doses given, and whether there exists a known prior history of anticonvulsant use. All data were recorded without patient identifiers and have been kept confidential. A multivariate logistic regression analysis was used to evaluate a relationship between other data collected from the patients’ medical records and seizure occurrence. Chi Square or Fisher’s Exact test will be used in the final analysis to compare the effectiveness of levetiracetam versus no prophylaxis to prevent posttraumatic brain injury seizures. Significance is defined as p<0.05 for all analyses.  
Main Results: The results are pending the final data analysis.  
Conclusion: To be determined.

27. Title: Exercise and Type 2 Diabetes Mellitus: A systematic review and meta-analysis of exercise duration and intensity and their effects on HbA1c and BMI  
Project Advisor(s): Marion Slack, PhD  
Student(s): C. Garrett Hoelzer, Evelyn Phillips, Marna Rautenbach  
Specific Aims: To assess the impact that exercise-type has on diabetes control through improvement in monitoring parameters such as hemoglobin A1c and fasting blood glucose.  
Methods: Studies were selected using a study inclusion tool and then data was extracted using the data extraction tool. The primary outcomes assessed were BMI and HbA1c. The standardized mean difference (SMD) was the main summary measure and the I² statistic was used to assess variability among the studies.  
Main Results: Ten studies met inclusion criteria (Total N = 1,787). The age range of patients was 40-66 years old with equal amounts of male and female participants. Aerobic and resistance exercise were effective (p < 0.01) in reducing A1c; Tai Chi was not (p = 0.50). Aerobic exercise did not have a significant effect on BMI (p = 0.07), however Tai Chi and Resistance exercise did (p<0.04).  
Conclusion: Aerobic and resistance exercise produced a significant reduction in HbA1c, whereas Tai Chi did not. The non-significant impact aerobic exercise had on BMI was probably due to large variation between the studies. No significant differences were found between the different forms of exercise and their overall impact on diabetes control. Based upon the data incorporated in this meta-analysis, it is reasonable for patients with diabetes mellitus type 2 to use aerobic or resistance exercise to improve their HbA1C. However, it remains to be seen whether recommending specific exercise types over others will provide increased benefit.
28. Title: Postoperative warfarin re-initiation strategies: an interview-based comparison of certified anticoagulation providers
Project Advisor(s): Jeannie K Lee, PharmD
Student(s): Evan Hood
Specific Aims: The purpose of this study is to identify a postoperative warfarin re-initiation protocol used most commonly by certified anticoagulation providers. Our main hypothesis is that certified Anticoagulation providers use a postoperative warfarin re-initiation strategy based upon clinical experience/knowledge as opposed to a guideline-based approach.
Methods: The Anticoagulation Forum website will be used to select the anticoagulation providers to interview via telephone. The selection process will be as follows: an excel spreadsheet will be created separating every clinic listed on the website by region, then fifty anticoagulation providers will be randomly selected by utilizing a random number generator function in excel for each region. Anticoagulation providers are listed on the website by region, and then further broken down by states in that region. The intention of separating regions is to attain equal representation of anticoagulation providers across the United States that are listed on the Anticoagulation Forum website. Anticoagulation providers will be called during the months of July, August and September 2012. Any anticoagulation provider contacted that is not certified with the National Certification Board for Anticoagulation Providers (NCBAP) as well as services or clinics not listed on the Anticoagulation Forum website will be excluded. An application will be submitted to the University of Arizona Institutional Review Board (IRB) Human Subjects Protection Program for approval of this study. We plan to randomly call 50 anticoagulation providers from each region of the US listed on the Anticoagulation Forum website. Thus, total estimated sample size is approximately 300 providers. The primary dependent variable is the postoperative warfarin re-initiation protocol. Our demographic variables are as follows: # of years in anticoagulation practice, gender of the provider and their credentials. The data extraction form is comprised of 3 parts. Part 1 will focus on questions directly related to the anticoagulation service, part 2 is for describing the patient population served and part 3 will be related to the provider demographic characteristics. Data will be collected by utilizing a telephone interview questionnaire-based approach. Each certified anticoagulation provider randomly selected from the Anticoagulat! 
Main Results: The information about warfarin re-initiation dose and protocol information are shown in Table 2. A majority of certified anticoagulation providers re-initiate warfarin at the same dose (64%) after temporary interruption compared to a relative warfarin dose (36%) following surgery/procedure. Likewise, more certified anticoagulation providers have a protocol in place (59%) compared to no protocol in place (41%).
Conclusion: This study displayed strength when certified anticoagulation providers were able to be contacted and take the time to answer the questionnaire. Certified anticoagulation providers utilize a common warfarin re-initiation strategy. Most providers’ re-initiation warfarin at the same dose at which the patient was receiving prior to surgery. However, there are many other factors that may go into making the decision of which warfarin dose to use postoperatively.

29. Title: The Direction of Pharmacist Education in Regards to Natural or Alternative Medicine
Project Advisor(s): Keith Boesen, PharmD
Student(s): Robert Jackson
Specific Aims: To identify how the field of pharmacy should be advanced in regards to pharmacist education of natural or alternative medicine (NAM) in a fashion that all pharmacists and pharmacy students would have access to. Subjects in this study were experts in the field of NAM.
Methods: An online questionnaire asking for expert opinion on ways to educate pharmacists about NAM was made available to experts in the field of NAM. Experts were identified by an internet search of the Arizona Naturopathic Medical Association’s (AzNMA) registry of licensed NDS in Arizona, as well as one previously known licensed ND in San Diego.
Main Results: The questionnaire was completed by 21 experts, 20 of which identified themselves as licensed NDs. Of the NDs, the average time in practice was 10 years. Sixteen (76%) of the respondents agreed that NAM should be taught in the Doctor of Pharmacy (PharmD) curriculum with the remaining five (24%) not directly commenting whether or not it should be taught in the PharmD curriculum, but agreeing that pharmacists need to be trained on important NAM.
Conclusion: Inclusion of NAM in the PharmD curriculum should be considered being implemented. Information on what resources are available and how to keep up with continued education in this field should also be made available to all students. For current practicing pharmacists there does not appear to be an ideal uniform way of increasing pharmacists’ level of education on NAM, reinforcing the need for inclusion of NAM in the PharmD curriculum.

30. Title: The Level of Accuracy in the Sixth Season of the Medical Television Show, House M.D.
Project Advisor(s): David Agar, PharmD; Edward Armstrong, PharmD
Students: Sunny Kim, Grace NgocThuy Nguyen, Kelly Barracough
Specific Aims: The aim of this study was to evaluate the level of accuracy of medical information presented in the sixth season of the popular prime time medical drama, House M.D.
Methods: The study was a descriptive, retrospective assessment of twelve episodes in the sixth season of the medical television show, House M.D. Three parameters were compared to reliable medical sources: signs and symptoms, diagnostic procedures, and medical treatment for the one primary medical problem portrayed in each episode. Three researchers reviewed each episode independently and rated the accuracy of each parameter. The accuracy of each dependent variable was rated on a scale of one to four (most to least accurate, respectively). After discussion, a consensus rating was determined for all three variables for all twelve episodes.
Main Results: The average accuracy scores for the signs and symptoms, diagnostic procedures, and medical treatments were 2.08, 2.58 (ie.,least accurate), and 1.5 (ie., most accurate), respectively. The average accuracy score across the three parameters was 2.06 (correct but somewhat unusual). The one-way ANOVA analysis on the variables revealed a statistically significant difference among the groups, with a p value of 0.003. The Tukey HSD test confirmed the statistically significant difference between diagnostic procedures and treatment (p = 0.002).
Conclusion: The treatments portrayed in twelve episodes of season six were judged more accurate than signs and symptoms and diagnostic procedures. The average accuracy score of the three groups determined that the medical information presented in the episodes seemed to be correct but somewhat unusual.
31. Title: Psychological and Genetic Predictors of Pain Sensitivity  
Project Advisor(s): Sid Patanwala, PharmD; Eric Snyder, PhD  
Student(s): May Li, Keith Walsh  
Specific Aims: To assess influence of PCS and FPQ-III on pain tolerance as well as SNPs TRPA1(rs11988795), COMT (rs4646312, rs6269) and FAAH(rs 932816, rs4141964, rs2295633).  
Methods: A Pain Catastrophizing Scale (PCS) and Fear of Pain Questionnaire (FPQ-III) were completed by a total of 89 healthy adults. A genetic analysis from cheek swabs was performed for single nucleotide polymorphisms(SNPs) within genes: TRPA1, COMT, and FAAH. A cold-pressor test involving the non-dominant hand inserted in circulating water kept at 1-3 degrees Celsius was used and the duration of time subjects were able to leave their hand in the water (pain tolerance) was measured as the primary outcome. Linear regression analysis was used to identify predictors of pain tolerance.  
Main Results: The subjects were 58% female, the majority were Caucasian (51%) with 26% Asian, 14% Hispanic and 9% other. The mean pain tolerance was 121 ± 66 seconds and regression analysis showed female sex (p=0.001), Asian race (p=0.001), PCS score (<0.001) and FPQ-III score (p=0.014) were associated with decreased pain tolerance while the SNPs were not.  
Conclusion: Psychological factors and patient demographics are associated with pain tolerance but the single nucleotide polymorphisms evaluated were not. Future pain studies should utilize a psychological assessment to adjust for this as a confounder.

32. Title: Evaluation of the Occurrence of Hypermanganesemia in Patients on Long-Term Parenteral Nutrition  
Project Advisor(s): Kathryn Matthias, PharmD; Carol Rollins PharmD  
Student(s): Olga Lowrey, Laura Thaler  
Specific Aims: Trace elements such as manganese are added into parenteral nutrition formulations to prevent or treat trace elements deficiencies. Excessive amounts of certain trace elements added to parenteral nutritional formulations can cause potential adverse effects. The purpose of this study was to evaluate whole-blood manganese concentrations obtained in patients prescribed parenteral nutrition for more than 30 days. The manganese concentrations obtained were evaluated based on the duration and amount of manganese prescribed in the parenteral nutritional formulations.  
Methods: In this IRB approved project, adult patients prescribed parenteral nutrition for at least 30 consecutive days at an academic medical center or through the outpatient healthcare system between January 2007 and December 2011 were evaluated. Subjects were excluded if no manganese concentrations were obtained while parenteral nutrition was prescribed. Manganese concentrations were grouped by duration that trace elements were added to parenteral nutrition formulations as < 30 days, 30-90 days, 90-365 days, and >365 days. A fifth group of manganese concentrations were evaluated if they were obtained when manganese was not added to the parenteral nutritional formulation for at least 90 days. Data collected included demographic information, reason for initiation and discontinuation of parenteral nutrition, reason for long-term parenteral nutrition, duration of parenteral nutrition, duration and timing of other nutrient sources, amount prescribed and timing of trace elements, trace element concentrations, and documentation of potential manganese toxicity in medical records. A normal manganese concentration was defined as 4.2 to 16.5 mcg/L.  
Main Results: A total of 27 subjects who were prescribed long-term parenteral nutrition were evaluated. Subjects had a median age of 54 years and range of 18 to 71 years. The majority of subjects (53%) were initially prescribed parenteral nutrition for enteric fistula or malabsorption issues while 27% of subjects were classified as have short gut. A total of 41 manganese concentrations were reported with a median value of 20.1 mcg/L and range of 9.1 to 49.9 mcg/L. The percentage of abnormally high manganese concentrations was 0% at 0-30 days, 63% at 30-90 days, 83% at 90-365 days, and 100% at >365 days of parenteral nutrition with manganese added through a multitrace element solution. In subjects who had received parenteral nutrition for at least 90 days without manganese, abnormal manganese concentrations reported rate was 28%. The rate of abnormal manganese concentrations was significant different between 0-30 days compared to 90-365 days (p = 0.015) and > 365 days (p <0.09) of multi-trace element added to parenteral nutrition. The median number of days between the initial day of parenteral nutrition and day manganese concentration checked was 131 days and ranged from 0 to 849 days.  
Conclusion: The majority of commercially available trace element solutions contain approximately 500% per mL of the recommended daily supplementation amount. In 27 subjects who received long-term parenteral nutrition, the risk of hypermanganesemia was significantly associated with durations of parenteral nutrition that contained multi-trace element solutions for more than 90 days.

33. Title: Availability and Cost of Pharmacist-Provided Immunizations at Community Pharmacies in Tucson, Arizona  
Project Advisor(s): Rebekah Jackowski, PharmD  
Student(s): Brian McKinley, Seung Oh, David Zucarelli  
Specific Aims: The objective of this study was to examine the availability of immunizations in community pharmacies and the out-of-pocket cost for those immunizations.  
Methods: Twelve community pharmacies in the Tucson area were examined and one pharmacist in each store was asked to complete a questionnaire. This questionnaire aimed to determine individual immunizations offered at each pharmacy and the out-of-pocket cost for those immunizations.  
Main Results: Differences in the availability and cost of immunizations were compiled for each category of community pharmacy. The categories included Supermarket/grocery store, chain, Mass merchant/big box, and independent pharmacy. Seven of the twelve (58%) pharmacies included in the analysis participated in pharmacist-based immunizations. Three out of the four (75%) supermarket based pharmacies, both chain pharmacies, and two of the four (50%) mass merchant pharmacies, provided immunizations. Neither of the independent pharmacies included in the analysis provided immunizations. The pharmacies that did not currently provide immunizations, none had plans in the future to provide immunizations. There were no other non-prescription immunizations provided at the pharmacies in the study. All seven pharmacies that provided immunization services stated they would accept insurance and only one of the chain pharmacies had a walk in clinic.  
Conclusion: Overall this study demonstrated that there are differences associated with cost and availability of immunization services offered between pharmacies. Further research is needed to determine what hinders community pharmacy from offering immunization services and how to develop a form of commonality between all immunizations offered.
34. Title: Activation Rates of the ADD-Vantage Medication Delivery System in a Community Teaching Hospital

Project Advisor(s): Eric Bergstrom, PharmD; Robert Wolk, PhD
Student(s): Michelle McLain, Ian Palese

Specific Aims: The objective of this study was to describe the failure rate of activation of medications that employ the ADD-Vantage medication delivery system in one community hospital, Tucson Medical Center (TMC).

Methods: A daily, hospital-wide summary was generated identifying all patients currently receiving ADD-Vantage medications using the TMC electronic medical record system, Epic. Data collection occurred on arbitrary days and times from July 2012 to March 2013. Direct observation of a failure or a success in activation occurred by entering a patient’s room after the ADD-Vantage medication was administered by the nurse. Important data collected included: medication, frequency of administration, nursing unit, time of administration, administering nurse, the shift during which the nurse was working and whether or not the medication was or was not properly activated.

Main Results: All medications utilizing the ADD-Vantage medication delivery system at TMC were analyzed. The rate of failure across 347 total samples collected on various days and times was 6.92%. Night shift had a higher rate of failure at 11.43% versus 6.41% for day shift ($\chi^2 = 1.23$). The General Surgery and Cardiac units of the hospital had the highest rates of failure with 18.18% and 15.38% respectively. Zosyn was improperly activated with greatest frequency with 12 total failures.

Conclusion: No statistically significant difference was found between the rates of activation failure for those samples collected during nursing day shift versus night shift. The overall rates of activation failure suggest a significant opportunity for nursing education to improve outcomes.

35. Title: Evaluation of Storage Conditions on Evaporation Rate of IV Solutions

Project Advisor(s): David Lee, RPh
Student(s): Christina Squire, Nathanael Mihoch

Specific Aims: To determine if temperature and direct sunlight influence the rate of evaporation of normal saline in 100ml IV bags.

Methods: Four study groups were created; refrigeration, dark shelf, shelf near window, and EMT box simulation. 80 bags (50 ml bags of normal saline) placed in different areas of temperature change and sun exposure. 20 of the bags stored in a drawer in a refrigerator. 20 stored on a shelf in a dark temperature controlled room. 20 stored next to a window in direct sunlight, and 20 stored outside where temperature and sun exposure will be highest in an EMT simulated box. Weights were recorded (in gms) weekly for 8 weeks using an analytical balance. Each saline bag was weighed individually and recorded at the time of measurement.

Main Results: Rates of volume loss were lower in the normal saline IV bags stored in a refrigerated environment compared to the other two groups stored at room temperature and the one group stored in outside conditions ($p<0.001$). IV bags stored at room temperature exposed to light had the second lowest rate of loss compared to the other two groups ($p<0.001$ compared to outside conditions and $p=0.0003$ compared to closed drawer). Bags stored at room temperature in a closed door had the third lowest rate of loss ($p=0.001$).

Conclusion: Rate of fluid loss from IV normal saline bags appears to be temperature sensitive and storage of these bags may have an impact on shelf life of the product.

36. Title: Appropriateness of antibiotic therapy during the first 72 hours of a hospital visit in patients with community-acquired pneumonia

Project Advisor(s): Kathryn Matthias, PharmD
Student(s): Nick Morey

Specific Aims: The objectives of this project were to determine the time to appropriate antibiotic therapy for community-acquired pneumonia, evaluate the appropriateness of antibiotic changes within a 72 hour period, and to determine the rate of re-admissions for pneumonia.

Methods: A retrospective chart review of patients admitted to an academic medical center in March 2012 with a diagnosis of pneumonia was performed. Subjects under the age of 18 years or who were not treated for infectious pneumonia were excluded. Relevant data were extracted from the subjects’ electronic charts and recorded onto a data collection form. Data collected included antibiotics given within the first 72 hours and times of administration, laboratory results, culture and susceptibility results, radiology results, testing for coccidioidomycosis, reason for readmissions within 30 days if applicable, and demographic information. A descriptive analysis of these data was performed.

Main Results: A total 100 subjects were included in the final data analysis with a mean age of 64 years. During the first 48 hours, patients were prescribed vancomycin (52%), azithromycin (48%), ceftriaxone (41%), moxifloxacin (30%), piperacillin-tazobactam (25%), meropenem (22%), and other antibiotics (26%). The mean (+SD) number of antibiotics prescribed within the first 24 hours was 2.5 (1.1). Either azithromycin, azithromycin plus ceftriaxone, or moxifloxacin only were prescribed in 21% of subjects within the first 24 hours. Within the first day, combinations of broadspectrum antibiotics (meropenem, piperacillin-tazobactam, cefepime) or a combination of ceftriaxone plus either meropenem or piperacillin-tazobactam were prescribed in 6% and 12% of subjects, respectively. The appropriateness of empiric therapy and antibiotic changes is currently in progress. A total of 53% of subjects were discharged with prescriptions for extended course oral or intravenous antibiotics. While 27% of subjects were readmitted within a 30-day period, 9% of subjects were readmitted with either a diagnosis of pneumonia or related respiratory condition. One subject was readmitted within 30 days with Clostridium difficile associated diarrhea. During the initial admission, coccidioidomycosis testing was performed in 38% of subjects.

Conclusion: A variety of combinations of antibiotic agents were prescribed to subjects diagnosed with community-acquired pneumonia. Changes to antibiotic therapies were frequent and often without explanation. Readmission rates for a respiratory related illness within 30-days was approximately 9% and less than 40% of subjects were tested for coccidioidomycosis.
37. Title: Quality Improvement Project: Reduction of Antipsychotic Use in Nursing Home Patients with Dementia  
Project Advisor(s): Jeannie Lee, PharmD; Sandra Brownstein, PhD  
Student(s): Marina Moroz  
Specific Aims: The purpose of the project was to determine if implementation of a detailed pharmacist recommendation form written for providers, could be an effective tool to reduce the use of antipsychotics in the psychiatric nursing home patients with dementia by 15%.  
Methods: The project was conducted by a pharmacy student and a consultant pharmacist at a single psychiatric nursing home. Thirty recommendations were written to the nursing home providers. The prescribers made comments on the forms and returned them to investigators for analysis. Active orders were compared pre and post pharmacy recommendations.  
Main Results: Of the 30 interventions, the prescriber addressed 26 (87%) recommendations and agreed to 15 (58%) of them. Nine recommendations involved either a GDR, discontinuation of a medication, or switching to a non-pharmacological method. Six of the nine (66%) recommendations led to the prescriber reducing the dose or discontinuing the medication. Overall, six out of 30 (20%) interventions resulted in a successful reduction of the use of antipsychotics.  
Conclusion: This project showed that when the prescribers see a more detailed pharmacist written recommendation regarding the therapy, they are more likely to respond with an explanation. However, even though the overall reduction was 20%, black box warnings did not seem to be a deterrent for prescribing in this psychiatric nursing home. Antipsychotics are heavily relied on to control behaviors associated with dementia.

38. Title: Evaluation of sulfamethoxazole concentrations in treatment with high-dose trimethoprim/sulfamethoxazole  
Advisor(s): Kathryn Matthias, PharmD; David Nix, PharmD  
Student(s): Long Nguyen, Gaeta Nkemzi, Brian M. Yee  
Specific Aims: The purpose of this study was to retrospectively evaluate sulfamethoxazole concentrations obtained in adult patients with varying degrees of renal function. The first study aim was to identify sulfamethoxazole serum concentrations obtained from patients who received high-dose trimethoprim/sulfamethoxazole. The second aim is to examine the relationship between sulfamethoxazole concentrations, trimethoprim/sulfamethoxazole doses prescribed, and subjects' estimated renal function.  
Methods: This institutional review board approved study examined sulfamethoxazole serum concentrations in adult patients with varying renal function. Subjects selected had recorded sulfamethoxazole blood concentrations while receiving high-dose sulfamethoxazole/trimethoprim between June 2006 and May 2012 while admitted to an academic medical center. For the first study aim, patients were grouped by renal function with estimated creatinine clearance exceeding 30 ml/min, creatinine clearance of 15 to 30 ml/min, and creatinine clearance of less than 15 ml/min. For the last group, dosing practices were described since few recommendations for this degree of renal function exist. For the first two groups, adherence to literature recommendations was evaluated. The second aim was addressed with a population pharmacokinetic analysis. A one compartment model was used with first-order elimination. Oral dosing was incorporate a separate administration compartment with first order transfer to compartment 1. Intravenous dosing was handled as a rate input into compartment 1. For patients with estimated creatinine clearance greater than 60 ml/min, all doses within the prior 48 hours were entered while those with estimated creatinine clearance less than 60 ml/min only the prior 96 hours of doses before a concentration were entered. Sulfamethoxazole concentrations were assessed in context of trimethoprim/sulfamethoxazole dose and renal function.  
Main Results: A total of 77 subjects who had a total of 206 sulfamethoxazole concentration(s) obtained while receiving high-dose sulfamethoxazole/trimethoprim. The sulfamethoxazole concentrations ranged from undetectable to 316.8 mcg/mL with a median value of 79.6 mcg/mL. The number of sulfamethoxazole concentrations obtained per subject ranged from 1 to 8 concentrations. The pharmacokinetic analysis of these sulfamethoxazole concentrations based on subjects' estimated renal function and doses prescribed is in progress.  
Conclusion: To be determined.

39. Title: Impact of amikacin national drug shortage on aminoglycoside prescribing and drug usage at an academic medical center  
Project Advisor(s): Kathryn Matthias, PharmD  
Student(s): Dalys O'Connor  
Specific Aims: The objective of this study was to compare the use of amikacin 1 year before the national drug shortage and 1 year during drug shortage in order to evaluate the impact of the drug shortage on prescribing amikacin at an academic medical center.  
Methods: All patients admitted to an academic medical center between January 1, 2008 to December 31, 2008 before the shortage and January 1, 2011 to December 1, 2011 during the shortage who were prescribed amikacin were evaluated. Data collected included demographic information, type of infection, aminoglycoside therapy prescribed, laboratory data, culture and susceptibility data, therapy outcomes, and potential complications of aminoglycoside therapy. Appropriateness of amikacin therapy was based on each subject’s clinical condition, culture and susceptibility results, and availability of an alternative antibiotic agent. The use of amikacin was considered inappropriate in subjects with Gram-negative organisms that had either tobramycin or gentamicin minimum inhibitory concentrations of less than or equal to 2 mcg/mL.  
Main Results: A total of 11 subjects in 2008 and 17 subjects in 2011 who were prescribed amikacin were evaluated. The median and range duration of amikacin therapy was 2.2 days and 0-17 days in 2008. In 2011, the median and range duration of amikacin therapy was 4.6 days and 0-38 days. In 2008 and 2011, 27% and 47% were subjects with cystic fibrosis and/or a history of solid organ transplant, respectively. In 2008 73% of amikacin orders were classified as appropriate while 59% of amikacin orders were classified as appropriate in 2011. Ototoxicity was reported in one subject who received amikacin in both 2008 and 2011.  
Conclusion: Despite restrictions for ordering amikacin implemented during a nationwide shortage, the percentage of appropriate orders for amikacin was lower during the shortage compared to before the shortage at an academic medical center.
40. **Title**: Charges and Mortality Associated with Melanoma Complications in a Hospital Setting  
**Project Advisor(s)**: Grant Skrepnk, PhD  
**Student(s)**: Michelle Pangelinan, Kathleen Whitmore  
**Specific Aims**: The purpose of this project was to determine inpatient charges, as well as define the frequency and mortality associated with the various sites of melanoma metastasis.  
**Methods**: Data was taken from the national database Agency for Healthcare Research and Quality (AHRQ) Healthcare Cost and Utilization Project (H-CUP) Nationwide Inpatient Sample (NIS) and was collected on patients admitted into hospital with any diagnosis of melanoma with disease progression of distant metastasis. Logistic multivariate regression was used to find odds ration by patient characteristic. Overall charges were assessed using a gamma multivariate regression. Multivariate regression was used to determine other patient demographics.  
**Main Results**: Average inpatient charges for stage IV melanoma was $32,296 per patient with a national inpatient total bill of $5.56 billion. The metastatic sites associated with the highest inpatient charges were genitourinary tract (exp B = 1.276), gastrointestinal tract (exp B=1.146), bone (exp B=1.132), lung (exp B=1.097), and lymph (exp b=1.092). The most common sites of melanoma dissemination for in-patient mortality cases were lymph (21.7%), lung and respiratory (19.2%), central nervous system (17.1%), and bone (17.1%).  
**Conclusion**: The annual average hospital charges per patient for melanoma with distant metastasis is about $32,000. We suggest that metastases of the genitourinary tract, gastrointestinal tract, bone, lung, and lymphatic system are associated with the highest hospital charges, while metastases to the CNS, bone, liver, lung, GI, and widespread dissemination are associated with increased mortality.

41. **Title**: Fracture Risk with Bisphosphonate Use versus Concurrent Proton Pump Inhibitor and Bisphosphonate Use: A Systematic Review and Meta- Analysis  
**Project Advisor(s)**: Marion Slack, PhD; Jeannie Lee, PharmD  
**Student(s)**: Erin Phoebe, Jeff Pasteur  
**Specific Aims**: To determine whether concurrent use of a proton pump inhibitor (PPI) and a bisphosphonate represent an additional fracture risk compared with bisphosphonate use alone and to identify an increased risk of any particular fracture type.  
**Methods**: This study was a systematic review and meta-analysis of data collected from PubMed, Cochrane, OVID Medline, Google Scholar, and IPA. The authors utilized the search terms: bisphosphonate, fractures and proton pump inhibitors. Studies which met criteria of being English-language with adults 18 years of age and older were included.  
**Main Results**: The studies were cohort studies and primarily evaluated older adults. The summary effect was that use of a PPI with a bisphosphonate showed a slight increase in fracture risk when compared to bisphosphonate-only therapy (odds ratio [OR] 1.12, 95% confidence interval [CI], 1.06-1.18). Systematic review of similar studies showed varied results, making difficult any conclusion regarding fracture risk among the treatments.  
**Conclusion**: In this analysis, PPI + bisphosphonate demonstrated a slight increase in fracture rate without inference to an increase in any particular fracture type compared with bisphosphonate only. However, there is minimal data on the association or causal effect of this increase. The few studies available offered contradictory results. Additionally, database studies are subject to the possibility of residual confounding. Further research using randomized control trial (RCT) design evaluating long term use of bisphosphonates with or without PPI and their impact on fractures is needed to determine if there is an additional degree of fracture risk from the concurrent use.

42. **Title**: Effects of Exenatide Twice Daily and Once Weekly on Weight Loss  
**Project Advisor(s)**: Marion Slack, PhD  
**Student(s)**: Rajal Patel, Katrina Skuba, Michelle Wild  
**Specific Aims**: To determine the effectiveness of exenatide twice daily (ExQW) versus exenatide once weekly (ExQW) on weight loss in type II diabetes.  
**Methods**: This study was a meta-analysis. The studies came from the PubMed database and Cochrane Reviews. To be included in the meta-analysis, studies must have been randomized controlled trials comparing ExQW to ExQW or drug to placebo. The studies that reported weight loss and/or HbA1C were included. Studies that included participants <18 years of age or compared only one dose of exenatide with other anti-diabetic medication without comparing to placebo were excluded. There were 13 studies that met the inclusion criteria and were included in the meta-analysis. The primary outcome was weight loss, and the secondary outcome was HbA1C levels. Meta-analysis was used to synthesize data.  
**Main Results**: The difference between ExQW and ExQW on weight loss was not statistically significant (standardized mean difference (SMD) = -0.71, CI -0.84 to -0.58 in ExQW vs SMD = 0.82, CI -1.02 to -0.62 in ExQW; p =0.36). The effect of ExQW on A1C was significantly larger than ExQW (SMD = -1.69 vs -1.07 respectively; p < 0.01). The variability was very high in the ExQW group (69% - 81%) compared to ExQW group (0%). Kendall’s tau was significant (p = 0.01) indicating that there may be publication bias.  
**Conclusion**: There is no difference in effect of weight loss between ExQW and ExQW group. Both dosages significantly improve A1C; however, ExQW has larger impact on A1C compared to ExQW.
43. **Title:** Evaluating Practice-Based Research Network (PBRN) Websites Using an Information Extraction Form and Interviews of Website Webmasters  
**Project Advisor(s):** Elizabeth Hall-Lipsy, JD  
**Student(s):** Sheida Rahimzadeh, Veronica Ramirez  
**Specific Aims:** To evaluate and describe the Agency for Healthcare Research and Quality (AHRQ) affiliated practice-based research network (PBRN) websites to determine the best qualities regarding format, content, and accessibility using a developed PBRN website information extraction form.  
**Methods:** A PBRN information extraction form was developed to assess the format, content, and accessibility of each AHRQ-affiliated PBRN website. Each student investigator completed an electronic copy of the extraction form for each PBRN website to confirm consistency of findings. A phone interview was then conducted with the webmasters of the PBRNs with the highest scores to determine the influences and challenges those webmasters faced during the development of their PBRN websites.  
**Main Results:** The information extraction form was completed for each of the 104 active PBRN websites in the U.S. The most common elements seen on the PBRN websites were site map, email address, mission statement, phone number, and search toolbar. The inter-rater agreement between the two student investigators for the data collected was 84 percent. Regarding the webmaster interviews, the majority of the webmasters believed that the single most important factor in creating a successful PBRN website was identifying the audience of the PBRN and making the material appropriate for that audience.  
**Conclusion:** The developed information extraction form was used to successfully evaluate and describe the AHRQ-affiliated PBRN websites. Audience identification is important in order to provide appropriate content, as well as in the development of an effective PBRN website.

44. **Title:** The Assessment of Clinical and Economic Outcomes Associated with Stroke in Rural Emergency Departments  
**Project Advisor(s):** Grant H. Skrepnek, PhD  
**Student(s):** Traci Richards, Marianne Tysoe  
**Specific Aims:** The purpose of this study was to assess the clinical and economic predictors associated with rural emergency department visits in stroke patients.  
**Methods:** The current research was a retrospective, observational, cohort study. Multivariate regression was used to assess data from the Agency for Healthcare Research and Quality (AHRQ) 2009 Nationwide Emergency Department Sample (NEDS). Inclusion criteria were at least 18 years of age and rural ED admission with principle diagnoses of stroke.  
**Main Results:** Significant results for risks included: Intubation for increased mortality (OR = 17.432, p = 0.001), increased length of stay (IRR = 1.643, p = 0.018) and increased charges (exp β = 2.289, p < 0.001); myocardial infarction for increased mortality (OR = 1.969, p = 0.006), decreased charges (exp β = 0.862, p = 0.013) and decreased length of stay (IRR = 0.853, p = 0.001); moderate to severe liver disease for increased mortality (OR = 62.691, p = 0.001) and reduced length of stay (IRR = 0.517, p = 0.025); congestive heart failure for increased mortality (OR = 1.978, p = 0.003) and increased charges (exp β = 1.118, p = 0.039); non-specific cancer (OR = 2.447, p = 0.017) and metastatic cancer (OR = 4.799, p = 0.016) for mortality; hemiplegia/paraplegia for increased charges (exp β = 1.173, p < 0.001).  
**Conclusion:** The current study found a better understanding of national estimates of burden of illness to further define clinical decision rules for stroke in rural emergency departments.

45. **Title:** Evaluating the efficacy and safety of apixaban, a new oral anticoagulant, using Bayesian meta-analysis  
**Project Advisor(s):** Daniel Malone, PhD; Lorenzo A Villa, PharmD  
**Student(s):** Daniel Ross  
**Specific Aims:**  
- To determine the efficacy of apixaban when compared to LMWH (enoxaparin) when used as thromboprophylaxis for patients undergoing total hip arthroplasty (THA), total knee arthroplasty (TKA), and medically ill patients  
- To determine the safety of apixaban when compared to LMWH (enoxaparin) when used as thromboprophylaxis for patients undergoing total hip arthroplasty (THA), total knee arthroplasty (TKA), and medically ill patients  
**Methods:** A systematic search of the literature for randomized controlled trials of apixaban thromboprophylaxis therapy versus enoxaparin was conducted using three databases: PubMed, EMBASE, and the Cochrane library. Data from five studies with 12,938 total patients were analyzed using Bayesian random effects meta-analysis. To evaluate efficacy, a composite of venous thromboembolism and death during follow-up was measured. To evaluate safety, major and total bleeding events were considered.  
**Main Results:** The odds ratio (OR) for the composite outcome of thromboembolism/death was 0.66 (95% CI: 0.33 to 1.29) for apixaban compared to enoxaparin, while there was a similar risk of major bleeding (OR=1.03, 95%CI: 0.36 to 3.73) and total bleeding (OR=0.92, 95%CI: 0.64 to 1.20).  
**Conclusion:** These results suggest a lack of clear superiority of apixaban relative to enoxaparin. Apixaban is an oral alternative with similar efficacy and safety to existing anticoagulant therapies.
46. Title: The Association of Vitamin D Supplementation with Type I Diabetes in New Born and Pregnant Mothers: A systematic Review

Project Advisor(s): Marion Slack, PhD; Richard Herrier, PharmD

Student(s): Newsha Sarmadian

Specific Aims: To assess whether vitamin D supplementation is associated with a reduced risk of type I diabetes in infants.

Methods: This study was a systematic review using Pubmed, Google Scholar and reference lists of retrieved articles. Only randomized controlled trials and prospective observational studies were considered for this study. Data were extracted and organized into tables. The data were organized into three categories; study characteristics, patient characteristics and study outcomes. The main outcomes were association of type I diabetes with vitamin D deficiency and identify the proper dose of vitamin D in pediatric population.

Main Results: A total of 3 randomized controlled trials and 2 prospective observational studies were found that met the inclusion criteria; retrospective studies and case control studies were excluded. Combining all studies, no association was seen between vitamin D supplement and control group. Most of the randomized control studies have not shown a statistically significant association between Hb A1C, C-Peptide and vitamin D level with type I diabetes. The Gabbay et al. study showed that vitamin D serum concentrations (25(OH)D3) in the cholecalciferol and placebo groups were not significant at 6 (P=0.93), 12( P= 0.81) and 18 (P= 0.53) months of follow up. The vitamin D concentration was increased during the 6 months period compared to baseline value (Basal: 26.3±4g/mL vs 6 months: 60.88 ng/mL; P <0.01). Also, Bizzarri et al. study showed that at 6, 12, and 24 months the A1C and insulin usage in both calcitrol and placebo groups were not different. On the other hand, the observational study by Vojtková et al. showed that two thirds of children with type I diabetes had insufficient vitamin D concentration and lower Z score of lumbar spine. Also, the Frönczak observational study showed that maternal intake of vitamin D via food was significant in decrease of IA-2 autoantibodies in offspring (HR=0.37;95%CI 0.17-0.78). Variety of different dosage of vitamin D supplement has been used in primary literatures. The data from Wicklow and Hypponen et al. used 2000IU/d that decreased risk of type I diabetes in diabetes type I.

Conclusion: Reported studies did not have consistent conclusion for association of type I diabetes and vitamin D. The data from the randomized clinical trials have shown that vitamin D supplementation can increase serum vitamin D >30 ng/ml but none support the use of vitamin D in prevention of type I diabetes. Given the lack of data to support the use of vitamin D to reduce the risk of type I diabetes, vitamin D supplementation should be used to supplement vitamin D levels in children not exposed to adequate sunlight. There is no clear recommendation dose for treatment and prevention of vitamin D supplementation for pediatric patients. Therefore, monitoring and routine measurements of vitamin D by physician can play an important role. More randomized control trials with large sample would be needed to answer all of the unknown questions regarding the dosage of vitamin D supplement.

47. Title: Impact of Olanzapine on Refractory Chemotherapy-Induced Nausea and Vomiting: a Retrospective Study

Project Advisor(s): Myke Green, PharmD

Student(s): Laurel Seibert, Sierra Vig

Specific Aims: To describe the outcomes of olanzapine in the treatment of refractory chemotherapy-induced nausea and vomiting (CINV).

Methods: Data were collected regarding demographic information, chemotherapy regimen, CINV prophylaxis, rescue antiemetics, and olanzapine usage for subjects, age 18-79, who were admitted to the University of Arizona Medical Center for chemotherapy and received at least one dose of olanzapine for CINV between January 2008 and January 2012. The primary outcome measure was the number of rescue antiemetics required following the first dose of olanzapine (greater than 10 doses was considered treatment failure). Comparisons using chi square to determine if differences existed with respect to the level of chemotherapy emetogenicity and demographic information were conducted.

Main Results: No statistical difference between chemotherapy regimens of high versus low-to-moderate emetogenicity was seen (P=0.79).

Conclusion: This study demonstrated a trend towards greater emetic control with the addition of olanzapine in patients failing first-line antiemetic pharmacotherapy. Additionally, a trend towards greater emetic control was seen in women. The rates of success among all groups may suggest benefit to adding olanzapine to subjects experiencing refractory CINV. Due to the limited sample size and retrospective methodology of the study, the use of olanzapine in refractory CINV merits further research with large, prospective studies directly comparing addition of olanzapine to other appropriate antiemetics.

48. Title: A meta-analysis of alternative and complementary medicine for the treatment of insomnia

Project Advisor(s): Marion Slack, PhD; Jennie Lee, PharmD; Bismark Baidoo, M.S.

Student(s): Hyun W. Song

Specific Aims: To evaluate three complementary and alternative medicines (CAM), tai-chi, acupuncture, and melatonin, for treating insomnia using meta-analysis assessment of randomized controlled trials.

Methods: The electronic database MEDLINE (PubMed) was searched from May of 2012 to November of 2012 by using the terms “sleep initiation and maintenance disorders” AND “tai-chi” OR “melatonin” OR “acupuncture”. All of the searches ended at November of 2012. Data extraction was conducted independently by 2 investigators and any disagreements were resolved by consensus. If the 2 investigators could not agree, the study was reviewed by all 4 investigators.

Main Results: Out of 500 studies that were initially retrieved, 12 studies were included; 3 for tai-chi; 4 for acupuncture; 5 for melatonin. We found that the effect of each type of intervention was significantly different than zero, p<0.01 thus all were effective in treating insomnia. From our analysis, acupuncture was the most effective (standard mean difference, SMD=0.66; p<0.01) followed by tai-chi (SMD=0.43; p<0.01) whereas melatonin was the least effective (SMD=0.26; p=0.04) but difference between acupuncture and melatonin was not significant (p=0.15).

Conclusion: All three interventions were found to be effective in treating insomnia. However, due to mixed and inconsistent data of the studies, poorly designed trials, and small sample size, further large, well-controlled trials are warranted.
49. **Title:** Meta-Analysis: Pharmacological Treatment of Depression in Advanced Cancer  
**Project Advisor(s):** John Regan, PhD  
**Student(s):** Matthew Stewart  
**Specific Aims:** To evaluate efficacy of the current pharmacological treatment of depression in the adult advanced and terminal cancer patient population.  
**Methods:** Trials assessing a pharmacological treatment for depression in cancer patients were found using MEDLINE and PSYCINFO databases. Comprehensive Meta-Analysis software was used to generate a random effects model forest plot, a funnel plot, classical fail-safe N, I2, and Kendall’s tau.  
**Main Results:** Ten studies, with an aggregate population was 1,167 patients, were used in this meta-analysis to generate a random effects variance model. The effect size was 0.42 +/- 0.09 (p < 0.01). I2 for aggregate data was 66.16 (p < 0.01). Kendall’s tau with continuity correction was 0.272 (P-value [2-tailed] = .244). The classic fail-safe N was 151 (p < 0.1). Three studies reported a significant increase in adverse effects between treatment and comparison group.  
**Conclusion:** Antidepressants were shown to have a moderate effect size when treating depression in advanced and terminal cancer patients. These medications were well tolerated. Antidepressant medications are beneficial as part of a comprehensive treatment plan for cancer patients diagnosed with depression.

51. **Title:** An evaluation of pharmacy regulation waivers granted to Arizona pharmacies from 2002 through 2012  
**Project Advisor(s):** Philip Schneider, MS; Hal Wand, RPh  
**Student(s):** Steven Warren  
**Specific Aims:** To compile and evaluate the impact of Arizona pharmacy rule waiver requests from 2002 through 2012 and to determine the current status of these waivers.  
**Methods:** Minutes of the Arizona State Board of Pharmacy (ASBP) meetings were reviewed to identify pharmacies which had sought waivers to Arizona state pharmacy regulations. Information was collected from the ASBP meeting minutes and from the ASBP pharmacy permits database. Persons at the pharmacies were contacted regarding their operation, whether the waiver was still in use, and any perceived impact the waiver had made.  
**Main Results:** Fifty waivers were requested of the ASBP. All but three of these requests were granted. The most waivers were requested for hospital and mail order pharmacies and the most common requests were for a smaller than required pharmacy floor plan area, no pharmacist final inspection or initialing, and fewer than the required hours of operation. One waiver was associated with a poor outcome and was subsequently rescinded. Three waivers were followed by rule changes. Some waivers improved pharmacy service to underserved or specialty patient groups and others increased patient convenience or eliminated unnecessary labor, facilities or equipment. One waiver reduced product waste and another enabled pharmacy students to get compounding experience. Several waivers allowed technicians to work from home. About half the waivers are either no longer in use or were never used.  
**Conclusion:** The waiver process has helped pharmacy evolve. The waiver process has also allowed businesses to serve underserved populations and special patient groups.

52. **Title:** Pediatric Education Diagnosis Survey (PEDS): Analyzing pediatric education within PharmD programs in the United States  
**Project Advisor(s):** Hanna Phan, PharmD; Terri Warholak, PhD  
**Student(s):** Phillip Weddle  
**Specific Aims:** To evaluate the level of didactic and experiential pediatric education currently provided in ACPE-accredited Doctorate of Pharmacy (PharmD) programs throughout the United States by comparing geographic location and type of institution.  
**Methods:** Questionnaires were administered electronically to pediatric clinicians through the American College of Clinical Pharmacy (ACCP) Pediatric Practice and Research Network (PRN) listserv and consisted of demographic questions as well as questions regarding the number of hours of didactic pediatric education within courses, the number of hours of experiential education, and the specific pediatric experiences available to students.  
**Main Results:** Questionnaires were completed by 36 Colleges of Pharmacy (29%) and included 26 dedicated pediatric faculty, 9 adjunct pediatric faculty, and 1 non-pediatric faculty who were the primary instructors for pediatric education. The average reported number of pediatric didactic hours was 16.3±19.2 hours. Pediatric didactic education was similar between private and state funded institutions (p=0.24) as well as geographic location (p=0.74). The percentages of students taking the different types of experiential rotations were similar between state funded and private institutions (p=0.64). There was a significant difference between regions for the percentage of students participating in pediatric APPE rotations (p=0.001). Specifically, the Northeast and Midwest regions showed a higher percentage than the South Atlantic, South Central, and West regions (p=0.001). Programs commonly reported the following pediatric rotations: general pediatrics (78%), pediatric critical care (69%), neonatal critical care (67%), and pediatric ambulatory care (28%).  
**Conclusion:** Pediatric didactic and experiential education appears to be consistent between state and privately-funded institutions as well as between geographic regions with the exception of a higher percentage of students in the Northeast and Midwest participating in pediatric APPE.
53. Title: Evaluating Diabetes Interventions in American Indian Populations, A Systematic Review  
**Project Advisor(s):** Elizabeth Hall-Lipsy, JD  
**Student(s):** Sterling White  
**Specific Aims:** Conduct a comprehensive and systematic review to identify and describe studies from October 2010 to May 2012 that have addressed diabetes interventions in American Indian populations and assess the impact those interventions had on improving humanistic and therapeutic outcomes in preventing or treating diabetes in American Indians.  
**Methods:** Studies published between 5 October 2010 and 30 May 2012 that described diabetes interventions or programs in American Indian populations were identified via electronic searches of PubMed, CINAHL, IPA, Cochrane, PsychINFO, Web of Science, and ERIC using key search terms related to (and MeSH terms where applicable) diabetes, interventions, medication adherence, diet, exercise, blood glucose, cholesterol, blood pressure, North American Indians, American Indians, Native Americans, and Alaska Natives. Articles were reviewed and were excluded if the study had no comparison group, was not interventional or programmatic in nature, took place outside the US, study population was < 50% American Indian, or did not report on patient-related outcomes. Data on study characteristics, patient characteristics, and study outcomes were extracted.  
**Main Results:** A total of five studies were included. Positive, significant effects were reported on A1c in 40% (n=2), cholesterol in 40% (n=2), blood pressure in 40% (n=2), weight/BMI in 20% (n=1), blood glucose monitoring in 20% (n=1), diet in 20% (n=1), and diabetes knowledge and health literacy in 20% (n=1).  
**Conclusion:** The literature review had minimal results. Of those included, the majority of diabetes interventions were educational-related, observational in design, assessed only adults, and study populations were primarily female. Few of the included studies interventions demonstrated significant improvements in diabetic outcomes. Continued research and efforts to further improve diabetes management within the American Indian community is needed.

54. Title: Comparing Population Characteristics, Healthcare Systems and Pharmacists’ Intervention for Elderly between Brazil and United States  
**Project Advisor(s):** Jeanne Kim Lee, PharmD; Marion Slack, PhD  
**Student(s):** Juliana Pinto Morales, Kirla Barbosa Detoni  
**Specific Aims:** The purpose of this study is to compare population characteristics and health care systems between Brazil and United States, learn with each country’s strengths and weaknesses what could be done to improve health delivery and quality of service, as well as to compare the role of the pharmacist in the health organization and the power of the intervention for elderly. Furthermore, there are no published studies that compare these two countries in these related topics, what reinforces the significance of the study.  
**Methods:** To compare the Brazilian and American healthcare systems and population characteristics we used specific databases to find the data, such as WHO, CDC, OECD, DataSUS and others. To compare pharmacists’ intervention we analyzed published studies conducted in elderly, for Brazil we did a bibliographic search in Medline/PubMed, Scielo and LilACS, and for U.S. we used a systematic review and meta-analyses by Lee et al. The data was summarized in three tables, one comparing population characteristics, a second comparing the healthcare systems and the third, comparing pharmacists’ roles.  
**Main Results:** The population of the United States is about 1.6 times larger than the Brazilian population and with a median age of 36 years against 32.1 years, American population is older. Also, there are more adults aged 65 years or older in U.S. (13.1%) than in Brazil (6.8%). Life expectancy is longer in the U.S. (78.7 against 73.2 years) but there are higher levels of chronic disease among elderly. Much less is spent on health care in Brazil, $990 per capita versus $8362 per capita in U.S. The percent of total health expenditures by each government is about the same, 47% for Brazil and 48% for U.S. According to published data, pharmacists’ activities, practice settings and outcomes measured are more robust in the U.S.  
**Conclusion:** Brazil spends much less than the U.S. on health care with small differences in life expectancy and with lower levels of chronic disease. Although United States spends more with healthcare, it does not mean that it has the best system. In the same way, only because Brazil has a public health national coverage, it does not mean that all population needs are met. There is more published data available on American pharmacists and it seems that activities are broader in caring for older adults than in Brazil.