1. Title: Assessing Nutrition Knowledge in Future Healthcare Professionals

**Project Advisor:** Terri Warholak, PhD  
**Students:** Amanda Zale, Johanna Peragine

**Objectives:** The purpose of this study was to measure and compare basic nutritional knowledge in first year health professional students. Authors hypothesized that nursing students would have more nutritional knowledge since a nutrition prerequisite was required.

**Methods:** In fall 2013 authors’ surveyed 244 subjects at a University, comprising of first-year medicine, pharmacy, and nursing students. A descriptive, cross-sectional study was performed utilizing a print-based questionnaire containing 3 descriptive and 14 multiple-choice questions (21 total points). Each college’s average score was compared using chi-square analysis. The a priori alpha was 0.05 (Bonferroni correction = 0.016).

**Results:** The overall response rate was 93%; 91%, 97%, and 92% for Medicine, Pharmacy, and Nursing, respectively. Average scores per college were: 6.50±1.76, 5.88±2.00, and 5.72±2.08, respectively. Analyses showed no significant difference between groups (p>0.016).

**Conclusions:** Although no difference in nutritional knowledge was identified between groups, the low scores reflect insufficient knowledge and suggest the need to re-evaluate curricula.

2. Title: A comparative study of self-reported medication knowledge and attitudes of patients with psychiatric conditions with or without participation in patient medication education group

**Project Advisors:** Lisa Goldstone, PharmD; Terri Warholak, PhD  
**Students:** Kayla Ward, Maria Tedesco, Danielle Okerblom

**Objectives:** To compare the self-reported medication knowledge and attitudes of patients with psychiatric disorders who attended a patient medication education group (PMEG) versus those who did not.

**Methods:** A convenience sample of 288 patients being discharged from an adult inpatient psychiatric unit was used. Just prior to discharge, patients were offered the opportunity to complete a questionnaire to assess their medication knowledge and attitudes. Patients who consented and attended the PMEG were assigned to the treatment group (n=81), while those who did not attend the PMEG were assigned to the control group (n= 207). The survey included nine statements for which the patients selected either agree or disagree. A Rasch analysis was used to analyze scaled questions. Chi-squared tests and Mann-Whitney U were used to analyze nominal and ordinal data, respectively. Demographic data was also collected. An alpha priori of 0.05 was applied. A Bonferroni correction was applied for multiple tests.

**Results:** Patients who attended the PMEG were found to have a higher level of education compared to those who did not attend (p=0.037). There were no significant differences in knowledge and/or attitudes between those who attended PMEG during this admission versus those who did not attend (p=0.065). However, those who attended a PMEG during a previous hospital admission had a more positive attitude toward taking their medications (p=0.025).

**Conclusions:** Results suggest that attitudes toward taking medications may gradually improve over time after patients attend a PMEG during an acute inpatient psychiatric admission.
3. Title: Impact of a Nationwide Medication Therapy Management Program on Drug-Related Problems at the Medication Management Center in 2012  
Project Advisors: Jill Augustine, PharmD; Kevin Boesen, PharmD  
Student: Brittany Tse  
Objectives: To compare provider acceptance rates of medication therapy management (MTM) interventions initiated by a MTM center for potential drug-related problems in 2012. Interventions included cost-savings to patients, adherence to clinical guidelines, medication adherence, and safety initiatives.  
Methods: This retrospective cross-sectional project measured the provider acceptance rates of MTM interventions for Medicare Part D beneficiaries. Intervention count and acceptance rates were analyzed from the center’s MTM software and database that utilizes prescription claims analysis post-intervention to determine intervention success. A chi-square test was used to assess the statistical significance between the interventions. An alpha level of 0.5 was determined a-priori. This was a quality improvement project, and Institutional Review Board approved this project as exempt status.  
Results: The total percent of recommendations accepted was 35% (159,795 out of 455,898). The rate of acceptance was highest for safety interventions (51%), followed by cost (35%), adherence (12%), and guidelines (8%). The acceptance rates for the four intervention types were statistically different from each other (p-value <0.0001). Within each intervention type, the most frequently accepted interventions were: removal of medications from the Beer’s Criteria (8% of safety related changes); changes from a brand name, non-oral medication like eye drops and nasal sprays, to a generic within the same class (15% of cost-saving related changes); improved adherence to hypertension and diabetic medications (29% of adherence related changes); and adding an antihypertensive agent to diabetic patients (62% of clinical guideline related changes).  
Conclusions: Safety initiatives had the highest acceptance percentage of all four intervention types. Approving more safety interventions with medication use may reduce the risk of morbidity and mortality. Pharmacists providing MTM services may want to increase focus on drug safety as providers are accepting more safety interventions. More research is needed to determine why providers approve the other recommendations at lower rates.

4. Title: Evaluation of treatment and outcomes in infants and children with urinary tract infection  
Project Advisors: Hanna Phan, PharmD; Megan Brandon, PharmD; Kathryn Matthias, PharmD  
Students: Amy Nguyen, Sarah Deitering  
Objectives: In 2011, the American Academy of Pediatrics released an updated urinary tract infection guideline that addressed diagnosis, antibiotic treatment, and duration of therapy in children ages 2-24 months. The objectives of this study were to evaluate the appropriateness of antibiotic prescribing and compare outcomes between age groups.  
Methods: This retrospective chart review included patients aged 1 month through 12 years admitted to a regional academic medical center from January through July 2014 and diagnosed with UTI or pyelonephritis. Patients were identified using ICD-9 codes. Demographic information, antibiotic treatment, length of stay, and complications were collected and the chi square statistical test was used to compare results between age groups.  
Results: There were 104 patients included in this study. The most common bacteria cultured were Escherichia coli (85%). Ceftriaxone (71%) and cephalaxin (30%) were the most commonly prescribed empiric and discharge antibiotic, respectively. Based on guideline recommendations and culture results, inappropriate antibiotic selection only occurred with 7% of the orders while inappropriate prescribing occurred 35% of the time. Readmission within 90 days occurred in 15% of patients aged 2-24 months (guideline age group) and in 14% of all other patients (P>0.05).  
Conclusions: There was no difference between age groups with respect to inappropriate antibiotic prescribing or complications for pediatric UTI treatment and inappropriate antibiotic dosing occurred more frequently than inappropriate selection. More research is necessary to assess the impact of the guidelines on prescribing practices and factors associated with inappropriate prescribing.
5. Title: Three factor Prothrombin Complex Concentrate to Reverse Warfarin Treated Mechanical Circulatory Device Patients Immediately Prior to Heart Transplant

Project Advisor: Richard Cosgrove, PharmD

Student: Bryan Sears

Objectives: To determine if using three-factor prothrombin complex concentrate (PCC) immediately prior to heart transplantation reduces blood product transfusions in patients bridged to heart transplantation by mechanical circulatory support (MCS) devices who are treated with warfarin.

Methods: This study retrospectively reviewed patients that either received PCC or received usual care (i.e. fresh frozen plasma – FFP) prior to heart transplantation. Outcomes that were evaluated included packed red blood cell (RBC), FFP, platelet and cryoprecipitate transfusions intra and five days post-operatively, Cell Saver autologous blood volume administered intra-operatively, chest tube output for the five days post-operatively, and thromboembolic events post-operatively.

Results: There were 24 patients included in the study, 12 from each group. The PCC group showed significantly less intra-operative RBC transfusion (2.60 ± 1.49 units vs. 5.09 ± 2.42 units, p=0.018), Cell Saver autologous blood usage (2.60 ± 1.49 units vs. 4.02 ± 1.55 units, p=0.032), and FFP transfusion (2.14 ± 2.30 units vs. 10.94 ± 5.96 units, p=0.0005) than the usual care group. There was no difference in amount of vitamin K given, change in INR, platelets administered, cryoprecipitate administered, chest tube output, or thromboembolic events between the groups. The average dose of PCC was 31 units/kg IV; repeat doses were given to 2 patients.

Conclusions: We propose that the use of PCC prior to heart transplant surgery for patients on MCS devices anticoagulated with warfarin may result in the reduction for the need of RBC’s, autologous blood use and FFP during surgery.

6. Title: Measurable Benefit of Targeted versus Comprehensive Medication Reviews in Medication Therapy Management

Project Advisor: Kevin Boesen, PharmD

Student: Allison Buhl

Objectives: To determine whether comprehensive medication reviews (CMRs) or non-CMR interventions following targeted medication reviews (TMRs) resulted in more positive medication changes. A CMR is a structured medication management session that includes a full review of an individual’s medical and medication records. Non-CMR interventions are more targeted problem-based interventions that include shorter medication management sessions, written patient outreach, and direct to provider interventions.

Methods: This cross-sectional quality improvement project compared the number of individuals with positive medication changes who received a CMR to those with positive medication changes who did not receive a CMR (non-CMR). Individuals were included in this project if they qualified for the Medication Management Center’s (MMC) pharmacist-driven medication therapy management (MTM) program and received their medication review(s) in 2012 or 2013. The addition of an appropriate medication or the removal of an inappropriate medication was considered a positive medication change within 120 days of intervention. Odds ratios were calculated using Wilcoxon Rank Sum.

Results: A total of 418,649 participants in 2012 and 370,107 in 2013 had their medications reviewed as part of the MTM program. The non-CMR group accounted for the majority of the interventions (375,159 for non-CMR versus 43,490 for CMR in 2012 and 332,006 versus 38,101 for 2013). Significantly more positive medication changes were achieved in the non-CMR group (n=88,467 for 2012 and n=54,971 for 2013) following the medication review compared to the CMR group (n=9,796 for 2012 and n=7,034 for 2013). CMR recipients were more likely to receive a recommendation (odds ratio 0.70, 95% confidence interval 0.69-0.72 for 2012 and odds ratio 0.62, 95% confidence interval 0.60-0.63 for 2013). Non-CMR recipients were more likely to have a recommendation result in a medication change (odds ratio 1.24, 95% confidence interval 1.21-1.28 for 2012 and 1.26, 95% confidence interval 1.22-1.30 for 2013).

Conclusions: While the percentage of participants who received a recommendation in the non-CMR group was lower, a greater percentage of these participants received a medication change. This indicates that non-CMR interventions following TMRs may be more effective in producing a positive medication change compared to CMRs.
Title: Comparison of pharmaceutical quality and product performance of albuterol inhalers available in the US and those obtained in Mexico for a fraction of US cost

Project Advisors: Paul Myrdal, PhD; Kelly Karlage

Students: Meira Nocella, Emily Kilber, Brittney Witmer

Objectives: American residents travel to Mexico to purchase medications, like albuterol inhalers, for 1/3 to 1/5 of the US price without prescription requirements. A previous bioequivalence study found clinical differences (P less than 0.05) between Ventolin and Assal, two Mexican manufactured albuterol inhaler brands. What other differences are there among such inhalers when we test more brands and analyze pharmaceutical qualities like respirable mass? This study seeks to provide some reasonable expectations for a medical tourist of Mexico who purchases albuterol metered dose inhalers (MDIs) by comparing the product performance of some of the brands available to the consumers in Mexico.

Methods: This study examined the performance of albuterol MDIs obtained from pharmacies in Nogales, Mexico. At least two units were purchased for each of the following brands: Xeneric-S, Victory, Ventolin (GlaxoSmithKline), Assal, and Sacrusyt. At least two lot numbers of each brand were included, with the exception of Sacrusyt, for which a second lot was unavailable at the purchase times. Sample MDIs were compared to US-purchased albuterol inhalers, Proventil and Ventolin. Total dose and respirable mass were determined for each MDI. These parameters were measured by actuating each inhaler into a USP throat, coupled to a cascade impactor, which separates drug particles based on aerodynamic particle size. Particles with an aerodynamic diameter larger than 4.7 micrometers are considered non-respirable, while particles less than 4.7 micrometers are considered respirable and the total of respirable and non-respirable particles is the respirable mass. The total dose delivered is determined by calculating the amount of drug that deposits onto the throat and the impactor. Quantification of albuterol was determined by high performance liquid chromatography (HPLC). In brief, the HPLC assay utilized an Apollo C18 column with a mobile phase of 1 percent phosphoric acid:methanol (77:23) at a flow rate of 0.75mL/min; UV detection was at 225 nm.

Results: Every inhaler was sold in a Spanish-labeled box containing a single page instruction insert and every inhaler label had a visible lot number, expiration date, and noted a 100 microgram dose. Listed manufacturing locations included China, Mexico, India, and Spain. All of the MDIs were purchased for about $3 to $5 each except for non-US Ventolin ($10-$20 each).

The measurements of total dose and respirable mass among the five Mexican purchased brands of inhalers varied widely. The MDIs’ average total doses ranged from 57 to 75 micrograms per actuation, while the average total dose of the US purchased MDIs was 79 to 82 micrograms. The respirable mass of the non-US MDIs was more similar. Among the study MDIs, respirable mass ranged from 28 to 41 micrograms, which compares to 38 to 42 micrograms for the two US branded albuterol inhalers.

To further investigate the variability among the study MDIs, student t-tests were performed to compare the mean respirable mass for each brand to that of the other four brands. All comparisons were significantly different (p less than 0.05) except for two (Sacrusyt vs Assal, p equals 0.89; Xeneric vs Ventolin, p equals 0.98).

Conclusions: Since significant pharmaceutical variability was found among the albuterol MDIs evaluated in this study, clinicians and patients should be conscious of possible differences in quality, therapeutic efficacy, and safety for albuterol MDIs obtained in Mexico. Sample MDIs compared to each other were statistically different in total dose and respirable mass. Thus a patient who has used US MDIs before can’t necessarily expect to get the same dose from non-US brands.
8. Title: Evidence-Based Use of Prophylactic Anticholinergic Medication in Combination with Antipsychotic Pharmacotherapy in an Acute Inpatient Psychiatric Setting  
Project Advisor: Lisa Goldstone, PharmD  
Students: Vivian Chyan, Megan Shell  
Objectives: The study aimed to increase EPS risk factor assessment when prescribers order prophylactic anticholinergics with antipsychotics. An evidence-based pharmacist checklist card was developed to aid in this decision making process.  
Methods: A retrospective chart review of patients admitted to the acute inpatient psychiatry units at an academic medical center was conducted to determine baseline prophylactic anticholinergic prescribing habits over a two-month period. Charts were included if the patient was at least 18 years old and ordered at least one scheduled antipsychotic during the admission. An educational intervention session introduced the pharmacist checklist card and shared baseline findings. Post-intervention data was collected during a two-month period following the intervention. The percentage of prophylactic anticholinergic orders based upon pharmacist checklist card parameters pre and post-intervention was analyzed using chi-square test.  
Results: There was a significant decrease in the total percentage of orders for prophylactic anticholinergics from 72.7% in the pre-intervention period to 50.8% in the post-intervention period (p<0.001). Significant changes in the percentage of orders for prophylactic anticholinergics were also found for patients at no-to-low risk for EPS (56.4% versus 31.8%, p=0.014) and at low-to-moderate risk for EPS (79.6% versus 50.8%, p=0.003). There were no significant changes observed in the percentage of orders for prophylactic anticholinergics for patients at moderate-to-high risk for EPS. A lower percentage of patients prescribed a prophylactic anticholinergic experienced adverse effects in the post versus the pre-intervention period (52.31% versus 75.27%, p=0.003).  
Conclusions: Significant differences were found between pre and post-intervention anticholinergic medication prescribing habits. This suggests that increased patient risk factor assessment in the form of a pharmacist checklist card is effective in decreasing orders for prophylactic anticholinergic medications not clinically indicated and reducing the incidence of adverse effects.

9. Title: Evaluation of the quality of amiodarone with macrolides and fluoroquinolones drug-drug interactions reported in the literature  
Project Advisor: Daniel Malone, PhD  
Students: Brian Do, Pritesh Patel, Kevin Yee  
Objectives: To determine the quality of evidence in the literature reporting the potential effect of QT prolongation and cardiovascular interactions of amiodarone with fluoroquinolones and macrolides.  
Methods: A thorough database search was conducted utilizing PubMed, Embase, Micromedex, and Facts and Comparison. Studies were eligible if they involved human subjects, original submission in English, and focusing on any drugs within the macrolide class along with amiodarone or any drugs within the fluoroquinolone class along with amiodarone was included. Drug-drug interactions (DDI) within the literature were evaluated using one of two tools: (1) van Roon to assess the quality of randomized controlled studies, and (2) the Drug Interaction Probability Scale (DIPS) to assess case reports.  
Results: Five case reports were included for evaluation. None of the patients within the case reports were less than 65 years old. Four of the five case reports included ciprofloxacin as part of the proposed drug interaction with amiodarone. The range of DIPS scores were 4-7 with a median score of 6.  
Conclusions: The evidence purporting this drug-drug interaction is of poor quality and low quantity. Additional studies of high quality must be conducted on the subject of this DDI to provide clinicians the ability to make more informed clinical decisions.
10. **Title:** Efficacy of low dose levetiracetam for seizure prophylaxis in traumatic brain injury  
**Project Advisor:** Asad Patanwala, PharmD  
**Students:** Elaine Truong, Alina Kurita  
**Objectives:** Guidelines from the Brain Trauma Foundation recommend that after traumatic brain injury (TBI) patients should be given seizure prophylaxis for up to seven days. Currently, phenytoin is the first line therapy for this indication. However, levetiracetam is increasingly being used as an alternative because it does not require serum concentration monitoring and has a desirable safety profile. Studies evaluating levetiracetam have used a loading dose, followed by a maintenance dose of 1000 mg every 12 hours. The primary objective of this study was to evaluate the efficacy of low-dose (500 mg every 12 hours) levetiracetam for seizure prophylaxis after TBI.  
**Methods:** This was a retrospective cohort study conducted in a tertiary care, academic institution that is designated as a level 1 trauma center. Institutional review board approval was obtained prior to data collection. Consecutive patients with TBI between 2010 and 2012, who received levetiracetam for seizure prophylaxis, were included. Patients who met at least one of the following criteria were included: cortical contusion on computerized tomography scan, subdural hematoma, epidural hematoma, intracerebral hematoma, depressed skull fracture, penetrating head injury, or Glasgow Coma Scale (GCS) of 10 or less. Patients were excluded if they were less than 16 years of age, had a previous head injury, previous neurosurgery, history of seizure, or anti-seizure medication, or were given a loading dose of levetiracetam, or given a maintenance dose greater than 500 mg every 12 hours. The primary outcome was the occurrence of a seizure within seven days of TBI. A one-sample test of proportions was used to compare the rate of seizures while being treated with levetiracetam to a hypothesized value of 3.6 percent (from previous trials), using an a priori alpha of 0.05.  
**Results:** There were a total of 146 patients included in the study, who were treated with levetiracetam 500 mg every 12 hours. The median age was 51 years (interquartile range 31 to 65 years), 110 (75 percent) were male, and the median GCS on admission was 11 (interquartile range 5 to 14). The mechanisms of injury were fall (n equals 49), motor vehicle or motorcycle collisions (n equals 42), pedestrian or bicyclist (n equals 19), assault (n equals 16), suicide attempt (n equals 2), and other (n equals 18). The median time to first dose of levetiracetam was 4 hours after injury (interquartile range 1 to 13 hours). After initiation of levetiracetam, there were 5 (3.4 percent) patients who had a seizure within seven days. This was not significantly different than the hypothesized population value (p equals 0.910). The median length of stay was 13 days (interquartile range 9 to 21) and 7 (4.8 percent) patients died during hospitalization.  
**Conclusions:** A low-dose of levetiracetam 500 mg every 12 hours after TBI was effective for early seizure prevention. This regimen may be an appropriate alternative to phenytoin or traditional dose levetiracetam for this indication. Future, prospective studies are needed to confirm these findings.

11. **Title:** A Qualitative and Quantitative Analysis of Quality Improvement Education in Colleges of Pharmacy  
**Project Advisors:** Terri Warholak, PhD; Janet Cooley, PharmD  
**Students:** Amber Montoya, Angela Walsh  
**Objectives:** To analyze the state of quality improvement (QI) education across ACPE-accredited pharmacy schools in the United States.  
**Methods:** Stage one of data collection consisted of an inspection of each pharmacy school website to reveal the presence of published QI curriculum or other related content. In the second stage, an e-mail questionnaire was sent to one representative of each of the 129 accredited schools in the U.S. who was interested in or who teaches QI at his/her school. Respondents could complete the questionnaire via: 1) electronic; 2) paper; or 3) phone. Later, the questionnaire was shortened and a raffle was initiated to increase response rate. The survey instrument contained both multiple choice and open-ended items.  
**Results:** Sixty responses were returned from the 129 accredited schools (47% response rate). The least-covered QI topics in respondents’ QI curricula were: Quality dashboards and sentinel systems (30%); Six-sigma, or other QI methodologies (45%); Measures of safety and quality (57%); Medicare Star measures (a national measurement program) and payment incentives (58%); and How to implement changes to improve quality (60%). More private schools covered Adverse Drug Events than public schools (p=0.039). Requiring a specific QI class was more likely in private schools (p=0.003) while requiring a QI project was more often reported by public schools (p=0.014).  
**Conclusions:** To the investigators’ knowledge, this is the first national study to map QI education in U.S. pharmacy schools. These results will inform pharmacy and other health-related professional programs in the integration of QI concepts into their curriculum.
13. Title: The Effect of Sodium Bicarbonate on the Stability of Phenytoin IV Solutions  
Project Advisor: David Lee, RPh  
Students: Ajla Hadzic, Sophia Un  
Objectives: To determine if a change in the amount of sodium bicarbonate (NaHCO3) in 5 different IV solutions will help prevent phenytoin from falling out of solution (i.e. precipitating). Our working hypothesis is that the stability of the phenytoin solution will change with different IV solutions and will increase with increasing the amount of sodium bicarbonate.  
Methods: A constant amount of phenytoin injection solution was mixed with a constant amount of one IV solution per beaker. Different amounts of alkalizing agents were then added to each phenytoin and IV mixture. Precipitation of the mixtures was observed every 30 minutes for 4 hours, then again in 24 hours.  
Results: When different IV solutions were added to the phenytoin and alkalizing agent mixture, the pH of the mixture dropped from 10 to 9 independent of the amount of alkalizing agent present in the mixture. All phenytoin mixtures precipitated within 60 minutes; 0.9% NaCl and phenytoin mixture being the one with the most delayed precipitation.  
Conclusions: Based on the result of this experiment, we rejected both of our specific aim hypotheses. Our hypothesis is rejected because the stability of the phenytoin solution will not change by using different IV solutions or by changing the amount of sodium bicarbonate.

14. Title: The Level of Accuracy in Selected Episodes of the First, Fourth, and Sixth Season of the Medical Television Drama, House M.D.  
Project Advisors: David Apgar, PharmD; Edward Armstrong, PharmD; Terri Warholak, PhD  
Students: Stasha Morris, Hanna Kim, and Jackie Benson  
Objectives: To assess the accuracy of the presenting signs and symptoms, diagnostic procedures, and treatments presented in the first 12 episodes of season one, the last 4 episodes of season four, and the last 7 episodes of season six of the television series House, MD was performed. The accuracy of the presenting signs and symptoms, diagnostic procedures, and treatment in each episode was rated on a score of 1 to 4. A score of 1 represented information that was correct and average and or usual, 2 and 3 indicated less accuracy, and 4 represented information that was not correct. Each researcher individually scored the episodes, and a final accuracy score was determined by consensus of the three reviewers. The results for seasons 4 and 6 were combined with episodes previously evaluated in other students’ projects.  
Results: The ANOVA results showed no statistically significant differences among the variables in Season 1, however, the treatment was the most accurate. In both season 4 and 6, the ANOVA test did demonstrate a statistically significant difference with the treatment group being most accurate.  
Conclusions: For season 1, there were no differences in accuracy of the treatments and diagnoses when compared to the signs and symptoms of each episode, however, for season 4 and 6, the treatments were more accurate than the presenting signs and symptoms and the diagnoses.
15. Title: Prescriber Knowledge and Perception of Naloxone Use for Opioid Overdose Reversal among Intravenous Drug Users

Project Advisor: Marion Slack, PhD

Students: Jennifer Poist, Regina Wu, Lourdes Peralta

Objectives: Evaluate prescriber knowledge on naloxone use for opioid overdose reversals in intravenous drug users. Interview prescribers on their perceptions about intravenous drug users, syringe access programs, and other related topics.

Subjects: Prescribers and medical professionals in the State of Arizona.

Methods: Medical facilities were contacted by email, fax, or telephone requesting for prescribers to complete the survey and return by email or fax, or call to schedule a face-to-face appointment. The respondents of the survey were kept anonymous and were permitted to answer the survey in free text. Surveys were sent to the 68 selected medical facilities at least twice during the study period.

Results: All of the six respondents were male, of the respondents had at least 11 years experience, with two having >30 years. A majority practiced in rehab centers or worked with drug abuse patients, however the number of patients treated per week by respondent varies from 10-320. Also of note five of the six respondents had a family member or relative with an addiction to opioids. The respondents seem to be in support of a naloxone distribution program however it is difficult to draw any conclusions since the number of responses was low.

Conclusions: It appears that prescribers have a favorable perception of naloxone use and support harm reduction strategies, however response rate was too low to make any definitive conclusions.

16. Title: Factors affecting prescribing behaviors of benzodiazepines and antipsychotics to patients with mental health diagnoses in an academic medical center emergency department

Project Advisors: Lisa Goldstone, PharmD; Elizabeth Hall-Lipsy JD, MPH

Students: Katrian Itantaffi, Maie Ngan, Lian Howden

Objectives: To determine whether disparities exist among mental health patients admitted to the emergency department in regards to the prescribing patterns of injectable benzodiazepines and antipsychotics.

Methods: A retrospective chart review was performed to evaluate patients with mental health diagnoses who received an injectable antipsychotic or benzodiazepine while in the emergency department of an academic medical center. A report was generated of all injectable antipsychotics and benzodiazepines removed from the emergency department Pyxis machines from November 1, 2013 to January 31, 2014. Data from the patient medical record included the patient’s age, height, weight, gender, race/ethnicity, insurance information, mental health diagnosis, evidence of substance abuse, how they arrived in the emergency department, their length of stay in the emergency department, any signs of aggressive behavior (adapted from the Overt Aggression Scale), information about each injectable antipsychotic or benzodiazepine that was administered was recorded including the name of the medication, dose, route of administration. If the patient received multiple doses of the same medication during their stay, the total dose and the total time receiving the medication was also recorded. The prescriber’s gender and whether they were a resident or an attending physician was also recorded for each medication administered.

Results: A total of 98 patient charts were reviewed and analyzed. Mental health diagnoses were broken down into categories of psychiatric disorders (39.8%), bipolar disorders (74.5%), mood disorders (40.8%), and personality disorders (54.1%). Of the 98 patients reviewed, 68% had a documented substance abuse, with 62% having a positive urinalysis for alcohol, illicit drugs, or opiates. The majority of the patients were white (64.3%). The next largest racial/ethnic categories were Hispanics (12.2%), Native Americans (8.2%), and African Americans (6.1%). There were 54 males and 44 females. Benzodiazepines comprised 74% of the medications administered with lorzepam being the most frequently administered medication overall at 63.4%. Haloperidol was the second most frequently administered medication at 22%. Initial Chi Square analysis did not yield any significant results with regards to race and prescribing patterns, gender and prescribing patterns, or insurance and prescribing patterns.

Conclusions: Patients with mental health diagnoses suffer from disparities within health care, and when these patients fall under other demographic groups such as racial/ethnic minorities and low socioeconomic status, the disparate treatment they receive could be even greater. Several limitations to this study including a small sample size and lack of geographical diversity resulted in a lack of statistically significant results, and our findings may not be generalizable to other patient populations.
17. **Title:** Assessment of Pharmacists’ Self-Reported Preparedness to Provide Pharmacotherapy Services to Individuals with Psychiatric Disorders  
**Project Advisor:** Terri Warholak, PhD  
**Students:** Alex German, Laura Johnson, Georgina Ybarra  
**Objectives:** Pharmacists’ level of training and experience in psychiatric pharmacy were compared for: 1) self-perceived preparedness to provide pharmacotherapy services; and 2) perceived barriers to providing services to individuals with psychiatric disorders.  
**Methods:** This study used data from an internet-based questionnaire. Respondents were divided into 2 groups: 1) completed the Arizona Pharmacy Association’s Psychiatric Certificate Program, and/or Board Certified in Psychiatric Pharmacy, and/or College of Psychiatric and Neurologic Pharmacists member, and/or completed a PGY2 psychiatric pharmacy residency; and 2) no specialized training/experience in psychiatric pharmacy. A Mann-Whitney U analysis was used to compare the scaled responses for each group. A Bonferroni alpha correction was use in the case of multiple tests.  
**Results:** Compared to pharmacists without training/experience in psychiatry (N = 235), respondents with specialized training/experience in psychiatry pharmacy (N = 38) reported more frequent interactions with psychiatric patients and provided more counseling/drug information, monitoring for adverse drug reactions, recommending non-pharmacological treatments, screening for treatment issues, and making therapeutic recommendations (p < 0.05). Trained pharmacists in psychiatry reported being more prepared to provide all pharmacotherapy services (p = 0.003), except in addressing non-adherence, utilizing online resources, and providing pharmacotherapy services to patients with attention deficit-hyperactivity disorder. They reported fewer barriers (α = 0.005) except for time to provide services, having a private consultation area, and reimbursement for patient care activities.  
**Conclusions:** This study found that responding pharmacists without psychiatric training/experience may need additional education/training post-graduation and that they perceive more barriers in providing services to this population.

18. **Title:** Incidence of delayed and recurrent coagulopathies in North American rattlesnake bite patients initially treated with crotalidae polyvalent immune Fab (ovine) (CroFab)  
**Project Advisor:** Keith Boesen, PharmD  
**Student:** Jaci Moench  
**Objectives:** To determine the incidence of late coagulopathy and characterize those requiring antivenom retreatment among rattlesnake envenomation patients managed by the Arizona Poison and Drug Information Center (APDIC).  
**Methods:** This descriptive, retrospective chart review used data extracted from APDIC charts. Data included coagulopathy lab values recorded during treatment, vials of antivenom required to achieve initial control, total vials during therapy, incidence of initial coagulopathy, use of extended infusion, time until treatment, and permanent sequelae due to snakebite. Demographic information was also recorded. Late coagulopathy is defined as coagulopathy occurring after completion of maintenance dosing, and can be considered recurrent or delayed. Delayed coagulopathy occurs in the absence of an initial coagulopathy, while recurrent coagulopathy requires an initial event previously controlled by antivenom therapy.  
**Results:** Of 321 identified reports, 120 patients were treated with antivenom, had outpatient follow-up, and were included in analysis. Sixty-one (50.8%) patients did not have an initial coagulopathy, while 59 (49.2%) had an initial coagulopathy. Late coagulopathy occurred in 63 (52.5%) of patients. Delayed coagulopathies occurred in 19 (31.1%) of patients with no initial coagulopathy; Of those with an initial coagulopathy, recurrent coagulopathies occurred in 44 (74.5%) of patients. Patients with initial coagulopathy were statistically more likely to develop a late coagulopathy than those with no initial coagulopathy (p<0.001). Seventeen patients required retreatment post-discharge.  
**Conclusions:** Patients envenomated by rattlesnakes are at high risk for developing late coagulopathies. Close outpatient follow-up is imperative for monitoring of coagulopathies. Need for retreatment with FabAV post-discharge is not uncommon.
19. Title: Assessing Access to Pharmacy Care among Refugees in Tucson, AZ  
Project Advisor: Janet Cooley, PharmD  
Students: Elena Almada, Kellie Vasquez  
Objectives: To describe refugee access to pharmacy care as perceived by key informants and pharmacists.  
Methods: Two groups of providers working with the refugee population in Tucson, AZ served as key informants. Case managers were asked questions about establishing refugees in a pharmacy and current resources available to refugees for pharmacy care. The interview for pharmacists focused on current services available for limited-English speaking patients, their point of view on these services and their perceptions of the barrier for refugee populations in accessing pharmacy care.  
Results: Five case managers and five pharmacists were interviewed. Overall case managers and community pharmacists identified the language barrier as the main problem for refugees in accessing pharmacy care. Translation services are limited in the community pharmacy setting and existing services are underutilized.  
Conclusions: Key informants and pharmacists agreed that language and communication are the principal barriers to access pharmacy care among refugees.

20. Title: Efficacy of fluconazole prophylaxis of coccidioidomycosis in post-transplant patients in an endemic area  
Project Advisors: Richard Cosgrove, PharmD; David Nix, PharmD  
Students: Kathryn Alver, Anne Simacek  
Objectives: To assess the efficacy of fluconazole prophylaxis in the prevention of coccidioidomycosis in the post-heart transplant patient and to identify risk factors for coccidioidomycosis infection.  
Methods: Heart transplant patients with ICD-9 code V42.1 from October 2001 to October 2013, were selected and electronic medical records were retrospectively reviewed for coccidioidomycosis history, Coccidiodes serologies, reason for transplantation, immunosuppressive drug therapy regimens, rejection treatment course, fluconazole dose, and demographics. Negative Coccidiodes serology results post transplantation relative to negative Coccidiodes serology results prior to transplantation will be determined using a Chi Square test. Risk factors for disease contraction will be analyzed using multivariate logistic regression.  
Results: Between October 2001 and October 2013, 244 patients received a heart transplant at this institution. Fourteen (5.7%) heart transplant recipients with a negative Coccidiodes serology pre-transplantation had a positive Coccidiodes serology post-transplantation. Nine (64.2%) of those recipients received antifungal prophylaxis (p=0.16). Risk factors for developing a positive Coccidiodes serology included using tacrolimus (p=0.05) and non-ischemic cardiomyopathy (p=0.04).  
Conclusions: Antifungal prophylaxis does not reduce the risk of developing a positive Coccidiodes serology after heart transplantation. Risk factors for developing a positive Coccidiodes serology include the use of tacrolimus and having non-ischemic cardiomyopathy prior to transplant.
21. Title: An Assessment of Medication Synchronization on Improving Medication Adherence  
Project Advisor: Terri Warholak, PhD  
Students: Shahene Badie, Elizabeth Jing, Carissa Fernandez  
Objectives: Our specific aim is to assess the changes in patient adherence in response to medication synchronization. Our working hypothesis is that medication synchronization will have a positive impact on patient adherence. 
Methods: This retrospective pre-post cohort study assessed medication adherence 365 days before and 365 days after enrollment into a prescription synchronization program. There were 5,994 patients included in the study. Seven medication classes and three demographic groups were chosen to assess for adherence. Adherence was determined by calculating mean proportion of days covered. A paired t-test was used to determine statistical significance for each drug class and demographic group. Exploratory analyses were done at 90 days and 180 days before and after the sync date to determine differences in terms of time. An alpha a-priori was set at 0.05 before analysis was started. 
Results: Current Fry’s Pharmacy patients greater than 18 years old that met the Centers for Medicare and Medicaid Services (CMS) for STARs rating criteria were included in the study. Results at 365 days showed a statistically significant decrease in PDC (p<0.0001), and was not affected by demographics. 
Conclusions: One year after the implementation of medication synchronization program at Fry’s Pharmacy, a statistically significance decrease in PDC is seen across all categories of chronic medications: statins, ACE-I/ARBs, beta-blockers, CCBs, metformin, thiazides, loop-diuretics, and inhaled corticosteroids. As such, medication synchronization may decrease patient adherence to the maintenance medications evaluated. 

22. Title: The Impact of Community and Hospital Pharmacists on Adult Immunization Rates: A Systematic Review and Meta-analysis  
Project Advisors: David Apgar, PharmD; Marion Slack, PhD  
Students: Justin Baroy, Danny Chung, Ryan Frisch  
Objectives: To establish the impact pharmacists can have on adult immunization rates by having pharmacists available to provide, administer, and advocate for immunizations. 
Methods: The following databases were searched from inception to November 2014: NLM PubMed; Ovid/MEDLINE; and Google Scholar. Inclusion criteria were comparative studies reporting pharmacist intervention and their impact on immunization rates. Of 38 publications originally identified, 15 met inclusion criteria. Variables examined included study characteristics, pharmacist intervention, and immunization rates. 
Results: Of the 15 studies we identified, only ten studies could be analyzed in the meta-analysis. All studies showed increases in immunization rates with pharmacist involvement, but there was high variance. Pharmacist interventions at hospital sites had the greatest benefit for increasing immunization rates (average odds ratio [OR], 10.64, confidence interval [CI] 95%, 5.25-21.49). Pharmacist intervention at one or two community sites had the second highest impact (OR, 2.81; CI 95%, 2.31-3.41). Studies covering multiple sites (more than two) showed the lowest increase in immunization rates (OR 2.26; CI 95%, 1.81-2.81). 
Conclusions: Pharmacist’s involvement in advocating and administering immunizations directly increases immunization rates in some patient populations. The greatest increases in immunization rates can be seen when pharmacists advocate for immunizations in the hospital setting.
23. Title: Evaluation of time to appropriate therapy for Stenotrophomonas maltophilia infection using rapid species identification

Project Advisors: David Nix, PharmD; Kathryn Matthias, PharmD

Students: Rod Bastani & Amanda Condon

Objectives: Stenotrophomonas maltophilia is considered one of the most intrinsically resistant opportunistic infections in the hospital setting. Immunocompromised patients are at a significant risk for nosocomial S. maltophilia infection. Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry can quickly identify S. maltophilia. This study sought to determine the median and range of time to appropriate therapy of S. maltophilia infections after implementation of MALDI-TOF-MS for rapid species identification.

Methods: A retrospective electronic medical record review of patients admitted to UAMC-UC during the study period was utilized to determine time to appropriate therapy. Positive cultures for S. maltophilia were identified by the microbiology laboratory database and assessed for inclusion in the study. Demographic information, time of culture, time to appropriate therapy, and isolate susceptibilities were collected using a data extraction tool. Variables were assessed with medians and ranges.

Results: The average time to appropriate therapy was 3.4 days with a median of 3 days (range 0-21). Most isolates were susceptible to sulfamethoxazole-trimethoprim and levofloxacin and resistant to ceftazidime. Of the 20 isolates resistant to sulfamethoxazole-trimethoprim, 14 were susceptible to levofloxacin. Only one isolate was resistant to all four drugs. Immunocompromised patients accounted for only 12% of the study population.

Conclusions: After implementation of MALDI-TOF MS, the median time to appropriate therapy in S. maltophilia infection was 3 days. Rapid species identification can lead to a quicker time to appropriate therapy, which is essential for effective treatment of S. maltophilia infection.

24. Title: Impact on vitamin D status in cystic fibrosis patients after implementation of 2012 Cystic Fibrosis Foundation guidelines

Project Advisors: Marcella Honkonen, PharmD; Hanna Phan, PharmD

Students: Dharti Bhakta, Kalyn Schmidt, Aubrey Silvester

Objectives: The primary objective of the study was to evaluate for change in vitamin D levels and regimens in cystic fibrosis (CF) patients following implementation of the 2012 Cystic Fibrosis Foundation (CFF) vitamin D guidelines. Secondary endpoints included clinician adherence to guideline recommendations for treatment and management of vitamin D deficiency.

Methods: This retrospective chart review included CF patients with 25-hydroxy vitamin D (25(OH)D) levels from University of Arizona Medical Center (UAMC) between April 1, 2011-March 31, 2012 and July 1, 2012-June 30, 2013. Total 25(OH)D levels and vitamin D regimens were collected along with data on respiratory cultures, pulmonary function, and hospitalizations. Data were analyzed by Student’s T-tests and chi square analyses.

Results: A total of 62 patients were included in the study. Mean 25(OH)D levels did not significantly differ between the study periods (28.9±10.5 ng/mL pre-guideline and 27.0±9.1 ng/mL post-guideline, p=0.158). Cholecalciferol use increased post-guideline (57.1%) versus pre-guideline (75.8%, p=0.027). Post-guideline cholecalciferol doses increased to 2836.5±2669.4 international units [IU] daily compared to 1518.0±912.0 IU daily pre-guideline (p<0.001). Clinician adherence to dose titration recommendations resulted in significant 25(OH)D level elevations (28.3±8.9 ng/mL versus 24.7±9.0, p=0.047).

Conclusions: The prescribing pattern of clinicians significantly changed to reflect vitamin D regimens suggested by CFF guidelines. This finding suggests that had sufficient time been allowed following guideline implementation, a significant difference in 25(OH)D levels would have resulted. Additional research is needed concerning the effect of the guidelines on vitamin D status, clinical outcomes, and comorbidities.
25. **Title:** Vancomycin Loading Doses in Septic Patients  
**Project Advisor:** Asad Patanwala, PharmD  
**Students:** Junyan He, George Mee, Marc Bingaman  
**Objectives:** To (1) characterize loading doses of vancomycin administered to patients with sepsis and (2) evaluate the relative impact of loading dose on clinical outcomes between patients who received a 1 gram loading dose or any other amount.  
**Methods:** Retrospective, observational chart review of adult patients who received vancomycin for treatment of sepsis through emergency department triage. Data from November 2013 through March 2014 were obtained for timing and administration of vancomycin as well as clinical outcomes: survival; length of hospitalization and intensive care unit (ICU) stay; need for mechanical ventilation.  
**Results:** Sepsis-related hospital encounters were identified for 123 patients, of which 114 charts were fully able to be evaluated. The majority of patients (84.21%) received a 1 gram loading dose as opposed to any other amount (p=0.001); few patients (1.75%) received a dose within 25-30 mg/kg. No significant differences in trends for timing of administration, inpatient survival, duration of hospital stay, or need for mechanical ventilation were identified between patients who received 1 gram doses or any other amount. Greater effective vancomycin loading doses were associated, albeit not significantly, with shorter durations of hospitalization, ICU admissions, and mechanical ventilation.  
**Conclusions:** Despite weight-based loading dose recommendations, vancomycin was frequently administered as a fixed 1 gram loading dose to patients with sepsis. However, there was little distinguishable impact on clinical outcomes in this preliminary study.

26. **Title:** The Impact of the Affordable Care Act and Medicaid Expansion Program on Emergency Room Visits for Patients with Anxiety Disorders  
**Project Advisors:** Lisa Goldstone, PharmD; Elizabeth Hall-Lipsy, JD, MPH  
**Student:** Monica Kaiser  
**Objectives:** Characterize all patients in the emergency room diagnosed with anxiety disorders from 11/01/2013 until 5/31/2014 to identify insurance coverage and demographic trends.  
**Methods:** Retrospective descriptive study of patients who present to the emergency department between 11/01/2013 – 05/31/2014 and discharged with a primary documented diagnosis of an anxiety disorder. Age, race, and gender were recorded in addition to insurance coverage.  
**Results:** 406 visits were reviewed: 212 (52.2%) males and 194 (47.8%) females. Average age per visit: 40.34 (SD=13.388). Race recorded with each visit: 189 (46.6%) white, 146 (36.0%) Hispanic, 42 (10.3%) African American, and 29 (2.2%) other. The most common insurance coverage was Medicaid at 63.3%, while 6.4% of visits had no insurance coverage. There was a significant difference in the distribution in number of ED visits between genders (Mann-Whitney U=17,407.5, p=0.007, sig ≥0.05). A Kruskal-Wallis Test showed a significant difference in the number of ED visits between racial groups χ²=43.434, p=0.000 as well as a significant difference between Medicaid and other insurance groups χ²=37.778, p=0.021.  
**Conclusions:** Men appear to have a higher frequency in anxiety symptoms requiring an ED visit than women do. White patients tend to have a greater frequency in anxiety symptoms followed by Hispanic patients. Medicaid tends to be the most prevalent insurance coverage used.
27. Title: An evaluation of the use of hydralazine and the risk of heart transplant rejection  
Project Advisor: Richard Cosgrove, PharmD  
Students: Michelle Dorame, Claudia Doming  
Objectives: Assess the impact of hydralazine in contributing to the risk of heart transplant rejection. Our primary working hypothesis is that patients who have undergone heart transplantation and have taken hydralazine have an increased risk of transplant rejection and ultimately have worse outcomes.  
Methods: A retrospective cohort study on data extracted from a patient’s medical chart at a local hospital. Data was collected using a paper data extraction form consisting of gender, race, age, panel reactive antibody scores, co-morbidities, white blood cell count, type of immunosuppression therapy and any other medications. The proportion of patients with rejections will then be compared and analyzed using a chi square test.  
Results: This study obtained 340 patient cases that involved heart transplantation. From the 340 patients that were extracted, 42 of them were recorded as having taken hydralazine. Of the 42 patients, 7 had stopped hydralazine before transplantation. The mean +/- S.D. age of the 35 patients analyzed was 54 +/- 20.5 years, and 69% were men. Approximately 14% of the 42 patients were found to have had a heart transplant rejection.  
Conclusions: Heart transplant patients at this institution who received hydralazine post surgery were on it about an average of 21 months. Most patients were placed on ACE inhibitors. ACE inhibitors have a theoretical benefit of immunosuppression, and this therapy is usually pursued in transplant patients. Further research must be done to determine the clinical significance of hydralazine use in heart transplant rejection.

28. Title: Safety and Efficacy of Commercially Available Pre-Workout Supplements  
Project Advisor: Amy Kennedy, PharmD  
Students: Steven Dudley and Eric Hudson  
Objectives: The purpose of this review was to determine the safety of various pre-workout supplements that utilize proprietary blends in comparison with some of the most common individual ingredients; caffeine, creatine, and B-alanine. We hypothesized that there will be a greater number of adverse events reported for proprietary products than for the individual active ingredients. Additionally, we also wanted to look at the efficacy of the same aforementioned products. We hypothesized that there would be no statistically significant differences in performance between the two arms.  
Methods: Four databases were searched for subjects that were 18-35 years of age that were already physically active. The number of participants included in each trial ranged from 6 to 98.  
Results: Caffeine was the only individual compound that affected health markers, increasing mean arterial pressure (MAP) (P<0.05), and HR in 2 of the 3 studies (P<0.05) significantly. Both caffeine and creatine showed a benefit in maximal exertion, but only caffeine improved endurance at doses of 3mg/kg (P<0.05). Proprietary blends did not show a benefit, but serious adverse events such as liver failure were reported.  
Conclusions: Individually caffeine, creatine, and B-alanine all look to be safe at the recommended doses in healthy and active individuals, with caffeine and creatine benefitting performance. Pre-workout blends should be safe in theory, but due to the unregulated nature of the supplement industry there are a number of serious adverse events that occur. Untested amphetamine-like compounds seem to be the most common addition, with contamination of other ingredients such as anti-depressants occurring as well.
29. Title: Use of dietary supplements among pharmacy students  
Project Advisor: Marion Slack, PhD  
Students: Courtney Edel, Janka Vanova  
Objectives: To compare the use of herbal and dietary supplements amongst pharmacy students to the use in the general population; assess knowledge and attitudes toward the use, and perceived effectiveness of herbal and dietary supplements.  
Methods: Paper questionnaires that were administered to the first-, second- and third-year students collected data about the herbal and dietary supplement use, knowledge, students’ attitudes towards the use of herbal and dietary supplements, as well as information about demographics and students’ work experience. Overall use was compared to the 2007 National Health Interview survey findings.  
Results: From a total of 179 students who responded, 52% indicated that they had ever used at least one product, which was greater than the 25%-use reported in the general population. Almost half (46%) of students indicated they had used fish oil/omega-3; about 38% used one or more of the other listed products. Students had limited knowledge on the use of herbal and dietary supplements. The average score on the side effects and indicated uses of selected dietary supplements was 50%; however, the third-year students scored significantly higher than the first-year students (p < 0.001). Students rated dietary supplements as not essential for health, but thought that the education on dietary supplements was inadequate.  
Conclusions: About half (52%) of this sample of pharmacy students reported having ever used dietary supplements compared to only 25% of the general population. However, students seemed to have limited knowledge of dietary supplements and thought more education was needed.

30. Title: Effect of a Network Wide Computer Entry System and Weight Based Dosing on Heparin Alert Rates  
Project Advisor: Jacqueline Brody, PharmD  
Student: Christopher Edmonds  
Objectives: The purpose of the study was to analyze the effect of a network wide computer system and the implementation of weight based dosing on heparin alert rates. Our central hypotheses was that the implementation of a network wide computer system will decrease alert rates for heparin infusions on smart pump infusion systems. Our rationale for this study was to evaluate methods to improve patient safety for high alert medications such as heparin.  
Methods: This was a before-after study design evaluating the effect of the intervention using data obtained by a smart pump infusion system. Heparin infusions at the university campus were analyzed for the effect of a network wide computer system, administered in the adult ICU or Med/Surg unit between July 2013-September 2013 and from January 2014-March 2014. Pump data from before the implementation of the network wide computer system was compared to the pump data obtained after the network wide computer system.  
Results: After the implementation of a hospital wide computerized physician order entry system, there was a statistically significant increase in heparin alert rates from 15.7 alerts per 100 infusions of heparin to an alert rate of 20.2 alerts per 100 infusions of heparin (P=0.001).  
Conclusions: The implementation of a network wide computerized physician order entry was associated with an increase in alert generation rate on smart pump infusion systems. Further studies are needed to elucidate this unexpected increase in alerts.
31. Title: Stability of tetracycline hydrochloride in miracle mouthwash formulations containing diphenhydramine and dexamethasone elixir  
**Project Advisors:** Paul Myrdal, PhD; Kelly Karlage  
**Students:** Mahdieh Fazel, Kellie Goodlet  
**Objectives:** To assess the solubility and stability of tetracycline in compounded miracle mouthwash solutions over time, and at different temperatures (room temperature versus refrigerated) and pH (unaltered versus pH 7).  
**Methods:** Miracle mouthwash (MMW) solutions were compounded using tetracycline HCl capsules and 1:1 pseudo-dexamethasone elixir and diphenhydramine. High-performance liquid chromatography (HPLC) was used to measure the tetracycline concentrations in the MMW samples tested. Data on tetracycline crystal composition over time were also collected using powder x-ray diffraction, differential scanning calorimetry (DSC), and thermal gravimetric analysis (TGA).  
**Results:** For the tetracycline MMW solutions stored at room temperature, only 16% of the original tetracycline remained in solution after 24 hours, stabilizing at 65-81 mcg/mL on day 5 then decreasing further down to 45 mcg/mL by day 15. Similar results were obtained for the refrigerated tetracycline MMW solution (11% of original concentration after 5 days, with a decrease from 31-54 mcg/mL on day 5 to 22 mcg/mL on day 15). Tetracycline concentrations appeared to undergo a steeper decline in MMW solutions of pH 7 than in unadjusted MMW solutions (pH 4.68). All MMW samples exhibited a conversion from tetracycline HCl to tetracycline hexahydrate.  
**Conclusions:** Tetracycline solubility decreases rapidly in MMW within 24 hours of compounding regardless of temperature. MMW solutions at pH 7 may have further reduced solubility. Stability decreases at a stable rate from tetracycline HCl to tetracycline hexahydrate.

32. Title: Post-stroke outcomes in atrial fibrillation patients treated with various oral anticoagulants  
**Project Advisor:** Marcella Honkonen, PharmD  
**Students:** Vanesag Gaerig, Roxana Lang  
**Objectives:** Warfarin has historically been the anticoagulant used for the primary prevention of stroke in atrial fibrillation (AF), however three target specific oral anticoagulants, dabigatran, rivaroxaban, and apixaban, have recently been approved for use in this setting. Current literature lacks a comparison of these four drugs in relation to post-stroke outcomes, and this study aims to compare their performance in a natural setting.  
**Methods:** This retrospective cohort study identified stroke patients admitted to an academic medical center between January 2013 and December 2014 using the Quintiles, Inc.-American Heart Association Get With The Guidelines-Stroke database; pertinent data was collected from the database and patient electronic medical records. Primary endpoints measured were length of stay, 30-day readmission, and discharge disposition; secondary endpoints included rates of admission to the intensive care unit (ICU) and complications.  
**Results:** Of 940 stroke admissions, 53 ischemic stroke patients were identified as receiving an oral anticoagulant for stroke prevention in AF. The warfarin (n=40) and non-warfarin (dabigatran, rivaroxaban, and apixaban; n=13) groups were well matched regarding admission demographics, however patients taking warfarin were more likely to have an elevated INR at hospital admission (P=0.0053) and receive tPA (P=0.047). Patients in the warfarin group were also statistically significantly more likely to receive warfarin on discharge (P=0.004). No endpoints achieved statistical significance.  
**Conclusions:** No differences in post-stroke outcomes between warfarin and non-warfarin oral anticoagulants used for stroke prevention in AF were found.
33. **Title:** The development of a novel fluorescence polarization drug-screening assay for the interaction between GIT1 and GRB2  
**Project Advisor:** Richard Vaillancourt, PhD  
**Student:** Jared Gonzales  
**Objectives:** To develop an assay to permit the identification of compounds that can inhibit the interaction between GIT1 and the amino-terminal SH3 domain (SH3-N) of GRB2.  
**Methods:** The GIT1 protein was expressed in Sf9 insect cells and purified using Talon resin beads. The SH3-N domain of GRB2 was expressed in the E. coli strain, BL21(DE3)pLysS, and purified using glutathione resin beads. The SH3-N domain was fluorescently tagged on cysteine 32 using Cyanine 3 maleimide. The fluorescence of the assay was measured by using a plate reader with excitation wavelength of 555 nm and emission wavelength of 570 nm.  
**Results:** The GIT1 protein was expressed in Sf9 cells and purified using the Talon beads. The SH3-N domain of GRB2 was expressed in BL21 cells and purified from the glutathione resin beads. The SH3-N domain was cleaved from GST by using thrombin, which was engineered into the GST fusion protein and were fluorescently labeled using Cyanine 3 maleimide.  
**Conclusions:** The fluorescence polarization assay that will detect the interaction between GIT1 and the SH3-N domain of GRB2 is still under development, but it has progressed towards completion since both components of the assay are in hand.

34. **Title:** Cosolvent Effect on Droplet Evaporation Time, Aerodynamic Particle Size Distribution, and Differential Throat Deposition for Pressurized Metered Dose Inhalers  
**Project Advisors:** Paul Myrdal, PhD; Poonam Sheth  
**Student:** Matthew Grimes  
**Objectives:** To evaluate the *in vitro* performance of various pressurized metered dose inhaler (pMDI) formulations by cascade impaction primarily focusing on throat deposition, fine particle fraction (FPF), and mass-median aerodynamic diameter (MMADₐ) measurements  
**Methods:** Ten solution pMDIs were prepared with varying cosolvent species in either low (8% w/w) or high (20% w/w) concentration. The chosen cosolvents were either alcohol (ethanol, n-propanol) or acetate (methyl-, ethyl-, and butyl acetate) in chemical nature. All formulations used HFA-134a propellant and 0.3% drug. The pMDIs were tested by cascade impaction with three different inlets to determine the aerodynamic particle size distribution (APSD), throat deposition, and FPF of each formulation. Theoretical droplet evaporation time (DET), a measure of volatility, for each formulation was calculated using the MMADₐ.  
**Results:** Highly volatile formulations with short DET showed consistently lower throat deposition and higher FPF than their lower volatility counterparts when using volume-constrained inlets. However, FPF values were not significantly different for pMDI testing with a non-constrained inlet. The MMADₐ values generated with volume-constrained inlets did not show any discernible trends, but MMADₐ values from the non-constrained inlet correlated with DET.  
**Conclusions:** Formulations with shorter DET exhibit lower throat deposition and higher FPF, indicating potentially better inhalational performance over formulations with longer DET. There appear to be predictable trends relating both throat deposition and FPF to DET. The shift in MMADₐ values for volume-constrained inlets suggests that large diameter drug particles are preferentially collected in these inlets.
35. Title: Differences in Pharmacists’ Skin Cancer Prevention Strategies by Age and Gender  
**Project Advisors:** Marion Slack, PhD; Janet Cooley, PharmD  
**Students:** Sean Guimond, Elijah Okegbile, Jeffrey Stevens  
**Objectives:** The purpose of this study was to describe differences in pharmacists’ children and personal skin cancer prevention strategies, clinical outcomes, knowledge, and to determine if there were differences based on attending pharmacy school in Arizona or other states. The skin cancer prevention behaviours of pharmacists were also compared to the general public.  
**Methods:** Pharmacists registered and living in Arizona with an email address with the State Board of Pharmacy were eligible for the study. A questionnaire was developed based on questions from the NHIS survey. The questionnaire was administered by using an electronic, on-line survey form.  
**Results:** Graduates of non-Arizona schools were significantly more likely to have completed a CE course on skin cancer prevention than the Arizona group (16% vs. 6%). Both groups were not significantly different in gender and work sites. The knowledge of pharmacists in both groups were very similar (p > 0.1) except for knowledge of photosensitivity for certain drug classes (p = 0.043). Pharmacists were most knowledgeable on risk factors for melanoma (97%) Pharmacists were least knowledgeable on when sunscreen should be applied (20%) responded correctly and the minimum age for using sunscreen in children (26%) responded correctly. Pharmacists were more than twice as likely to use sunscreen as the general population (72% vs. 31%).  
**Conclusions:** Pharmacist graduates of non-Arizona schools (Non-Arizona group) used a similar number of skin cancer prevention strategies as graduates of Arizona schools (Arizona group). Sun protective measures utilized by parents for their children were superior to parents’ own self-care sun protection measures.

36. Title: Factors that determine career choice in Pharm.D. candidates: a focus group study  
**Project Advisor:** Kevin Boesen, PharmD  
**Student:** Megan Handley  
**Objectives:** The objective of the study is to describe which factors influence career choice in Pharm.D. candidates, and determine what makes a potential employer attractive to graduating students.  
**Methods:** A descriptive focus group study was conducted to describe opinions of Pharm.D. candidates regarding factors that determine career choice. Subjects were recruited via email. All participants were required to have a scheduled graduation date in 2015 or 2016. Demographic data was collected anonymously. Focus group conversations were recorded.  
**Results:** There were 13 participants, 8 female (61.5%) and 5 male (38.5%). Six (46.2%) hope to work in the retail setting after graduation, and 5 (38.5%) wish to work in an institutional setting. Four participants (30.1%) plan to complete a PGY1 residency after graduation. Ten participants (76.8%) agree that they would consider working for their current employer after graduation from pharmacy school. The majority of participants changed their mind throughout their education in regards to their future career choice. Rotations, professors, employers, and family seem to be the most common factors that helped determine career choice in participants. All participants agreed that clinical pharmacy and residency are promoted career paths at University of Arizona.  
**Conclusions:** The clinical pharmacy career path is believed to be strongly promoted at the University of Arizona. Rotations, professors, family, and employers during pharmacy school appear to be determining factors in career choice for Pharm.D. candidates. Many students pursue a career with the same employer they had during their education.
37. Title: Effect of Fungal Exposure on Airway Immunity in Asthma  
Project Advisor: Yin Chen, PhD  
Student: Jinjie Huang  
Objectives: The purpose of this study is to explore potential changes in cytokine and interferon expression during co-infection of rhinovirus and Alternaria.  
Methods: Alternaria filtrates were used to represent Alternaria spores in real-life. The responses were assessed by production of IL-6, IL-8 and interferon, which were measured by ELISA. mRNA expression was detected by quantitative real-time PCR. For data analysis, a two-sided t-test was performed to compare individual experimental groups.  
Results: Co-infection of Alternaria and rhinovirus enhanced IL-6 and IL-8 production significantly (p< 0.05). However, Alternaria significantly inhibited production of interferon which would otherwise be induced by rhinovirus. Average interferon-beta (IFN β) production was reduced by about 67%; interferon-lambda (IFN λ) was decrease by about 75%. The differences between treatment and control groups were also statistically significant (p < 0.05).  
Conclusions: These findings suggested that the Alternaria may cause an imbalanced mucosal antiviral response through inhibiting production of interferon while enhancing production of proinflammatory cytokines. These results indicated that Alternaria may lead to inhibit host innate immunity against virus infection, causing more inflammatory response.

39. Title: Publications and presentations from PharmD student research projects: A systematic review  
Project Advisor: Marion Slack, PhD  
Students: Sameer Islam; Leah Worede  
Objectives: To conduct a systematic review of reports of pharmacy student research programs to describe publication and presentations resulting from the research.  
Methods: To be eligible for the systematic review, studies must have described student research programs in which students’ were required to collect, analyze, report or present findings and be reported in English. Candidate studies were screened and data extracted using standardized forms by two investigators independently with the final list identified by consensus. The primary outcome variables were extramural posters/presentations and publications. Data were summarized in tables.  
Results: A total of 6112 studies were screened and 14 studies were identified that described student research meeting inclusion criteria; two reports were from outside the United States. Two-thirds were reports of required projects and a third were elective projects. Required research projects were conducted on a wide variety of topics including clinical, practice, laboratory, public health, education and other topics. Elective research was focused on clinical practice, and laboratory topics. Components of the research process were not uniformly described. The terminal project requirement was usually a written report (57%) or a poster (29%). One program required a presentation. More than half (64%) of the student research programs reported that students presented extramural posters and half (57%) reported that publications resulted from student research.  
Conclusions: About half of the student research programs described in the literature indicated that student research resulted in extramural posters or presentations.
40. Title: Evaluation of anticoagulation parameters after discontinuation of argatroban in critically ill patients.

Project Advisors: Brian Erstad, PharmD; Asad Patanwala, PharmD; Ashlee Gerfen, PharmD

Student: Manfei Jiang

Objectives: Argatroban is the current drug of choice for type II heparin induced thrombocytopenia. Primarily metabolized by the liver, this direct thrombin inhibitor has a volume of distribution of approximately 174 mLs per kg. While few studies suggested no differences in coagulation parameters or clinical outcomes between obese and non-obese populations receiving argatroban, a recent case report revealed elevated anticoagulation parameters for 20 days post argatroban discontinuation in a morbidly obese female. The purpose of this study is to assess anticoagulation parameters in obese and non-obese patients in an intensive care unit (ICU) setting who received argatroban treatment during their stay.

Methods: This is a retrospective, observational, single-centered study. Participants of the study must be adults, at least 18 years of age. Patient must be an inpatient and have received argatroban for either suspected or confirmed heparin-induced thrombocytopenia (HIT). All patients in the study were screened for the above criteria between November 2008 and September 2013. Patients admitted to the cardiac ICU were excluded from the study. Main anticoagulation parameters post discontinuation evaluated were daily international normalized ratio (INR) and activated partial thromboplastin time (aPTT), while safety outcomes included major, minor and non-bleed events. All data were analyzed with STATA 13 with P less than 0.05 being considered as statistically significant.

Results: The study included a total of 51 patients, 37 were non-obese with body mass index (BMI) less than 30 kg per m2 (73 percent), and 14 were obese with BMI greater or equal to 30 kg per m2 (27 percent). Among basic demographic data, no differences were found between age, sex, race, height and SOFA scores at baseline between the two groups, BMI less than 30 kg per m2 and BMI greater or equal to 30 kg per m2. (P equals 0.7, 0.21, 1.0, 0.41, 0.51 respectively). However, as expected, weight was the only characteristic that was different at baseline (P less than 0.01). Primary outcome of time of INR to normalization post argatroban administration (2.73 seconds plus or minus 0.27 seconds) as well as safety outcomes including major, minor, and non-bleed adverse events (P equals 0.61) were statistically non-significant between the two groups.

Conclusions: In this retrospective, observational, single centered study, no differences were identified between non-obese and obese groups in terms of argatroban administration, primary anticoagulation parameters, and safety outcomes. The length of time required for coagulation parameters to normalize after discontinuation of argatroban therapy for HIT does not appear to be influenced by BMI. Large, multicenter, and random controlled trials are needed to evaluate obesity on pharmacokinetic parameters and clinical outcomes of argatroban.

41. Title: Effects of azithromycin and moxifloxacin used alone and concomitantly with QTc prolonging medications on the QTc interval

Project Advisor: David Nix, PharmD

Students: Herman Johannesmeyer, Parissa Moghimi, Hershil Parekh

Objectives: The goals of this study were to determine how frequently azithromycin and moxifloxacin were used in combination with other drugs that cause QTc prolongation, describe the effects these combinations have on QTc interval length, determine the incidence of QTc prolongation in patients on these medication combinations, and identify risk factors associated with QTc interval prolongations in patients on these medication combinations.

Methods: A retrospective chart review was performed on patients who received at least two doses of azithromycin or moxifloxacin. It was noted whether these patients received other medications that prolonged the QTc interval. ECG information was grouped into daily phases depending on whether the patient was at baseline, receiving antibiotic therapy, QTc prolonging medication therapy, or concomitant therapy. These data were compared using repeated measures ANOVA.

Results: Patients received concomitant antibiotic-QTc prolong medication therapy in 70% of cases analyzed. In all patients on concomitant therapy there was no significant difference in QTc interval length, QTc prolongation on patients on these medication combinations, and identify risk factors associated with QTc interval prolongations in patients on these medication combinations. ECG information was grouped into daily phases depending on whether the patient was at baseline, receiving antibiotic therapy, QTc prolonging medication therapy, or concomitant therapy. These data were compared using a repeated measures ANOVA.

Results: Patients received concomitant antibiotic-QTc prolong medication therapy in 70% of cases analyzed. In all patients on concomitant therapy there was no significant difference in any measured ECG data (all p-values > 0.26). In those who were on azithromycin and experienced QTc prolongation there was a significant difference in RR interval length (p=0.034). In those that experienced QTc prolongation on moxifloxacin there was a significant difference in QT (p=0.0033) and QTcF (p=0.0089) length.

Conclusions: These medication combinations are used frequently in the hospital. These medications may not increase the QTc interval length in the general population but more research is warranted in this area to confirm this finding.
42. Title: Evaluation of Medication Use and Outcomes in Patients Suffering an In-Hospital Cardiac Arrest
Project Advisors: Asad Patanwala, PharmD; Erin McCusker, PharmD; Cole Sloan, PharmD
Student: Vanessa Jordan
Objectives: There is limited information regarding medication use during in-hospital cardiac arrest (IHCA). The purpose of this study was to characterize medication use during IHCA, and determine the association between medications used and survival to hospital discharge.
Methods: This was a retrospective cohort study conducted in an academic medical center looking at IHCA between October 2009 and December 2013. Data regarding medication use during IHCA and other pertinent predictors of survival were collected. The primary objective was to characterize medications used during IHCA and to assess the relationship between medications used and survival to hospital discharge.
Results: There were 171 patients who were included in the study and 44 (26%) survived to hospital discharge. The medications most commonly used were epinephrine, sodium bicarbonate, calcium chloride or gluconate, atropine, amiodarone, vasopressin, magnesium sulfate, and lidocaine. Patients who died were more likely to receive total epinephrine ≥3 mg (53% versus 27%, p=0.005), sodium bicarbonate (73% versus 55%, p=0.025), and calcium (59% versus 27%, p=0.001), compared to survivors, respectively. After adjusting for duration of resuscitation, total epinephrine ≥3 mg (OR 0.38, 95% CI 0.18 to 0.83, p=0.015) and calcium (OR 0.30, 95% CI 0.14 to 0.64, p=0.002) was associated with decreased survival.
Conclusions: This study found that 3 mg or more of epinephrine, calcium salts and sodium bicarbonate are linked to decreased survival to hospital discharge. Further research should be done to define the cause of this link.

43. Title: Meta-analysis of Weight Change in the Placebo Groups of Lorcaserin and Phentermine/Topiramate Trials from the FDA Database
Project Advisor: Marion Slack, PhD
Students: Andrew Korte, Danielle Manley, Nathan Parker
Objectives: To retrieve data from RCTs for lorcaserin and phentermine and topiramate combination on weight loss, BMI reduction, and other factors from the placebo groups and to determine if there is a difference in weight loss between those groups.
Methods: Design: Meta-analysis
Inclusion criteria: RCTs that compared lorcaserin or phentermine/topiramate to placebo as submitted to the FDA and posted to the FDA website. The studies needed to report weight loss or BMI values at baseline and post-treatment.
Measures: The primary dependent variables were weight lost in kilograms, change in BMI, and percent who achieved 5% weight loss in the placebo arm.
Data Collection: A standardized data collection form was used to extract data from the selected trials. Data was independently extracted by 3 researchers and discrepancies were resolved by consensus.
Data Analysis: Data was analyzed by constructing a forest plot of the amount of weight lost in the placebo arm stratified by type of drug. A funnel plot and Kendall’s tau were used to assess publication bias. Heterogeneity was assessed with I2. The a priori alpha level was 0.05.
Results: Statistically significant weight loss was achieved in the placebo arm in all 6 RCTs
Weight loss was consistent across type of study
Lorcaserin studies, mean = 2.42 kg
Phentermine/topiramate studies, mean = 2.14 kg
Overall rate of 5% weight loss was 0.32
No data was reported on actual caloric intake or actual quantity of exercise
Funnel plot and Kendall’s tau (p = 0.85) indicated there was no publication bias
There was heterogeneity in the lorcaserin studies resulting from one study reporting a large effect
Conclusions: Participants in the placebo arm lost weight with monthly counseling on calorie intake and exercise, however, actual caloric intake or quantity of exercise that resulted in the weight loss is unknown.
44. **Title:** Improved Safety and Patient Satisfaction: A Pilot Medication Therapy Management Program in a Community Pharmacy  
**Project Advisor:** Janet Cooley, PharmD  
**Students:** Roy Tan Jr. and Katy Lee  
**Objectives:** Quantify how many interventions were made during a pilot MTM program at a Costco pharmacy and assess patients’ attitudes towards MTM services offered at their local pharmacy.  
**Methods:** Contacted patients by phone and offered MTM services over 10 weeks. The patients are insured patients referred by Outcomes MTM and filled at least 50% of medications at Costco. Successful interventions were tallied and questionnaires administered to collect data on patients' background knowledge of MTM, rating of how helpful and beneficial MTM services conducted by local pharmacy were, how frequent patients would like such services, how much they were willing to pay for such services, and demographic information.  
**Results:** Due to low response rate no meaningful statistical differences were able to be observed. However interesting trends started to emerge; more adherence related interventions, adequate compensation for a dedicated MTM pharmacist, and that MTM is unknown to most patients but do find it useful. Additionally we were able to observe challenges and difficulties with implementing MTM services at a store level.  
**Conclusions:** The original aim of the study was not able to be adequately achieved due to low response rate. However the trends that emerged let us make some subjective conclusions; adherence related interventions were fairly common, a dedicated MTM pharmacist may be a feasible in a community setting, most patients are unaware of what MTM is but do find it useful after the service, and challenges to implementing an MTM service from the store level.  

45. **Title:** Survey on Patient Safety and Pharmacist Working Conditions  
**Project Advisor:** Richard Herrier, PharmD  
**Students:** Stephanie Lee, Kristin Peterson, Matthew Noble  
**Objectives:** To assess pharmacists’ perspectives on patient safety in relation to their working conditions.  
**Methods:** The survey was sent to 1000 pharmacists within Arizona. Results for the item evaluating pharmacists’ level of agreement with the statement regarding their employers providing a work environment optimized for safe patient care were compared to those from the Oregon Working Conditions Survey using Mann Whitney U. Mann Whitney U was also used to compare agreement between Arizona pharmacists who filled less than and more than 200 prescriptions per shift, and between Arizona community and hospital pharmacists. Chi-squared test was used to compare community pharmacists in Arizona and Oregon. A priori alpha level was 0.05 for all statistical tests.  
**Results:** Arizona pharmacists were significantly more likely than Oregon pharmacists to agree with the statement that their employer provided a work environment conducive to patient safety (p < 0.001). Arizona pharmacists who filled less than 200 prescriptions per shift agreed significantly more than those who filled more than 200 prescriptions per shift (p < 0.001). Hospital pharmacists were significantly more likely to agree with the patient safety statement than community pharmacists (p < 0.001).  
**Conclusions:** The pharmaceutical climate may play a role in the difference between Oregon and Arizona. With a lower percentage of chain/mass merchandiser community pharmacy respondents in Arizona, the overall agreement with the patient safety statement could have been influenced by practice type. Regardless, higher prescription volume still remains as a factor that can have potentially deleterious effects on optimization of patient safety.
46. Title: The effect of mock interviews on student performance on Career Day interview
Project Advisor: Janet Cooley, PharmD
Students: Peter Li, Sikeat Yi

Objectives: To determine if students who participated in mock interviews will have better interviewing skills/performance and be more likely to be offered a second interview than students who did not participate.

Methods: A hybrid survey approach was used. During Career Day, students were given a packet consisting of a consent form, demographics questionnaire, and multiple recruiter questionnaire forms. Recruiter ratings and student demographics were paired up and analyzed using the Mann-Whitney U test. The outcomes measured were ratings of the student’s interviewing performance, student’s confidence, and the likelihood of a second interview.

Results: Students without prior mock interview experience received lower recruiter ratings than students with interview experience, but the results were not statistically significant (3.5 in no mock interview arm vs. 3.757 in mock interview arm for interview responses, [p=0.394]; 3.796 in no mock interview arm vs. 4.0 in mock interview arm for confidence ratings, [p=0.781]; and 3.714 in no mock interview arm vs. 3.59 in mock interview arm for likelihood of being offered a second interview [p=0.69]).

Conclusions: Students who participated in mock interviews had higher interview ratings and were more likely to be offered a second interview when compared to students who do not have prior interview training, however, the association was not statistically significant. Students who have or have had prior work experience had significantly better interviewing skills/performance and were more likely to be offered a second interview compared to students who did not work while in pharmacy school.

47. Title: Reviewing and evaluating claims for dietary supplements: Omega Q Plus® Resveratrol
Project Advisor: Michael Mayersohn, PhD
Student: Fiona Lim

Objectives: To determine the effects of the dietary supplement, “Omega Q Plus® Resveratrol” on cardiovascular health. More specifically, to review randomized controlled trials to determine the effects of resveratrol, coenzyme Q10, and omega-3-fatty acids on lipid levels and blood pressure.

Methods: Randomized, double-blinded, placebo-controlled trials were searched using PubMed and Embase. Studies that assessed the effects of either resveratrol, coenzyme Q10, or omega-3 fatty acids on lipid levels and/or blood pressure in humans were included. Studies that did not use less than 1 gram of EPA and DHA were excluded. Data extraction and validity assessment was conducted by one reviewer; validity for trials were assessed using the Potential for Methodological Bias Assessment Tool (PBMAT).

Results: A total of 24 studies were included; 11 for resveratrol, seven for coenzyme Q10, and six for omega-3 fatty acids, totaling to 1633 participants combined. Doses ranged from 8 mg to 3,000 mg of resveratrol per day, 100 mg to 200 mg of coenzyme Q10 per day, and 67 mg EPA + 33 mg DHA to 1944 mg EPA + 1686 mg DHA. Results across trials were inconsistent in regards to efficacy on lipid levels and blood pressure. Subjects with metabolic syndrome or hypertriglyceridemia seemed to benefit from omega-3 fatty acids through improvement in triglyceride levels, however effects with healthy patients were less clear.

Conclusions: Overall, the interventions demonstrated mixed results in affecting lipid levels and blood pressure. No conclusions can be made at this point about the efficacy of Omega Q Plus® Resveratrol on cardiovascular health. Further research into these dietary supplements need to be conducted in order to assess their efficacy.
Title: A retrospective chart review on the effect of cisplatin related kidney damage when used with mannitol diuresis versus saline diuresis

Project Advisors: Christopher Campen, PharmD; Erin Ballard, PharmD

Students: Cynthia Ling, Sebastian Mak

Objectives: To compare and evaluate effects on kidney function of mannitol diuresis versus saline diuresis on kidney function with cisplatin therapy.

Methods: Patient charts documented between January 2010 and July 2013 were obtained and reviewed from a database of a university associated medical center. The patient’s lowest creatinine clearance (CrCl) and potassium levels during any time in therapy were compared against the baseline. Statistical testing for primary and secondary outcomes was calculated using the Independent-Samples T-Test.

Results: A total of 140 patients were reviewed – 68 patients were included in the mannitol arm, 72 in the saline arm. All baseline characteristics reviewed were not statistically different between groups except for sex, which was skewed towards males in the saline arm of the study. Baseline CrCl was 97.14 ml/min in the mannitol arm, and 93.69 ml/min in the saline arm (p=0.91). The average change in CrCl was found to be -16.72 ml/min (95% CI, -21.85 to -11.59) in the mannitol arm, -14.00 ml/min (95% CI, -18.82 to -9.20) in the saline arm; this was not statistically different (p=0.41). There was an average change of -0.31 mmol/L in blood potassium levels in mannitol patients, and a change of 0.014 mmol/L in saline patients; this was found to be significantly different (p<0.01).

Conclusions: In this single-center retrospective study, there appeared to be no benefit in using mannitol diuresis over saline diuresis. The use of mannitol incurs additional cost and place additional restrictions on administration.
49. **Title:** Reliance on Electronic Drug Information Resources: Pharmacy Students, Residents and Faculty  
**Project Advisors:** David Lee, RPh; Marion Slack, PhD  
**Student:** Charles McFarland  

**Objectives:** To assess how likely pharmacy students, faculty, residents and pharmacists will rely on an electronic device when presented with a specific drug name to research and to identify which electronic devices these four particular groups are most likely to use on a daily basis by including students enrolled in the first, second, or third year didactic coursework attending a four-year Doctor of Pharmacy program; faculty members and residents who were associated with a public research university located in the southwestern United States of America; and the pharmacy professional working in a research hospital type setting.  

**Methods:** Questionnaires were administered following three different scenarios. The first involved distributing the questionnaire during regularly scheduled classes to the first-year, second-year, and third-year professional pharmacy students. The second involved distributing questionnaires to the faculty and residents to their respective mailboxes and then collecting them at a later date. And the third scenario involved the project advisor distributing the questionnaires to his colleagues at the University of Arizona Medical Center (UAMC), now known as Banner – University Medical Center (Tucson), and then collecting them at a later date.  

**Results:** A total of 262 pharmacy students, 12 faculty, and 17 residents and other pharmacists participated in this study. Almost half of the first-year (44%) students do not work while in pharmacy school, 18% for the second-year students, and 9% for the third-year students whereby those who did work while in pharmacy school obtained more exposure to the various drug names currently available versus those who did not work. When comparing each group, having more experience typically resulted in less reliance on an electronic device. The first-year students, having the least experience, relied on an electronic device the most for the USA (3.1), pulled (3.3), and foreign (3.6) drug categories versus the residents and the working professional group (2.4, 2.4, and 3.0, respectively). The p-values for the USA, pulled, and foreign drug categories were all less than 0.001 (p < 0.001) which equates to all three groups being clinically significant. However with the fictitious drug category, the p-value was not clinically significant (p > 0.05). When analyzing the seven drugs currently marketed in the United States (USA), each group (P1, P2, P3, faculty, residents and pharmacists) knew the most about Cialis (2.5, 1.7, 1.2, 1.2, and 0.8) and Nexium (1.5, 1.1, 1.0, 0.5, and 0.3), respectively, versus the five newer drugs. The p-values for these two drugs showed clinical significance (p < 0.001).  

**Conclusions:** With the number of new drugs constantly being introduced to the global market, the pharmacist must typically rely heavily on his or her electronic device to provide optimal patient care, but with experience gained comes less reliance on these electronic devices. Both men, women, and the various groups surveyed had similar levels of confidence when reaching for their electronic device. Repeated use of these electronic devices can potentially increase the pharmacist’s knowledge about a particular new drug whereby one day, it becomes common knowledge about the drug being dispensed (e.g. Cialis and Nexium). These electronic devices are now included as one of the more common tools found inside the typical pharmacy nowadays alongside the counting tray and spatula. Unfortunately these electronic devices do have their own personal limitations and the pharmacist must still use his or her own clinical judgement.
51. Title: Therapeutic molecular targeting of Polo-like kinase 4 for cancer treatment  
**Project Advisors:** Vijay Gokhale, PhD, Gregory Rogers, PhD  
**Student:** Annie Nguyen  
**Objectives:** Two characterized peptide substrates were assayed with human Polo-like kinase 4 to determine phosphorylation activity. A pilot library of Type-II kinase inhibitors designed to fit into the ATP-binding pocket will be screened to determine HsPlk4 inhibition activity, which will help characterize a novel drug compound.  
**Methods:** Two peptide substrates of varying concentrations (2 uM, 1 uM, and 0.5 uM) were each combined with serial dilutions of HsPlk4 (1.25 uM, 0.625 uM, 0.313 uM, 0.156 uM, 0.078 uM, and 0.039 uM). EZ Reader detected phosphorylation activity by measuring fluorescence of both substrate and product, which separated at respective time points based on electrophoresis. The subsequent part of the experiment will be to inhibit the kinase activity with molecular inhibitors.  
**Results:** The results showed HsPlk4 activity with the modified PLKtide, (5FAM)KKKPSDSLYDDGLSKK(CONH2). All reactions with the various concentrations of substrate 1 and HsPlk4 showed phosphorylation activity. The reaction started within the first 10 minutes, quickly reaching maximal phosphorylation of substrate. No p-values were calculated due to lack of data.  
**Conclusions:** No overall conclusions can be drawn based on the current results. Results showed the reaction reached its saturation point, so methods need to be refined to obtain data within the first 10 minutes. HsPlk4 phosphorylation of PLKtide confirmed the presumption that PLK family is a conserved family of Ser/Thr kinases. There are practical limitations for obtaining good kinetics data depicting enzyme activity, such as having EZ Reader quickly sample the reaction.

52. Title: Effects of an educational intervention on hypertension and cardiovascular health awareness among community-dwelling older adults  
**Project Advisor:** Jeannie Lee, PharmD  
**Students:** Stephanie Nguyen, Breanna Yano  
**Objectives:** The specific aim of the study was to examine the effects of a 30-minute educational intervention, developed and delivered by student pharmacists, on knowledge of hypertension and its management among community-dwelling older adults and their caregivers. The study also aimed to examine the helpfulness of the program and readiness of the participants to adopt healthier lifestyle practices afterward.  
**Methods:** This was a pre- and post-interventional study. At senior centers around the Phoenix metropolitan area, community-dwelling older adults (ages 60 or older) and family members or caregivers (ages 18 or older) were recruited to participate. Participants completed knowledge-based questionnaires prior to and after the educational program. The mean number of correct responses was calculated for pre- and post-program questionnaires, then compared using paired t-test.  
**Results:** A total of 77 individuals participated in the program with mean age of 72 and 67% female. The mean number of correct responses calculated for survey before the educational program was 3.03 and 5.46 for survey after the program, which was significantly different (p <0.01). 85% of participants reported the program to be helpful, and 84% participants were willing to adopt healthier lifestyle after attending the program.  
**Conclusions:** An intervention tailored to community-dwelling older adults, developed and delivered by student pharmacists, was found to improve awareness of hypertension and generated willingness to adopt healthier lifestyle among the participants.
53. **Title:** Characterization of dosing recommendations for renal impairment provided in prescribing information since the FDA guidance document: have the recommendations become more clear?  
**Project Advisor:** Marcella Honkonen, PharmD  
**Student:** Karen Parades  
**Objectives:** To characterize the types of renal dosing recommendations provided in the prescribing information (aka package insert) before and after the FDA guidance for industry document regarding renal dosing, released in 1998.  
**Methods:** The prescribing information (PI) for all new molecular entities (NMEs) for three time periods was collected from the FDA website. Time period 1 was January 1995 to December 1997 and represents dosing recommendations prior to the FDA guidance statement. Time period 2 was January 2000 to December 2002 and time period 3 was January 2011 to December 2013. These represent recommendations after the FDA guidance statement. The renal dosing recommendations for each NME were reviewed and classified as either specific (includes CrCl, serum creatinine), nonspecific (mild, moderate, or severe impairment), caution, unnecessary, no information or other by two investigators independently. A further analysis was conducted for NMEs in time periods 1 and 2 with LexiComp and the most recent PIs located on FDA or company website. Presence of dialysis (hemodialysis or peritoneal) dosing recommendations was also recorded.  
**Results:** Time period 1 had significantly less NMEs characterized as No information in Lexicomp in comparison to original PIs (p= 0.02). A statistically significant decrease in original PIs characterized as Caution was observed between time periods 2 and 3 (p= .0004) and time periods 1 and 3 (p= 0.001).  
**Conclusions:** Terminology used in renal dosing recommendations in PIs does not seem to be clearer over the past years. There remains a need for improved quality of dosing information within PIs.

55. **Title:** Proposing Molecularly Targeted Therapies Using an Annotated Drug Database Querying Algorithm in Cutaneous Melanoma  
**Project Advisors:** Phillip Schneider, MS; Cheryl Cropp, PharmD, PhD  
**Student:** Aaron Pavlik  
**Objectives:** The aim of this study was to develop a computational process capable of hypothesizing potential chemotherapeutic agents for the treatment of skin cutaneous melanoma given an annotated chemotherapy molecular target database and patient-specific genetic tumor profiles.  
**Methods:** Aberrational profiles for a total of 246 melanoma patients indexed by the Cancer Genome Atlas (TCGA) for whom complete somatic mutational, mRNA expression, and protein expression data was available were queried against an annotated targeted therapy database using Visual Basic for Applications and Python in conjunction with Microsoft Excel. Identities of positively and negatively associated therapy-profile matches were collected and ranked.  
**Results:** Subjects included in the analysis were predominantly Caucasian (93%), non-Hispanic (95.9%), female (59%), and characterized as having stage III clinical disease (37.4%). The most frequently occurring positive and negative therapy associations were determined to be 17-AAG (tanespimycin; 42.3%) and sorafenib (41.9%), respectively. Mean total therapy hypotheses per patient did not differ significantly with regard to either positive or negative associations (p=0.1951 and 0.4739 by one-way ANOVA, respectively) when stratified by clinical melanoma stage.  
**Conclusions:** The developed process does not appear to offer discernably different therapy hypotheses amongst clinical stages of cutaneous melanoma based upon genetic data alone. The therapy-matching algorithm may be useful in quickly retrieving potential therapy hypotheses based upon the genetic characteristics of one or many subjects specified by the user.
57. Title: Evidenced-Based Analysis of an Herbal Supplement, Procera AVH™ for Cognitive Enhancement

Project Advisor: Michael Mayersohn, PhD

Student: Michelle Sandberg

Objectives: To evaluate evidence-based research on acetyl-L-carnitine (ALC), huperzine – A, and vinpocetine, the active ingredients found in Procera AVH for the treatment of memory loss and to investigate the named “authorities” or other professionals named in advertisements to determine if they are credible, reliable and unbiased sources of information for the treatment of memory enhancement.

Methods: A systemic literature review of randomized controlled trials (RCT) was performed, based on predefined search criteria, using the words “memory” and “cognition” with the active ingredients of Procera AVH. The studies evaluated needed to meet certain inclusion criteria in order to be included.

Results: Study selection criteria included RCTs conducted on male or female participants of all ethnicities, who were at least 18 years of age. The PubMed search on each of Procera’s active ingredients, ALC, vinpocetine and huperzine-A, using the search terms and criteria described, yielded a total of 21 RCTs, but only one of which met all the inclusion criteria. The one study that met the inclusion criteria reported on the effect of ALC on cognition in patients with severe hepatic encephalopathy.

Phone calls to KeyView Labs, Inc., the company that sells the product, were unsuccessful in obtaining the information sought. The company representatives stated that they did not have CVs or any other professional biographical information on the developers and promoters of Procera AVH.

Conclusions: A search of the scientific literature yielded no evidence that Procera AVH, or any of its individual components listed as being the active ingredients, were effective in improving cognitive or memory function in healthy subjects. No data were found to either support or deny the credibility of those professionals or so-called authorities promoting Procera AVH.