1. Title: Effect of a pharmacist led medication education group on hospital readmissions for patients with previous inpatient psychiatric admissions

**Project Advisor:** Lisa W. Goldstone, PharmD

**Students:** Allison Arterbury, Audrey Bushway

**Specific Aims:** It has been demonstrated through numerous studies that pharmacists have the ability to significantly impact patient outcomes. It is especially important to measure the effect that pharmacists have on psychiatric patient care as this is a population that is often underserved and can potentially benefit from pharmacist intervention. To date, there has been little research on pharmacist led patient medication education groups for patients with psychiatric diagnoses. Therefore, the purpose of this study was to assess the effectiveness of a pharmacist led medication education group in reducing adult psychiatric hospital readmission rates due to medication non-adherence.

**Methods:** Patients admitted to an acute adult inpatient psychiatric unit at an academic medical center between September 1, 2011 and July 31, 2012 were included. A random sample of 100 patients that attended the medication education group (intervention group) and 100 patients that did not attend the group were selected (control group). The following data were collected: patient age, gender, ethnicity, insurance benefits, primary diagnosis, substance abuse history, number of medications at first discharge, length of stay on initial admission, time to first readmission, length of stay on first readmission, and reason for readmission (medication non-adherence versus other). A chi square analysis was conducted to determine if admission rates and reason for readmission were different between the two groups. An independent t test was conducted to determine if time to first readmission or length of stay on first readmission was different between the two groups.

**Main Results:** There were 28 psychiatric hospital readmissions in the intervention group and 28 readmissions in the control group. Although these numbers were similar, there was a statistically significant difference in the number readmitted due to medication non-adherence, 11 in the intervention group vs. 19 in the control group (p=0.032). There was also a clinically significant difference in the time to readmission between the two groups (an average of 94.43 days in the intervention group vs. 60.70 days in the control group.)

**Conclusion:** The pharmacist-led medication education group did not have an impact on readmission rate. However, the group did reduce the number of readmissions for medication non-adherence. There is a clinically significant increase in the time to readmission in patients that attended the medication education group. The data in this study support the implementation of pharmacist-led medication education groups to improve outcomes in adults admitted to acute inpatient psychiatry units.
2. Title: The Level of Accuracy in the Sixth Season of the Medical Television Show, House M.D.
Project Advisor: David Apgar, PharmD
Students: Jacqueline Barraclough, NgocThuy-Grace Nguyen
Specific Aims: The aim of this study was to evaluate the level of accuracy of medical information presented in the sixth season of the popular prime time medical drama, House M.D.
Methods: The study was a descriptive, retrospective assessment of twelve episodes in the sixth season of the medical television show, House M.D. Three parameters were compared to reliable medical sources: signs and symptoms, diagnostic procedures, and medical treatment for the one primary medical problem portrayed in each episode. Three researchers reviewed each episode independently and rated the accuracy of each parameter. The accuracy of each dependent variable was rated on a scale of one to four (most to least accurate, respectively). After discussion, a consensus rating was determined for all three variables for all twelve episodes.
Main Results: The average accuracy scores for the signs and symptoms, diagnostic procedures, and medical treatments were 2.08, 2.58 (ie., least accurate), and 1.5 (ie., most accurate), respectively. The average accuracy score across the three parameters was 2.06 (correct but somewhat unusual). The one-way ANOVA analysis on the variables revealed a statistically significant difference among the groups, with a p value of 0.003. The Tukey HSD test confirmed the statistically significant difference between diagnostic procedures and treatment (p = 0.002).
Conclusion: The treatments portrayed in twelve episodes of season six were judged more accurate than signs and symptoms and diagnostic procedures. The average accuracy score of the three groups determined that the medical information presented in the episodes seemed to be correct but somewhat unusual.

3. Title: Health Expenditure Trends in East Asian and Pacific Countries, 1995-2010
Project Advisor: Ivo Abraham, PhD
Students: Olga Boytsova, Kinjal Patel, Tina Pham
Specific Aims: To classify East Asian and Pacific countries into homogenous groups based on potential determinants of their healthcare expenditures and public health care.
Methods: We used data from the 1995 to 2010 World Health Organization (WHO) database. Cluster analysis techniques were applied to identify clusters of East Asian and Pacific countries using variables identified as potential determinants of healthcare expenditures and public health care. Differences between clusters of countries were validated using Analysis of Variance (ANOVA). Average annual growth rate (AAGR) was calculated to study the change in trends across countries over time.
Main Results: Nineteen countries with complete data were included. Of those, we identified four distinct clusters. Cluster 1 consisted of Cambodia, Laos, Mongolia, Solomon Islands, Timor-Leste and Vanuatu. Cluster 2 represented China, Myanmar, and Vietnam. Cluster 3 consisted of Fiji, Indonesia, South Korea, Malaysia and Thailand. Cluster 4 represented Micronesia, Papua New Guinea, Philippines, Samoa and Tonga. Health Expenditure per capita AAGR (P=0.002), infant mortality rate AAGR (P=0.018), life expectancy at birth AAGR (p=0.003), population ages 65 and above AAGR (P=0.004) and death rate (P<0.001) were found to be significantly different among the clusters. Clusters were similar based on birth rate (P=0.425) and public health expenditure (P=0.231), though there were trends of differences.
Conclusion: East Asian and Pacific countries were similar based on birth rate and public health expenditure, but were different based on health expenditure per capita, infant mortality rate, life expectancy at birth, population ages 65 and above and death rate. Exploration of clusters among countries may increase the chances of success for health policies and innovations at lower costs of targeted implementation at a global level.
4. **Title:** Inpatient pharmacist intervention helps sustain improved rates of baseline metabolic monitoring for patients initiated on atypical antipsychotics

**Project Advisors:** Lisa Goldstone, PharmD; Amy Kennedy, PharmD

**Students:** Phalyn Butler, Christa Goldie, Caitlin Simonson

**Specific Aims:** The purpose of this study is to assess whether baseline rates of metabolic monitoring of scheduled atypical antipsychotics are sustained as a result of a pharmacist intervention.

**Methods:** This study was a retrospective chart review assessing rates of metabolic monitoring two months after a pharmacist intervention that utilized a pharmacist-physician metabolic monitoring recommendation form was discontinued. Patients ages 18 years or older with orders for a scheduled atypical antipsychotic were included. Patients with orders for first-generation antipsychotics or who have orders for as needed atypical antipsychotics were excluded.

**Main Results:** Data from the two month post intervention period was compared to those obtained during the pharmacist intervention. For the monitoring of hemoglobin A1c and fasting lipid panels, which improved during the pharmacist intervention, there was a non-statistically significant trend towards decreased monitoring. For hemoglobin A1c, the rates of monitoring decreased from 21.59% to 12.32% (p = 0.09). For fasting lipid panels, monitoring decreased from 39.77% to 28.99% (p = 0.125).

**Conclusion:** A pharmacist intervention utilizing a recommendation form was effective in sustaining the improvement of baseline metabolic monitoring of personal history of diabetes and cardiovascular disease and monitoring of hemoglobin A1c and lipid panels. However, a trend towards decreased monitoring was observed in both the percentage of hemoglobin A1c and lipid panels ordered. Thus, continuing pharmacist intervention may be necessary in order to ensure that baseline metabolic monitoring for atypical antipsychotics occurs.

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5. **Title:** Arizona community pharmacy quality assurance legislation: evaluation of motivation, awareness and knowledge change after attending a continuing education program.

**Project Advisor:** Terri Warholak, PhD

**Students:** Patrick Campbell, Kristina Gerboth

**Specific Aims:** On April 18, 2007, the Arizona legislature passed the Pharmacy Continuous Quality Assurance (CQA) law, with enforced compliance beginning January 1, 2014. With the lengthy lag time between passage of the law and required compliance with the law, a continuing pharmacy education (CPE) seminar was developed to educate Arizona pharmacy personnel about the new requirements. The CPE seminar was evaluated by assessing changes in participant self-reported knowledge, motivation, and awareness regarding the quality assurance legislation and the CQA process.

**Methods:** The CPE seminar took place at the Arizona Pharmacy Association’s Community Pharmacy Academy Conference. Data were collected using a retrospective pre-assessment/post-assessment questionnaire. Data were analyzed using Wilcoxon Signed-Rank tests with a Bonferroni correction. Demographic information were reported using descriptive statistics.

**Main Results:** The response rate was 70%, with 28 of 40 participants completing the questionnaire. Each of the six self-assessment questionnaire statements showed a statistically significant change from pre to post assessment (p = 0.0005).

**Conclusion:** The results show that the law CPE session positively impacted participant self-assessment of knowledge, awareness, and motivation of quality improvement initiatives and medication errors. Follow-up research is needed to determine what impact this CPE session will have in pharmacy practice.
6. **Title:** A comparison of the efficacy of two types of faxed medication interventions  
**Project Advisors:** Jill Augustine, PharmD; Tracy Harrell, PharmD; Kevin Boesen, PharmD  
**Student:** Zak Cerminara  
**Specific Aims:** To assess the impact of provider outreach for an MTM program by comparing two formats of recommendations: a general informational fax and a prescription template fax.  
**Methods:** This study was a retrospective analysis of pharmacist recommendations at an MTM center in 2012. Recommendations were made following either a comprehensive medication review with a patient or of available pharmacy claims. Interventions included in this analysis were those made to improve patient treatment through the use of medications consistent with national treatment guidelines (“guideline alerts”) or those made to reduce cost (“cost alerts”). A recommendation was a success if the change in medication therapy was noted in claims data within 120 days. The success rates between the two interventions were compared using Chi square.  
**Main Results:** The overall success rate was 20.9% (10,947/52,409). For guideline alerts, there was a significant difference in the acceptance of prescription faxes (13.1%) versus informational faxes (9.9%) (P <0.001). Prescription faxes recommending the addition of an ACE inhibitor for hypertension in diabetic patients was significantly higher compared to informational faxes in females over 60 years old (14.8% vs. 10.00%, P <0.001) and all males (13.2% vs. 9.9%, P <0.001). For cost alerts, there was a statistically significant difference in the acceptance of prescription faxes (49.7%) versus informational faxes (37.7%) (P <0.001).  
**Conclusion:** Prescription faxes produce higher rates of acceptance for guideline and cost recommendations. While both prescription and informational faxes could be used to further improve the communication between prescribers and pharmacists that provide MTM services, providers may prefer specific prescription faxes.

7. **Title:** Comparing the Efficiency and Accuracy of Health Information Exchange (HIE) to the Traditional Process of Medical History Gathering During Admission at the Pima County Adult Detention Complex (PCADC)  
**Project Advisor:** Terri Warholak, PhD  
**Students:** Hout Chao, George Hernandez, William McCracken  
**Specific Aims:** Assess the change in efficiency and accuracy of healthcare in provider access to HIE for medication profiles at the PCADC.  
**Methods:** Adults detainees admitted from October 22, 2012 to July 31, 2013 were enrolled in this study. A completed Intake Medical Screening form with self-reported/correction facility staff verified medication list will (the old method) be compared to the medication list obtained by querying the medication HIE (the new method). Descriptive statistics will describe the patients. Statistical significance will be calculated using the McNemar chi-square test for comparing the proportions of omissions (medications and strengths) on the 765PI to the HIE with an a priori alpha of 0.05.  
**Main Results:** A total of 401 records were randomly selected, 389 retrieved, with 197 (50.6%) detainees within the HIE database and 55 of those patients contributed to 248 medications (average 4.5, SD 3.9). Of the sampled patients, 103 patients self-reported in total of 362 medications (average 3.5, SD 2.6). Mean completeness of self-reported medications was 81.4% while HIE yielded an average of 93.9% ($\chi^2$; p=0.007). Thirty-six (9.3%) patients had both self-reported medication and medications within the HIE database in which HIE shared 108 medication compared to the self-reporting method with 105 (97.2%) sharing the same name, 70 (95%) sharing the same dose, 79 (84%) sharing the same date of last filled, and 72 (83.7%) sharing the same quantity.  
**Conclusions:** HIE has the capability of providing a more complete and accurate medication profile compared to the traditional self-reporting method for healthcare providers within an adult detention facility setting.
8. **Title:** Suboxone for Medically Assisted Treatment for Opioid Dependence  
**Project Advisor:** Terri Warholak, PhD  
**Students:** Mary Cradick, Shannon DeGrote, Spencer Marsall  
**Specific Aims:** To show that Suboxone is more effective than no MAT (Medically Assisted Treatment) in opioid dependence. Additionally, that Suboxone is as effective as methadone in MAT.  
**Methods:** This study was a retrospective chart review of probationer’s case files at The Pima County Adult Probation Office. Treatment groups included: Suboxone (n=16), methadone (n=15), and no MAT control group (n=15). The total sample size was 46 probationers. The primary dependent variables were the number of negative events and time to a negative event (i.e. missed/positive urinalysis, violation of terms of probation). The secondary outcome variables were the number of positive events and time to a positive event (i.e. finding employment, documented social/family improvement). Data analysis utilized chi-square for categorical data while t-tests were used for continuous data.  
**Main Results:** A total of 46 probationers of Pima County with violations related to possession or use of an opioid substance were analyzed. No significant differences were found between Suboxone and placebo (no MAT) for any of the four outcomes (number of negative events p=0.82; time to first negative event p=0.41; number of positive events p=0.93; time to first positive event p=0.45). No significant differences were found between Suboxone and methadone as well (number of negative events p=0.34; time to first negative event p=0.52; number of positive events p=0.93; time to first positive event p=0.56).  
**Conclusion:** This study found no statistically significant differences between no MAT and Suboxone nor Suboxone and methadone. Differences in baseline characteristics between groups were found that could characterize the Suboxone group as being more severely ill.

9. **Title:** Validation of the Accuracy of RxLator, an iPhone-based English-to-Mandarin Translator  
**Project Advisors:** John Gilkey, PhD; Richard Herrier, PharmD; Marion Slack, PhD  
**Student:** Echo Fallon  
**Specific Aims:** Determine the accuracy of RxLator, an iPhone-based English to Mandarin Translator.  
**Methods:** Subjects (graduate chemistry students at Soochow University, Taiwan, N = 27) individually listened to 25 RxLator medication directions in Mandarin. Each subject verbally told the translator the meaning of each direction, and the investigator recorded the translated responses on paper. At the end of the session, each subject identified which directions required editing. These directions were then played for an additional subject.  
**Main Results:** Of the 25 directions, 17 were easily understood the first time subjects heard them. Of the 6 directions that required edits, the subjects’ confusion was caused by a single word found in 4 of the directions. The remaining 2 more difficult directions caused confusion due to other reasons. Overall, the subjects were confident in understanding the majority of the medication directions.  
**Conclusion:** With few exceptions, the iPhone-based English-to-Mandarin Translator seems to be accurate for medication directions. This application is the first mobile, electronic device to ensure an accurate, convenient method to translate medication directions from English to Mandarin.
10. Title: The effect of follow-up phone calls after patient discharge on 30-day hospital readmission rates
Project Advisors: Janet Cooley, PharmD; Terri Warholak, PhD
Students: Kristen Fyfe, Tiffany Lee-Chan, Heather Marrow
Specific Aims: The objective of this study was to perform follow-up phone calls to patients after discharge to determine if it had a significant effect in lowering 30-day readmission rates.
Methods: Men and women aged 18 years and older who provided informed consent participated in this prospective, pre-post study. The intervention consisted of a scripted follow-up phone call to each patient after discharge. At three to seven days post-discharge, a pharmacy student on an advanced pharmacy practice experience rotation at a teaching hospital called each patient discharged from a designated ward (Med/Surg I), which admits patients with a variety of conditions, such as liver cirrhosis, pneumonia, osteomyelitis, those who are uninsured, or those who require placement after discharge. Information was collected regarding prescription filling, understanding of medication(s), concerns regarding medications, and the community pharmacy he/she used to fill the discharge medications. The specified community pharmacy was then called to verify that the patient filled discharge medications at that pharmacy. The results were compared to the readmission rate in the same ward over the same time period one year prior to implementation of the intervention. Chi-square and descriptive analysis was used and the alpha a priori is 0.05. The institutional review board approved this study.
Main Results: Of the 315 people contacted, a total of 89 people completed the survey (28% response rate) and 11 of these participants were readmitted at least once. There was no statistically significant difference between the participant readmission rate and the readmission rates of the total unique admission population of Med/Surg I in 2013 ($\chi^2 = 1.206; p = 0.272$).
Conclusion: Follow-up phone calls did not significantly impact 30-day readmission rates; however, a downward trend was observed in the participant group.

11. Title: Evaluating treatment options for NAP1 versus non-NAP1 strains of Clostridium difficile infection among pediatric patients at an academic hospital.
Project Advisors: Kathryn Matthias, PharmD; Hanna Phan, PharmD
Student: Amelia Smith
Specific Aims: The incidence of Clostridium difficile (C. Diff) infections in pediatric patients has continually risen, which could be caused by the emergence of a hyper virulent strain, specifically NAP1/B1/027. The objectives of the study were to evaluate the incidence of strain type, compare treatment(s) prescribed, treatment duration, rate of infection recurrence based on strain and severity, rates of re-infection or recurrence, and treatment failures for patients less than 6 months and up to 18 years of age.
Methods: A retrospective study of patients admitted to an academic medical center with detection of C. diff toxin was performed. Data analyses included descriptive and inferential statistics to examine demographics, strain type, infection severity, and treatment failure.
Main Results: Forty-five patients with C. Diff toxin detection were included in study analyses and the median age was 6.2 [0.31-17.9 years]. Oral or intravenous metronidazole was prescribed as initial therapy in 89% of the patients. Strain type was available in 77% of patients, with NAP1/B1/027 detected in 31% of stool samples tested. Within 21 days after initial toxin detection, there was a 13% rate of clinical failure or death, although none directly associated with C. Diff. Within days 22-65 after initial toxin detection, there was a 16% rate of recurrence or reinfection. Initial therapy selection, therapy duration, and rate of recurrence or reinfection were not significantly associated with NAP1/B1/027 strain type.
Conclusion: Despite variability in severity of infection, the majority of pediatric patients with C. Diff were treated with metronidazole and were infected with a non-B1/NAP1/027 strain.
12. Title: Assessment of Ambulatory Care Practice in Adult and Pediatric Patients  
Project Advisors: Hanna Phan, PharmD; Amy Kennedy, PharmD  
Student: Tina Vallabh  
Specific Aims: The purpose of this study is to compare frequency of pharmacy services available in ambulatory care practice between adult and pediatric populations and to identify factors that affect the availability of such practice settings between the two populations in the United States.  
Methods: This study was a descriptive survey study that was distributed nationally. Participants were recruited using two electronic listservs registered with the American College of Clinical Pharmacy (ACCP), the Pediatric PRN listserv and Ambulatory Care PRN listserv. A total of 126 participants completed and submitted the electronic questionnaire. This descriptive survey study collected data through an online questionnaire distributed to adult and pediatric ambulatory care pharmacists. Descriptive variables, demographic variables, categorical variables, and ordinal data were analyzed by calculating frequencies, percentages, and averages.  
Main Results: The majority of participants specialize in diabetes (n = 51, 40.5%), anticoagulation (n=42, 33.3%), hypertension (n=42, 33.3%), hyperlipidemia (n=40, 31.8%), and asthma (n=32, 25.4%). Adult care was greater than pediatric care in diabetes (Adult: n=54, 42.83%; Ped: n=14, 9.53%), anticoagulation (Adult: n=46, 43.66%; Ped: n=6, 4.76%), hypertension (Adult: n=44, 34.94%; Ped: n=8, 6.34%), hyperlipidemia (Adult: n=42, 33.34%; Ped: n=3, 2.39%), and asthma (Adult: n=35, 27.78%; Ped: n=28, 22.23%). Averages of 4.88 hours of work per week and 5.21 years of experience were obtained for provision of pediatric care in the ambulatory care setting.  
Conclusion: In conclusion, availability of ambulatory care services for pediatric patients is dramatically less than those available for adults. Generalized structure for location of clinics, billing for services, and funding for positions may increase the opportunity for provision of adult and pediatric ambulatory care services.  

13. Title: Stenotrophomonas maltophilia and time to appropriate antibiotic therapy  
Project Advisor: Kathryn Matthias, PharmD  
Students: Amelia Kwong, Jenny Zhu  
Specific Aims: Determine time to appropriate therapy for S. maltophilia infection before implementation of mass spec. A second part of this project will evaluate the time to appropriate therapy after implementation of mass spec. The hypothesis is the time to appropriate therapy will decrease by > 2 days after implementation of mass spec. Appropriate antibiotic therapy will be based on susceptibility data reported for each isolate of S. maltophilia. Potential appropriate therapy that will be evaluated includes high-dose sulfamethoxazole-trimethoprim (10-20 mg/kg/day based on TMP adjusted for renal function), ticarcillin- clavulanate plus aztreonam, moxifloxacin or levofloxacin, and ceftazidime.  
Methods: A retrospective chart review was done to evaluate time to identification and time to appropriate therapy for S. maltophilia as baseline data before implementation of mass spectrometry for earlier species identification. Subject selection included all patients between June 1, 2011 through May 31, 2012 with S. Maltophilia isolated from any source while admitted to the University of Arizona Medical Center-University Campus, Tucson, AZ. Patients with initial S. maltophilia isolated from a post-mortem sample or were colonizers were excluded.  
Main Results: There were 86 subjects included in the study based on inclusion and exclusion criteria. There were 60 subjects that received appropriate therapy for S. maltophilia coverage. The averaged time to initiation of appropriate antibiotic prior to the implementation of mass spectrometer was determined to be 6.5 days.  
Conclusion: Since S. maltophilia is not susceptible to many antibiotics used as empiric therapy, early identification of the pathogen via mass spectrometry, in addition to pharmacist intervention, may lead to initiation of appropriate antibiotics that is earlier than an average of 6.5 days found in this study.
14. **Title:** Evaluation of the differential effects of MK-801 and MMP-2200 on dopamine receptor 1- and 2-agonist-induced abnormal involuntary movements  
**Project Advisors:** Torsten Falk, PhD; John Regan, PhD  
**Student:** Lisa So  
**Specific Aims:** The specific aim of this study was to measure the severity of dopamine receptor 1 (D1R)- and dopamine receptor 2 (D2R)-induced abnormal involuntary movements (AIMs) when administered with the NMDA receptor antagonist MK-801 or opioid glycopeptide MMP-2200.  
**Methods:** Male Sprague-Dawley rats were injected with 6-hydroxydopamine to cause unilateral loss of dopaminergic neurons in the substantia nigra and subsequent striatal dopamine loss. Levodopa (7 mg/kg; i.p.) injection for 21 consecutive days caused the rats to develop levodopa-induced dyskinesias, termed AIMs in this preclinical rat model. The rats were first primed with the D1R agonist SKF81297, then co-administered with MK-801 or MMP-2200 and AIMs scores were recorded to determine the severity of the dyskinesias. Then the same procedure was performed with the D2R agonist quinpirole.  
**Main Results:** MK-801 worsened D1R-induced limb, axial and orolingual (LAO) AIMs (p<0.05) whereas there was no change in locomotor AIM scores. MK-801 reduced D2R-induced LAO AIMs by 89% (p<0.001). However, MK-801 induced ipsiversive rotations, which is a parkinsonian symptom in this model. MMP-2200 had no effect on D1R-induced LAO AIMs but significantly reduced locomotor AIMs by 50% (p<0.05). MMP-2200 significantly decreased both D2R-induced LAO and locomotor AIMs by 40% and 90%, respectively (p<0.01).  
**Conclusion:** Both MK-801 and MMP-2200 had differential effects on the rodent direct and indirect striatofugal pathways with regards to AIMs. These results support that MK-801, an NMDA receptor antagonist, and MMP-2200, a mixed mu and delta opioid receptor agonist, modulate levodopa-induced dyskinesias through the dopaminergic and glutaminergic pathways.

15. **Title:** Medication Identification Rates by Pharmacists and Nurses  
**Project Advisors:** David Apgar, PharmD; Chanadda Chinthammit, BPharm; Terri Warholak, PhD  
**Students:** Brian Lamhang, Ae Ri Lee, Shannon Lim  
**Specific Aims:** To assess and compare prescribing error-identification rates by healthcare professionals  
**Methods:** Pharmacists and nurses from Northwest Medical Center were invited to participate in this study. Participants completed a questionnaire that consisted of 10 fictitious patient prescriptions. They were asked to evaluate the accuracy of the prescriptions and indicated the type of error found, if any. The number of correctly identified prescribing errors, correct types of errors, and error identification rates for each group were calculated. Rasch analysis was used to assess the validity and reliability of the questionnaire. Wilcoxon and Rasch-Welch t-test were used to assess the difference in prescribing error-identification rates.  
**Main Results:** Thirty-five out of 700 nurses and 6 out of 20 pharmacists completed the questionnaire (response rate 5% and 30% respectively). Pharmacists had significantly higher error-identification rates compared to nurses (p = 0.0001). Additionally, pharmacists were able to correctly identify the type of error in each prescription (p < 0.0001).  
**Conclusion:** Pharmacists were significantly able to correctly identify more prescribing errors and more types of prescribing errors in 10 fictitious prescriptions compared to nurses. Several assumptions and limitations were identified in this study, therefore future studies are warranted.
16. Title: Using meta-analysis to explore the factors affecting the potency of pharmacists’ patient interventions  
Project Advisors: Jeannie Lee, PharmD; Jennifer Martin, MA; Marion Slack, PhD  
Students: Bach-Truc Chau, Trang Vo, Ling Yuan-Lee  
Specific Aims: To identify the factors that affects the potency of pharmacists’ interventions.  
Methods: Literature search was based on keywords and Mesh terms in eight different databases. The inclusion criteria were evidence of pharmacist involvement in direct patient care, patient-related therapeutic outcomes, studies done in the United States, randomized controlled trials, studies with reported number of subjects in the intervention and control group and reported means and standard deviations of therapeutic outcomes. For the study selection and data extraction, two students independently reviewed each study and met to resolve any discrepancies. In addition, each study was assigned a potency score using the potency tool. Data extraction included: pharmacists’ interventions (technical, behavioral, educational, and affective), patient characteristics, and therapeutic outcomes. The standardized mean difference (SMD) was calculated; studies with SMD ≥ -0.3 formed the low impact group (controls) and studies with SMD ≤ -0.8 formed the high impact group (cases).  
Main Results: The included randomized control trials (N=11) were conducted in a variety of settings from ambulatory clinics to hospital. The high impact group was favored in the educational category (ES=0.88, p=0.18) while the low impact group was favored in the behavioral category (ES=0.19, p=0.81). In general, there was a difference between the high impact and low impact (ES=0.82, p=0.37) groups with the high impact group being favored.  
Conclusion: There is a difference between the low impact and high impact groups, but it is unclear which pharmacist interventions have a significant impact on therapeutic outcomes.

17. Title: Appropriate Use of Meropenem: A Pharmacy Intervention  
Project Advisors: Georgina Rubal-Peace, PharmD; Jamie Natkowski, PharmD  
Student: Stacey Abbott  
Specific Aims: The primary objective was to determine the effectiveness of a criteria-based antibiotic order form (CBAOF) at increasing appropriate meropenem use at University of Arizona Medical Center – South Campus (UAMCSC). The secondary objective was to assess any cost savings associated with increased appropriate meropenem use.  
Methods: A retrospective chart review of patients (n = 133) meeting inclusion criteria at UAMCSC during the pre and post-intervention periods was conducted. Outcomes included appropriate empiric use of meropenem, appropriate treatment of a known pathogen use of meropenem, appropriate dose and frequency of meropenem, appropriate antibiotic streamlining after culture and susceptibility report, and meropenem acquisition costs.  
Main Results: Appropriate empiric use of meropenem was significantly higher after the implementation of the CBAOF (100% vs. 65.8%, p = 0.002). Although not statistically significant, the post-intervention group had more patients meeting the criteria for appropriate use of meropenem for a known pathogen than the pre-intervention group (50% vs. 40%, p = 0.809). There were no differences between the pre and post-intervention groups with respect to appropriate dose of meropenem or appropriate frequency. After the implementation of the CBAOF there were significantly more patients who received antibiotic streamlining within 24 hours of culture and susceptibility reports (12.5% vs. 48.7%, p = 0.002). Drug acquisition costs for meropenem were reduced by approximately $30,000 after CBAOF implementation.  
Conclusion: The CBAOF was effective at increasing appropriate empiric meropenem use and decreasing meropenem acquisition costs at UAMCSC.
18. **Title:** Title of project: Prevalence and Willingness of Mothers in a Local Support Group to Ask Pharmacists for Pediatric Dosing of Over-the-Counter (OTC) Products: A Descriptive Study

**Project Advisor:** Jenene Spencer, PharmD

**Students:** Jacquelyn Adkins, Katrina Kittell

**Specific Aims:** To assess the prevalence of mothers asking pharmacists for pediatric dosing and mothers’ knowledge of pediatric OTC use. Subjects: Mothers with ≥ one child under 6 years old in a local mothers’ support group in Tucson.

**Methods:** Questionnaires were sent out weekly for a month by the group’s listserv and social media website to determine the prevalence of mothers that ask pharmacists questions and assess their knowledge of OTC medications and what medical sources they use. Data on ages, ages of children, number of children, race/ethnicity, pharmacy visited, education, insurance coverage, and children’s chronic diseases were collected.

**Main Results:** Twenty-six people responded. About 46% of the participants were 30 - 34 years old. Forty-six percent of mothers had 2 children; 42% had 1 child. About 54% of mothers have asked a pharmacist for pediatric OTC dosing. The reasons mothers gave for not asking pharmacists dosing information were that they hadn’t needed to ask (25%), they asked a doctor (16%), they used an online resource (8%), and they didn’t think about asking (8%). Three questions assessed OTC knowledge; 50% of participants got all questions correct, 38.5% got two questions correct, and 11.5% got one question correct. There wasn’t a difference in OTC knowledge and whether they asked a pharmacist questions (p=0.373).

**Conclusion:** More than half of mothers asked pharmacists dosing information, but this percentage could still be higher. Fifty percent got all three questions right, 38.5% got two questions correct, and 11.5% of mothers got only 1 question correct.

19. **Title:** Avella Medication Mail-back Disposal Program: a report on success

**Project Advisors:** Janet Cooley, PharmD; Kelly Mathews, PharmD

**Student:** Andrea Woodard

**Specific Aims:** The primary aim of this project was to determine how receptive patients of Avella Specialty Pharmacy are towards using a mail-back medication disposal envelope by phone survey. This evaluated the hypothesis: participants in the Avella Pharmacy Medication Mail-Back Program will find the program helpful and easy to use. A secondary aim was to describe the participation in Avella’s pharmacy based medication mail-back program. This evaluated the hypothesis: Avella’s pharmacy based mail-back program will produce more participants versus non-participants.

**Methods:** Patients of Avella Specialty Pharmacy with unused medications from discontinued prescriptions for any reason were offered a pre-paid Take Away™ envelope to dispose their medications. Each patient who accepted an envelope was called and asked about their experience using the envelope.

**Main Results:** The majority of patients (58%) who were offered a medication disposal envelope agreed to receive one. All of the respondents surveyed indicated they would use their envelope to mail medications back. Patients of Avella Specialty Pharmacy think medication disposal envelopes are easy (100%) and helpful (97%) to use. Utilizing the trash or toilet to dispose of medications made up 41% of responses when asked about their usual method of medication disposal. A majority of respondents (74%) had not heard of a medication disposal program before Avella’s call regarding the envelope.

**Conclusion:** Medication mail-back disposal envelopes are helpful and easy to use for disposing of unused medications among Avella Specialty Pharmacy patients. The majority of Avella Specialty Pharmacy patients are receptive towards receiving and using medication mail-back disposal envelopes.
20. **Title:** An Interactive Approach to Educate Older Adults about Polypharmacy  
**Project Advisor:** Jeannie Lee, PharmD  
**Students:** Valmira Asllani, An Nguyen, Lena Phung  
**Specific Aims:** To create and implement an educational presentation on polypharmacy using interactive strategies. Secondly, to assess the effectiveness of the interventional presentation by evaluating its helpfulness in improving polypharmacy awareness among older adults as measured by a retrospective pre-post participant survey.  
**Methods:** Residents of select independent senior living facilities in Tucson, Arizona were invited to attend an interactive, educational program entitled "What is Polypharmacy?" presented by fourth-year Doctor of Pharmacy students. This program consisted of a 30-minute PowerPoint presentation, which included various interactive learning approaches, followed by a 10-minute question and answer period. An anonymous retrospective pre-post survey was distributed to the participants after the presentation to evaluate the effectiveness and helpfulness of the program, as determined by the participants’ ratings on Likert-type scales and willingness to confidently engage in medication self-management.  
**Main Results:** Of the 73 participants from the six independent living facilities, 55 surveys were collected from the residents and 54 surveys were included in the data analysis. The retrospective pre-post data analysis found that familiarity with the definition of polypharmacy increased (p<0.001), understanding of the risks of polypharmacy increased (p<0.001), and the willingness to manage one’s own medications increased (p=0.045). Overall, 95.9% of the participants found this educational program to be helpful, and 95.8% of the participants would recommend this program to a friend.  
**Conclusion:** The interactive, educational program about polypharmacy, created and presented by pharmacy students, was helpful and effective in increasing polypharmacy awareness among older adults residing in independent senior living facilities.

21. **Title:** Comprehension and Attendance of Prescription Warning Labels  
**Project Advisor:** Marti Lindsey, PhD  
**Students:** Mina Baghzouz, Sarah Flocks, Thu Nguyen  
**Specific Aims:** The purpose of this study is to determine if people who take or manage medications attend to the prescription warning labels (PWLs) and if education levels affect how they interpret these warnings. The primary hypothesis is that people without a high school degree/equivalent will have more difficulty correctly interpreting PWLs.  
**Methods:** A survey was designed to assess whether or not the general population attends to warning labels and if education levels affect how they interpret these warnings. The survey contained questions to assess PWL attendance, a quiz to assess PWL interpretation, and demographic information. Surveys were collected at Joel Valdez Main Library in Tucson, AZ from August 2013 to January 2014. For data analysis, the percentage of participants who attended to warning labels was calculated. To compare the two education groups a Chi square analysis was performed.  
**Main Results:** A total of 113 participants took the survey and 4 were excluded from analysis. The survey was completed by 55 men (51.4%) and 52 women (48.6%). The mean age of participants was 46.9 years (SD +/- 15.3). Of the participants who took and/or managed medications, 46.8 % of them attended to the PWLs. There was a significant difference in the number of correct responses between the education groups for only one of the PWLs ("external use only") with a p-value of 0.03.  
**Conclusion:** The majority of the general public does not attend to PWLs. Education level does not significantly affect the interpretation of most PWLs.
22. **Title:** Health Literacy Assessment of Fifth and Sixth Grade Students at Two Schools in Tucson, Arizona Using the REALM-Teen: A Descriptive Study  
**Project Advisor:** Jenene Spencer, PharmD  
**Students:** Brian Barkow, Chelby Helmrich  
**Specific Aims:** Fifth and 6th grade students at two schools in Tucson, Arizona were assessed using the Rapid Estimate of Adolescent Literacy in Medicine (REALM-Teen) to increase awareness of the need of childhood health literacy.  
**Methods:** After receiving permission from the two schools, the parents and the students, assessment by the REALM-Teen determined if the children were at, above, or below grade level.  
**Main Results:** Ninety-eight students were assessed of 183 possible (53.6%). Eighty-four were at or above grade level (85.7%), 14 were below (14.3%). Fifty-seven 5th graders were assessed of 90 (63.3%); of the 46 (of 72) in public school, 40 were at or above grade level (86.9%) and 6 were below (13.1%); of the 11 (of 18) in private school, 9 were at or above grade level (81.8%) and 2 were below (18.2%). Forty-one 6th graders were assessed of 93 (44.1%); of the 34 (of 84) in public school, 28 were at or above grade level (82.4%) and 6 were below (17.6%); of the 7 (of 9) in private school 7 were at or above grade level (100%). Chi-square analyses showed no statistical significance between health literacy outcomes and gender, school type or prior health knowledge.  
**Conclusion:** Most (85.7%) students assessed were at grade level or higher for health literacy, which supports standards being taught and reached. That 14 students fell below grade level at the time of assessment as well as the high percentage of students not assessed (46.4%) emphasizes need for more health education and assessment.

23. **Title:** Assessing the impact of the transition to an enterprise-wide health information system on pharmacy performance.  
**Project Advisor:** Kurt Weibel, PharmD  
**Student:** Steven Boyles  
**Specific Aims:** The purpose of this study is to quantitatively analyze the pharmacy department’s performance before and after the transition from a segmented set of information technology systems to an enterprise wide electronic health record.  
**Methods:** This prospective, observational study collected data from both the pre-implementation and post-implementation electronic systems. The enterprise wide electronic system was implemented on November 1, 2013. Medication turnaround time, missing medication requests, and profile-linked automated dispensing cabinet (ADC) override rates were measured before implementation (August and September 2013) and after implementation (November 2013 and January, February, and March 2014). This study did not use patient specific data and does not involve human subjects and therefore was exempt from Institutional Review Board review.  
**Main Results:** Average medication turnaround time in November 2013 (1243.6 seconds; 95% CI 1219.55-1267.73) was significantly slower than in September 2013 (697.71 seconds; 95% CI 685.45-709.97; p<0.001). In January 2014, there was no difference (695.45 seconds; 95% CI 678.17-712.73; p = 0.83) and February 2014 showed significant improvement (619.09 seconds; 95% CI 605.18-633.00; p<0.001). There were significantly more missing medication requests in February (19002) and March 2014 (18996) than in August 2013 (1319; p<0.001 for both). The ADC override rate was significantly higher in November 2013 (5.87%) than in August 2013 (3.98%; p<.001) and lower in February 2014 (3.16%; p<0.001).  
**Conclusion:** This study suggests that implementation of an enterprise-wide electronic health record has led to improved pharmacy order processing efficiency and allowed for increased communication between healthcare professionals, albeit with a loss of efficiency initially.
24. Title: Impact of automated dispensing technology on medication safety and costs at an inpatient pharmacy  
Project Advisor: Kurt Weibel, PharmD  
Students: Daniel Burgos, Eric Wong  
Specific Aims: To compare two groups of automated dispensing technology and their impact on medication safety and costs at an inpatient pharmacy.  
Methods: A total of 784 medications were audited for Pyxis refill errors, 352 prior to and 432 post implementation of Boxpicker and the ATP High Speed Tablet Packager. Data were collected by obtaining refill reports for automated dispensing. Every other medication on the refill report was audited for errors in the corresponding location of the automated dispensing cabinet. The rate of reported errors was obtained from a self-reported error program, Patient Safety Net (PSN). Analysis related to costs included automated dispensing cabinet related inventory and costs associated with bulk repackaging. All data associated with costs were obtained from pharmacy financial records.  
Main Results: There was no significant difference in the Pyxis refill error rate between Pyxis PARx and Boxpicker (0.00284% versus 0.00231%, respectively, p =0.88). The total number of automated dispensing cabinet problems reported through Patient Safety Net transiently increased during and after implementation of new automated technology. Value of pharmacy inventory costs associated with automation was $674,460 prior to and $594,789 post implementation of technology. Bulk repackaging with the ATP High Speed Automatic Tablet Packager resulted in an estimated cost savings of $203,400 annually.  
Conclusion: Implementation of Boxpicker and ATP High Speed Tablet Packager resulted in no significant change in Pyxis refill error rates, a transient increase in reported automated dispensing cabinet problems, a decrease in inventory costs, and savings associated with bulk repackaging.

25. Title: Optimizing Patient Adverse Drug Reaction History Through the Use of Structured Open Ended Questions  
Project Advisor: Richard Herrier, PharmD  
Students: David Choe, Matthew Stevens, Christina Summy  
Specific Aims: To assess if the use of three targeted open ended questions elicited more adverse drug reactions (ADRs) and allergies than found in the electronic medical record.  
Subjects: Inpatients at the University of Arizona Medical Center (UAMC) in Tucson, AZ that were 18 years or older and agreed to participate in the study.  
Methods: Data was collected using a verbal questionnaire. Each patient was asked the exact same three open ended questions in the same order by the one student to determine the number of ADRs the patient has had. The patient’s electronic medical record at UAMC was used to determine the number of ADRs documented. The number of ADRs elicited by the two methods were documented and compared using statistical analysis. No demographic variables were collected in this study.  
Main Results: A total of 58 patients at UAMC agreed to participate in our study by answering three targeted open ended questions. Overall the use of the three open ended question did elicit more ADRs (mean = 1.12) than listed on their electronic medical record which were elicited by asking one closed ended question (mean = 0.91). However, the results were not statistically significant (p-value = 0.57).  
Conclusion: The use of three targeted open ended questions appears to elicit a similar number of ADRs compared to the number of ADRs listed in the patient’s electronic medical record.
26. Title: Inaccuracies in the second half of the First Season of the Medical Series, House M.D.
Project Advisors: David Apgar, PharmD; Edward Armstrong, PharmD
Students: Sarena DeBaca, Clinton Napier
Specific Aims: To assess the accuracy of the presentation (signs and symptoms), the diagnostic procedures used to arrive at the final diagnosis, and the ultimate treatment performed in each of the last ten episodes of the first season of the television medical drama, House MD.
Methods: A descriptive retrospective analysis of the accuracies and inaccuracies of episodes 13 to 22 in season one of the television series House, MD. The accuracy of each episode in regards to the presenting signs and symptoms, diagnostic procedures, and treatment was rated on a scale of one to four: 1) Correct and usual representation; 2) Correct but somewhat unusual representation; 3) Correct but extremely unusual representation; 4) Incorrect representation. Both researchers evaluated each episode on the above criteria independently, and a cooperative and final rating was chosen upon.
Main Results: Results of the ANOVA test did not demonstrate a statistically significant difference between the three variables (p=0.581). A Tukey HSD post-hoc test was unable to confirm if there was a significant difference between the the three variables. The average rating for the presenting signs and symptoms was 2.50 (±0.707), and 2.30 (±1.160) and 2.10 (±0.568) for diagnostic procedures and treatment, respectively.
Conclusion: There was no difference in accuracies between the presenting signs and symptoms, diagnostic procedures, or treatments in the last ten episodes of the first season of House, MD.

27. Title: The Prevalence of Metabolic Syndrome in Patients Treated with Atypical Antipsychotics in an Outpatient Health Clinic
Project Advisors: Lisa Goldstone, PharmD; Amy Kennedy, PharmD
Students: Thomas Deeren, Tanya Kent, Robert Sanzenbacher
Specific Aims: To determine the prevalence of metabolic syndrome (MetS) in patients treated in an outpatient clinic that were taking atypical antipsychotics.
Methods: This retrospective chart review included 822 adults diagnosed with various personality/mood disorders. Age, gender, ethnicity, blood pressure, height, weight, lipid panels, fasting blood glucose, and second-generation antipsychotic (SGA) used and treatment length were obtained. Patients were separated into two groups: those who were not taking an SGA in/for the past three months (group 1), and those taking at least one SGA for a minimum of three months (group 2). MetS was determined using NCEP ATP III guidelines. The primary outcome measured was the difference in the prevalence of MetS between each group.
Main Results: At baseline, 753 patients were in group 1 and 69 patients were in group 2, there was a higher percentage of females in group 1 (p<0.0001), and a higher percentage of males in group 2 (p<0.0001). No difference was seen with age, and weight, (p=0.294, p=0.625, respectively). There were more patients reported as Caucasian in group 2 (p=0.0001) and more reported as Caucasian/Hispanic in group 1 (p=0.0001). The rate of MetS between group 1 (54.45%) and group 2 (59.42%) was not statistically different (p = 0.427).
Conclusion: No statistical difference was found in the rate of MetS between the two groups. Removing confounding drugs known to cause weight gain did not change these results.
28. **Title:** Continuous intravenous insulin weight based dose-related hypoglycemia in critically ill patients  
**Project Advisors:** Brian Erstad, PharmD; Sid Patanwala, PharmD  
**Students:** Paul Frey, Yong Gu Lee, Holly Paddock  
**Specific Aims:** To evaluate the association of weight-based insulin dose with hypoglycemia in critically ill patients receiving continuous intravenous insulin infusions. To determine whether higher weight-based doses of insulin were associated with a higher incidence of hypoglycemia  
**Methods:** This was a retrospective, case-control study conducted at a tertiary care, academic medical center. Adult (>18 years) patients admitted to the intensive care unit (ICU) receiving intravenous (IV) regular insulin infusions for the management of hyperglycemia between 1 January 2008 and 30 March 2013 were included. Medical records were retrospectively reviewed. Each patient with hypoglycemia was matched with a non-hypoglycemic control subject, based on age range and sex. Laboratory data, patient demographics, hypoglycemic events, insulin infusion data, SOFA scores, length of hospital and ICU stay, and patient outcomes were collected and evaluated.  
**Main Results:** Sixty-one patients experienced a hypoglycemic event and were matched with 61 non-hypoglycemic control subjects for statistical analysis. With the exception of ethnicity (p = 0.041) as a demographic predictor of hypoglycemia; age, sex, weight, height, and BMI were not significant. The starting insulin infusion rate and the total number of insulin units per day administered were not found to be associated with hypoglycemia, p=0.107 and p=0.357, respectively.  
**Conclusion:** This study failed to show significance in the total units per day of insulin and the incidence of hypoglycemia. There was no statistical significance in BMI between case and control groups, thus no clear conclusion can be made associating hypoglycemia with weight-based insulin dosing.

29. **Title:** Consumer knowledge of proper sunscreen application  
**Project Advisor:** Janet Cooley, PharmD  
**Students:** James Go, Brian Hreniuc, Kevin Tran  
**Specific Aims:** To determine what the general public understands about sunscreen and to see if specific groups need more targeted marketing and education about sunscreen.  
**Methods:** Questionnaires administered to eligible participants that rated the participants’ knowledge of general sun safety, sunscreen application, and FDA labeling on sunscreen products compared to demographic data. Demographic data were collected on age, gender, years resided in Arizona, whether participants has or known anyone with a history of skin cancer and ethnicity.  
**Main Results:** Questionnaires were completed by 62 participants. When comparing skin cancer versus no skin cancer using student’s t-test, there was no significant difference (P=0.09). When comparing gender versus total using student’s t-test, there was no significant difference (P=0.62). When comparing ethnicity versus total using ANOVA, F < Fcritical indicating there was no difference. When comparing age versus total using ANOVA, F < Fcritical indicating there was no difference. When comparing years residing in Arizona versus total using ANOVA, F < Fcritical indicating there was no difference.  
**Conclusion:** Consumer knowledge of general sun safety, sunscreen application, and FDA labeling on sunscreen products appears to have little to no difference between each demographic category.
30. **Title:** Assessing pharmacist’s, pharmacy technicians’, and pharmacy interns’ knowledge of current Centers for Disease Control and Prevention (CDC) immunization guidelines for pregnant women  
**Project Advisor:** Jenene Spencer, PharmD  
**Students:** Jared Hatchard, Brent Houston  
**Specific Aims:** The purpose of this study was to assess pharmacists’, pharmacy technicians’, and pharmacy interns’ knowledge of current Centers for Disease Control and Prevention (CDC) immunization guidelines for pregnant women.  
**Methods:** Questionnaires administered to volunteers during the Arizona Pharmacy Association (AzPA) 2013 Annual Convention and Trade Show collected data showing the volunteers’ level of knowledge about current immunization guidelines; data on professional roles (pharmacist, pharmacy intern, or pharmacy technician), years in practice, current immunization certification status and activity, and practice setting were also collected.  
**Main Results:** Questionnaires were completed by 112 volunteers, including 48 pharmacists, 25 pharmacy technicians, and 39 pharmacy interns. The overall percentage of correct answers from all participants was 33%. Pharmacists, pharmacy technicians, and pharmacy interns had correct answer percentages of 41%, 16%, and 34%, respectively. Pharmacy practitioners who were state certified to perform immunizations performed statistically significantly better than the non-certified group (44.2% correct versus 33% correct, P=0.012). Practitioners who work at a practice site that provides immunizations were compared with practitioners who do not, with results trending toward statistical significance, but falling just short (45.7% correct versus 36% correct, P=0.054).  
**Conclusion:** The general level of knowledge about CDC immunization guidelines appears to be inadequate among the volunteer group of pharmacy practitioners, possibly leading to missed opportunities for needed immunizations.

31. **Title:** Trends in Use and Effects of Synthetic Cannabinoids and Cathinones Pre- and Post-Amendment of the Controlled Substance Act in 2012  
**Project Advisors** Robyn L. Bellestri, MBA; Lisa Goldstone, PharmD  
**Student:** John Hayes  
**Specific Aims:** To compare trends in user demographics, clinical effects, and clinical outcomes associated with the use of synthetic cannabinoids and cathinones before and after signing into law the Synthetic Drug Abuse Prevention Act of 2012 on July 9, 2012.  
**Methods:** Reports generated by the National Poison and Drug Information Center’s Toxic Exposure Surveillance System were used to isolate calls regarding patients who reportedly used either synthetic cannabinoids or synthetic cathinones from July 2011 to March 2013. Clinical effects, clinical outcomes, and demographic information of patients associated with these calls from July 9, 2011 to July 8, 2012, were compared to that of patients associated with calls from July 9, 2012 to July 8, 2013.  
**Main Results:** Nationally, poison centers received 5860 calls regarding synthetic cannabinoid exposure and 3148 calls regarding synthetic cathinone exposure during the pre-period. These calls decreased following SDAPA: 2288 synthetic cannabinoid calls and 870 synthetic cathinone calls (P<0.001). Males represented over 70% of all synthetic cannabinoid exposures, although their percentage decreased in the post-period. Over 50% of synthetic cannabinoid exposures in the pre-period and over 45% in the post period involved teens age 13-19. Males represented about 70% of all synthetic cathinone exposures, and over 40% were age 20-29. About 90% or more of all exposures were intentional.  
**Conclusions:** Exposure to synthetic cannabinoids and cathinones reported to US poison control centers decreased significantly after SDAPA. Synthetic cannabinoid users were most commonly males, age 13-19 who intentionally inhaled the substance and experienced minimal outcomes. Synthetic cathinone users were most commonly male, age 20-29 exposed to the substance intentionally and experienced moderate effects. Critical care admissions increased for both substances in the year following SDAPA.
32. Title: Probiotics in the Prevention of Clostridium Difficile Associated Diarrhea in the Acute Care Setting
Project Advisor: David Lee, RPh
Students: Kirsten Haslett, Michael Herman
Specific Aims: Clostridium difficile associated diarrhea (CDAD) frequently occurs in patients exposed to broad-spectrum antibiotics which can result in a life threatening illness. The role of probiotics in the prevention of CDAD is not well established and many medical centers across the United States are opting to remove probiotics from common CDAD prophylaxis. We aim to evaluate the efficacy of lactobacillus probiotics during the use of broad-spectrum antibiotic therapy in the acute care setting for the prophylaxis of CDAD at Kindred Hospital.
Methods: We performed a single center, retrospective data analysis efficacy trial of inpatients receiving beta-lactam, fluoroquinolone or clindamycin antibiotics from the Kindred Hospital database. Two study groups will be compared: patients who received lactobacillus probiotic therapy based on protocol since May 2011 and patients who did not receive probiotic therapy. The presence or absence of CDAD will be used to evaluate probiotic efficacy.
Main Results: Of the 432 patients screened, 57 were assigned to the primary treatment group and 25 were assigned to the primary non-treatment group, a total of 82 patients were analyzed for the primary endpoint. CDAD occurred in 16 patients (28.1%) receiving probiotic therapy while CDAD occurred in 5 patients (20.0%) not receiving probiotic therapy (p=0.441).
There were a total of 219 patients screened for secondary analysis; 147 patients were assigned to the secondary treatment group and 72 were assigned to the non-treatment group. CDAD occurred in 7.3% of patients receiving probiotic therapy while CDAD occurred in 2.3% of patients not receiving probiotic therapy (p=0.352).
Conclusions: We identified no statistically significant evidence that the use of lactobacillus probiotics were effective in the prevention of CDAD.

33. Title: Appropriateness of Repeated Clinical Alerts to Add Angiotensin Converting Enzyme Inhibitor Therapy in Diabetic Patients with Medicare Part D Coverage
Project Advisors: Nicki Scovis, PharmD
Students: Patrick Hryshko, Zac Johnson
Specific Aims: To identify reasons that an angiotensin converting enzyme inhibitor (ACEi) would not be indicated in diabetic patients with repeated clinical alerts to add ACEi therapy for preservation of renal function and/or hypertension. In addition, to identify if these repeated clinical alerts to add ACEi therapy are appropriate.
Methods: Eligible patient charts were reviewed by researchers using a data dictionary to complete a standardized spreadsheet with patient demographic information (age, gender, and location), type of diabetes mellitus, evidence indicative of comorbid hypertension, action taken by pharmacist in response to clinical alert (letter sent to patient and letter sent to prescriber), and rationale of that action. This data, along with SOAP notes of patient interactions, was used by researchers to classify the repeated clinical alert as appropriate or inappropriate.
Main Results: There were a total of 200 charts reviewed (male n = 61 (30.5%), female n = 139 (69.5%), mean age = 70 ± 11 years). Reasons for not contacting patients again include previous failure or adverse drug reaction (n = 62, 31.0%), patient did not meet call script requirements (n = 55, 27.5%), patient did not have diabetes or hypertension (n = 20, 10.0%), potential drug-disease interaction (n = 17, 8.5%), overlapping or previously addressed alerts (1.9%), or documentation was provided for “other” reasons (n = 43, 21.5%). The previous failure or adverse drug reaction rationale was appropriate in 32 of 62 repeated clinical alerts (52%; χ2 = 10.15). The patient did not have diabetes or hypertension rationale was appropriate in 11 of 20 repeated clinical alerts (55%, χ2 = 2.72). The potential drug-disease interaction rationale was appropriate in 3 of 17 repeated clinical alerts (8%, χ2 = 9.89). The patient did not meet call script requirements rationale was appropriate in 31 of 55 repeated clinical alerts (56%, χ2 = 6.91). The overlapping or previous alerts rationale was appropriate in 2 of 3 repeated clinical alerts (67%, χ2 = 0.18). The “other” rationale were appropriate in 22 of 43 repeated clinical alerts (51%, χ2 = 7.21). Overall, retrigger alerts were considered appropriate 50.5% of the time compared to the predicted value of 90% (χ2= 347 > critical value = 3.84 for p = 0.05)
Conclusion: There are multiple reasons pharmacists do not recommend initiating ACEi therapy in patients with diabetes. Although the Medication Management Center (MMC) has rationale of these reasons documented after individual patient interactions, there are still several reasons why a retrigger alert would be appropriate despite that rationale. In addition, retrigger alerts were not considered appropriate as frequently as expected.
34. Title: Therapeutic drug monitoring and dose adjustment of posaconazole in adult patients with acute myeloid leukemia: a single-center experience  
Project Advisor: Myke R. Green, PharmD  
Student: Shelly Hummert  
Specific Aims: Evaluate serum posaconazole concentrations following dose adjustment in response to subtherapeutic serum concentrations. Determine optimal dose adjustment schema and identify toxicity with doses above 600 mg daily (e.g.: 200 mg per os three times daily).  
Methods: The health records were reviewed for 29 patients ≥ 18 years with acute myeloid leukemia over a four-year period. Participants initially received posaconazole 200 mg per os three times daily as prophylaxis and required at least one dose adjustment secondary to a subtherapeutic posaconazole serum concentration. Patients were stratified by posaconazole dosing following dose adjustment (A=200mg QID, B=300mg TID, C=400 mg TID, D=400 QID).  
Main Results: There was a statistically significant increase in posaconazole serum concentration in each group compared to baseline serum concentration, aside from group C (group A and B P<0.001, group C P=0.236, and group D P=0.0076). The majority of participants in 3 of the 4 groups reached therapeutic serum concentration (A=0.87, B=0.76, D=0.80) whereas group C had a serum posaconazole concentration on average below therapeutic range (0.51). There was no significant difference between the four groups in regards to renal function (p=0.35) or hepatic function (AST p=0.676, ALT p=0.877, total bilirubin p=0.097).  
Conclusion: A dose increase led to an increase in posaconazole serum concentration except for the dosing regimen of 400 mg three times daily. However, the study is limited by a small patient population, an unequal number of patients in each group, and potentially by poor absorption of posaconazole suspension. Further research is required to expand on these findings.

35. Title: Inpatient management of blood pressure and fluid overload in patients with end-stage renal disease on hemodialysis  
Project Advisors: Brian Erstad, PharmD; Marcella Honkonen, PharmD  
Students: Alex Jasensky, Patrick McNeill  
Specific Aims: The main objectives of the study are to compare the number of antihypertensive medications upon admission versus discharge, determine the fluctuation index ((SBPmax – SBPmin)/Avg)x100) between inpatient HD sessions, determine the minimum SBP during each inpatient HD session and compare pre-HD weight to post-HD weight for each inpatient HD session to determine inter-dialytic weight gain. The findings of this study are expected to have a positive impact on the management of blood pressure and fluid overload in HD patients by identifying the adverse effects associated with an increased anti-hypertensive medication burden.  
Methods: The Institutional Review Board approved this retrospective chart review. The electronic medical record system identified patients that received HD between January 1, 2010 and January 1, 2013. The following data was collected: the admission diagnosis and patient comorbidities; time on dialysis prior to admission and time since last HD session; the number and class of anti-hypertensive medications documented on admission, while inpatient, and upon discharge; the use of midodrine, receipt of erythropoietin stimulating agents, total time on dialysis while admitted, intra-dialytic hypotensive events, blood pressure readings pre- and post-HD, and inter-dialytic weight gain. The number of anti-hypertensive medications were compared between admission and discharge. SBP between inpatient HD sessions, and pre-HD weight to post-HD weight including total volume removed per each HD session were compared. Multiple linear regression analyses will be completed to evaluate independent predictors of inter-dialytic weight gain and intra-dialytic hypotension.  
Main Results: For the study period, 150 patient encounters met inclusion criteria, totaling 85 individual patient charts. Group 1 (n=44) experienced 7 readmissions (16%) and group 2 (n=41) experienced 8 readmissions (18%). On discharge, the most common anti-hypertensive for group 1 was an ACE inhibitor (45%), while group 2 most commonly was on a dihydropyridine calcium channel blocker (66%). Conclusion: Antihypertensive medications continue to play an important role in the hemodialysis population and further investigation in this area should be completed.
36. **Title:** Economic Impact of Pharmacokinetic Monitoring on the use of Oral and Intravenous Busulfan in Patients Undergoing Hematopoietic Stem Cell Transplantation (HSCT)  
**Project Advisor:** Erin Ballard, PharmD  
**Students:** Stephen Karpen and Marti Larriva  
**Specific Aims:** Busulfan is a chemotherapy used in conditioning regimens for hematopoietic stem cell transplant (HSCT) that requires therapeutic drug monitoring (TDM) to reduce the risk of adverse effects. Variable oral absorption and several studies demonstrating decreased toxicity with the intravenous formulation have led to IV preference despite the lower acquisition cost of oral busulfan. However, these studies failed to consider therapeutic drug monitoring and their results may therefore be flawed. The objective of this retrospective chart review was to determine the adverse effect, outcome profile, and cost-effectiveness of IV versus PO busulfan at a single medical center under TDM.  
**Methods:** This quality improvement project was a retrospective cohort analysis using patient data from a single large academic medical center from January 2007 to April 2013. Patients were included if they were 18 years or older and had undergone HSCT using either IV or PO busulfan using standard dosing regimens. This data was then used to design a cost-effectiveness model in order to determine if IV or PO busulfan is cost effective.  
**Main Results:** There were 68 subjects receiving autologous transplants and 37 subjects receiving allogeneic transplants that received busulfan as part of their pretreatment therapy and were included in this study. Allogeneic and autologous transplant populations were analyzed separately. In both populations there was no difference in occurrence of pulmonary toxicity, HVOD, or mucositis between the IV or PO groups. IV busulfan was significantly associated with an increased need for patient controlled analgesia in both autologous and allogeneic populations (p=0.038 and 0.028 respectively). Total cost of PO therapy was $30,081 and $30,047 less than IV for autologous and allogeneic transplants, respectively. PO therapy also represented a cost savings of $41 and $57 dollars for autologous and allogeneic transplants, respectively. This was confirmed through bootstrapping technique, which found PO to be dominant to IV busulfan.  
**Conclusion:** In conclusion, this study finds PO busulfan to be a therapeutically equivalent and cost saving option as part of a pretreatment regimen for both autologous and allogeneic hematopoietic stem cell transplants when therapeutic drug monitoring is performed.

37. **Title:** Direct Costs of Unnecessary Antibiotic Prescribing in Patients Administered Imipenem in the Emergency Department  
**Project Advisor:** Kathryn Matthias, PharmD  
**Student:** Michael Klein  
**Specific Aims:** The aim of this study was to examine the appropriateness of antibiotic use in the first 48 hours of being admitted to the emergency department in a tertiary care medical center. The purpose was to identify inappropriate usage patterns of antibiotics to limit future misuse and prevent the unintended consequences of overuse of antibiotics.  
**Methods:** Patients 18 years and older who were admitted to the emergency department at University of Arizona Medical Center – University Campus who were administered imipenem within 48 hours of admission were included. All antibiotics received by included patients were recorded and assessed for appropriateness by two pharmacists with specialized infectious disease training. Inappropriate use of carbapenems or other antibiotics in conjunction with carbapenems was identified and the acquisition cost of the misused antibiotics was calculated.  
**Main Results:** Imipenem use was considered inappropriate in 35/52 (71.1%) of patients included in this study. The direct cost of inappropriate antibiotic prescribing was $914.77. Multiple β-lactam antibiotics were used in 24/52 (46.1%) patients while 18/52 (34.6%) of patients received four or more antibiotics within the first 48 hours of admission.  
**Conclusion:** Imipenem was frequently used empirically for cases that did not fit the predetermined criteria of use within 48 hours of admission emergency department of the University of Arizona Medical Center – University Campus, resulting in unnecessary direct costs to the medical center.
38. Title: Assessing the effectiveness of the University of Arizona College of Pharmacy’s student-run health screening events at reaching underserved Tucson populations  
**Project Advisor:** Jenene Spencer, PharmD  
**Students:** Connie Kwong, Marben Mopera  
**Specific Aims:** To assess the population that attends The College of Pharmacy’s health fairs and determine which fairs best cater to Tucson communities that benefit the most from free health services.  
**Methods:** Data collection occurred throughout two semesters, fall of 2012 and spring of 2013. Information was obtained from screening tools administered at health fairs. Access to insurance, whether patients had previously seen a physician for screened condition, and the amount of referrals were gathered for data analysis.  
**Main Results:** Significant differences were found between the health fairs in categories, i.e. patients with/without insurance, had/had not previously seen their physician and were/were not referred.  
**Conclusion:** Study results can be used to help in the process of scheduling health fairs for subsequent academic years. A criterion should be generated to make decisions for reconsideration and to better allocate the College’s resources.

39. Title: Inappropriate use or cessation of metformin therapy in type 2 diabetic patients with renal impairment  
**Project advisor:** Amy Kennedy, PharmD  
**Students:** Yin Lai, Beena Vemulapalli  
**Specific Aims:** To assess appropriate use or cessation of metformin therapy in the presence of renal impairment.  
**Methods:** A retrospective chart review was conducted on 785 charts of patients at El Rio Community Health Center between June 2011 and December 2012. Eligibility criteria were adults aged 18 years or older with a diagnosis of Type 2 Diabetes Mellitus (DM), a history of metformin therapy, and renal function data. Data was accessed through the electronic medical record (EMR) at El Rio and metformin history, presence of contraindications, renal function, weight, age, gender, and race/ethnicity were collected. Group 1 were patients who were currently taking metformin and Group 2 were patients with a history of taking metformin.  
**Main Results:** A larger proportion of patients had renal impairment (eGFR 30-60 ml/min/1.73 m2) in Group 1 than Group 2 (Yates’ p = 0.002). Only one patient in the entire study had severe renal impairment (eGFR < 30 ml/min/1.73 m2). There was a greater proportion of inappropriate cessation in Group 2 than inappropriate use or cessation in Group 1 (Yates’ p < 0.001).  
**Conclusion:** Most patients were found to have normal renal function. Group 2 had a greater proportion of inappropriate metformin cessation than inappropriate use or cessation in Group 1.

41. Title: Awareness of medication-related fall risk: a survey of community-dwelling older adults  
**Project Advisor:** Jeannie Lee, PharmD  
**Student:** Gia Leonetti  
**Specific Aims:** To assess older adults’ knowledge of medications associated with an increased risk of falls and to evaluate the impact of pharmacist counseling on knowledge of medication-related fall risk. Subjects: Community-dwelling adults 60 and older.  
**Methods:** Data were collected using an online questionnaire consisting of 15 knowledge-based items to determine awareness of medication-related fall risk, four items to determine pharmacist counseling experience, fall history, and number of medications taken, and two items to collect demographic information (age and gender).  
**Main Results:** Two hundred and six community-dwelling older adults (mean age = 69.07 years, SD = 5.59) participated in the study by completing all or part of the questionnaire. The number of older adults who reported having fallen within the last five years was 90 (43.7%). The knowledge-based portion of the questionnaire was completed in its entirety by 162 older adults (80 males, 81 females, one unreported gender; mean age = 68.7 years, SD = 5.12). One hundred and nineteen of 162 (73.5%) questionnaire respondents scored below 70% on the knowledge assessment (mean score 49.3%, SD = 26.8). The 12 respondents (7.6%) who reported having received counseling from a pharmacist regarding medication-related fall risk scored significantly higher on the knowledge assessment compared to the 145 respondents who did not (mean score 61.66% versus 48.09%, p = 0.01).  
**Conclusion:** A majority of community-dwelling older adults lacked knowledge of medications associated with an increased risk of falling. However, those who had been counseled by a pharmacist demonstrated greater awareness of medication-related fall risk. Thus, pharmacist counseling of older adults regarding medications and fall risk should be promoted.
42. **Title:** Evaluating design improvements to a preceptor performance and APPE assessment tool using pharmacy student focus groups  
**Project Advisor:** Janet Cooley, PharmD  
**Student:** Lea Mollon  
**Specific Aims:** The final year of the Doctor of Pharmacy program at the University of Arizona is comprised of seven 6-week Advanced Pharmacy Practice Experiences (APPEs). Students evaluate rotations via voluntary anonymous, web-based assessments at the end of each rotation. The purpose of this study was to evaluate an original and a modified assessment tool using pharmacy student focus groups to determine if student feedback via the assessment tools accurately reflected opinions of rotation content and preceptor performance.  
**Methods:** Two moderators conducted tape-recorded focus groups with fourth-year pharmacy students using 10 standardized prompts. The first focus group included 5 students from the class of 2013. Based on data from that session, the assessment tool was modified. The second focus group included 5 students from the class of 2014 to evaluate the outcome of these modifications. Session transcripts and notes were used to construct thematic analysis tables and draw conclusions.  
**Main Results:** Focus group data revealed feedback via both assessment tools was not completely honest because of concerns about anonymity. The Class of 2013 felt limited by evaluating only their primary preceptor. The Class of 2014 stated that some revisions to the evaluation tool, such as item-specific comment boxes and separate evaluative sections for rotation site, preceptor, and rotation experience were helpful; however, they found the assessment tool lengthy, leading to survey fatigue.  
**Conclusion:** Student feedback from either assessment tool was not completely reflective of true attitudes of rotation experiences. Continued improvements to the tool and its delivery may provide more accurate feedback for quality improvement purposes.

43. **Title:** Comparison of Length of Hospital Stay and Cost of Intravenous and Oral N-acetylcysteine in Acute Acetaminophen Toxicity  
**Project Advisors:** Edward Armstrong, PharmD; Keith Boesen, PharmD  
**Students:** Jazmin Moreno, Misael Porras  
**Specific Aims:** To determine the cost of treatment of oral and intravenous n-acetylcysteine (IV NAC) in acute acetaminophen (APAP) toxicity using the length of treatment and length of hospital stay.  
**Methods:** A retrospective chart review of Arizona Poison and Drug Information Center electronic records from 2009-2012 and January-June 2013 were evaluated. The following information was collected: age, sex, use oral or intravenous NAC, length of treatment, length of hospital stay (intensive care unit (ICU) and non-ICU) and use of antiemetic. The mean length of stay (MLOS) was calculated for each group as well as the cost of IV and oral NAC. These means were then compared using t-test for independent groups to test for significance. The average total cost of IV and oral NAC treatment was calculated by using monetary values from primary literature. A sensitivity analysis was performed to test the possible effects of an increase or decrease of the final costs by 5 to 10%.  
**Main Results:** Patients (≥18 yrs) being treated with IV or oral NAC for acute APAP toxicity (≤8 hours prior to ingestion) were included in this study. A total of 47 patients met the inclusion criteria. Length of hospital stay was shorter in patients receiving IV NAC (42.5% 24-24hr; 37.5% 48-72hr) compared to patients receiving oral NAC (28.6% 48-72hr, 71.4% >72hrs; p<0.001). Total cost of ICU/non-ICU stay in patients receiving IV NAC ($8,720/$3010) was less than patients receiving oral NAC ($12,321/$4703); however, cost of IV NAC-extended (37hrs) in ICU/non-ICU ($13,153/$5535) was greater than oral NAC. The sensitivity analysis performed demonstrated that an increase or a decrease by 5 to 10% in change of cost does not affect our final conclusion.  
**Conclusion:** The cost of treatment of IV NAC is lower due to shorter LOS of patients treated with IV NAC (p<0.001). However, when an extended course of treatment is medically necessary for patients on IV NAC then the cost of treatment with IV NAC exceeds the cost of treatment with oral NAC.
44. Title: Medication Adherence Education in U.S. Schools and Colleges of Pharmacy
Project Advisor: Jeannie Lee, PharmD
Student: Danielle Nguyen

Specific Aims: Medication adherence is the extent to which patients take their medications correctly and consistently as prescribed. The objective of this study was to assess Accreditation Council for Pharmacy Education (ACPE)- preaccredited and accredited schools and colleges of pharmacy for adherence course content in their curricula.

Methods: The survey link was sent via email to the Department of Pharmacy Practice Chair, or equivalent, at each institution. The data collected via the online survey included information regarding the details of medication adherence curriculum present at the program. All data remained confidential. Chi-square statistical test was used for analysis to compare hours of adherence education taught in older (in existence ≥ 20 years) versus newer (< 20 years) programs.

Main Results: Twenty-eight programs responded among 130 inquiries (22% response rate). Of the respondents, only two colleges of pharmacy offered a course on medication adherence, one as an elective and one as required. Common adherence principles were incorporated into other pharmacy courses with the most common topics being counseling, patient education and communication skills. Older programs taught more hours (> 20 hours) focused on adherence compared to the newer programs, but they did not differ significantly (p = 0.39).

Conclusion: Despite the low response rate, the findings show a lack of curricular focus on medication adherence, particularly as an individual course. Further studies are needed to identify adherence training received by student pharmacists, and to evaluate the impact of adherence-focused curriculum components on provision of patient care centered on medication adherence by pharmacy practitioners.

45. Title: Best Practices Continuing Education Program for Pharmacy Preceptors
Project Advisor: Janet Cooley, PharmD
Students: Natalie Nguyen, Olivia Renner, Lawrence York

Specific Aims: To increase the use of best practices by pharmacy preceptors within their own settings and to identify if live continuing education presentations are considered superior to other forms of CE presentation.

Subjects: Pharmacists attending the “Quest for the Best: Best Practices for Pharmacy Preceptors” CE program at the Arizona Pharmacy Alliance 2013 Annual Convention.

Methods: Surveys administered before, after, and 6 months following the CE program collected data concerning the use of syllabi for rotations, the type and quantity of expected projects, frequency of student oversight, and feedback opportunities. Follow-up surveys assessed preferred forms of CE delivery. A survey administered six months following the CE’s conclusion identified changes made at the subjects’ sites as a result of the CE.

Main Results: Surveys were completed by 20 pharmacy preceptors (mean years of experience = 5.95; SD = 5.36). 86% of the subjects preferred the live CE; 5% would have preferred the CE be delivered as a webinar. Chi-square testing found no statistically significant difference between pre-CE use of syllabus, frequency of student monitoring, and frequency of given feedback compared to 6-months post-CE (p = 0.59, 0.57, 0.30 respectively).

Conclusion: The CE program did not demonstrate a difference among attending pharmacy preceptors in incorporating a syllabus at their site, altering monitoring of student, or time provided for feedback. Live CE was found to be the most desired at imparting best practices to pharmacy preceptors. 86% of responders reported changing their site practices as a result of the CE presentation.
46. **Title:** Assessing adherence to the tetanus, diphtheria and pertussis vaccination guidelines at a federally qualified health center before and after a clinical pharmacist intervention  
**Project Advisor:** Amy Kennedy, PharmD  
**Students:** Dawne O'Brien, Ashley Santa-Cruz  
**Specific Aims:** Tetanus, diphtheria, and pertussis are diseases, which are preventable through proper vaccination. In spite of the availability these vaccines, however, there has recently been a surge in the number of pertussis cases in the United States. The objective of this study is to determine provider adherence to tetanus, diphtheria and pertussis guidelines set forth by the Advisory Committee on Immunization Practices in a primary care setting before and after a clinical pharmacist intervention.  
**Methods:** A retrospective cohort of chart reviews was conducted between January 1 – September 30, 2013 to determine immunization adherence to tetanus, diphtheria, and pertussis vaccination guidelines. A clinical pharmacist then performed a series of cross-sectional chart reviews as an intervention. Following the intervention, a retrospective chart review was conducted to evaluate if Tdap vaccination rates improved between March 17-23, 2014.  
**Main Results:** Overall immunization rates greatly improved following the intervention (p<0.0001). For non-pregnant adults between the ages of 19-64 the vaccination rate improved from 26% to 61.1% (p<0.0001). A statistically significant improvement was not seen in the groups with patients 65 or older or pregnant women (p>0.05). Tdap vaccination status was appropriately evaluated and vaccinations given by primary doctors improved from 17.7% to 61.2% and those prescribed by nurse practitioners improved from 22.4% to 56.3%. **Conclusion:** Intervention by a Clinical Pharmacist helped improve overall provider adherence to the tetanus, diphtheria, and pertussis vaccination guidelines.

48. **Title:** Research-related Coursework and Research Experiences in Doctor of Pharmacy Programs  
**Project Advisor:** John Murphy, PharmD  
**Student:** Victoria Sherbeck  
**Specific Aims:** Our goal was to identify the extent and type of research requirements in Doctorate of Pharmacy programs in the United States and Puerto Rico. Regular and associate institutional school members of the American Association of Colleges of Pharmacy (AACP) were eligible to complete this study.  
**Methods:** Online questionnaires were distributed through email in three waves. Questions consisted of demographic questions, and questions about the type and extent of research requirements each school offers.  
**Main Results:** Some type of research project was required in seven schools (25.9%) during the course of their PharmD curriculum. Of the 27 schools completing the questionnaire, 55% indicated they required research methods, 78% required statistics, and 100% required drug information/literature evaluation courses during their PharmD curriculum.  
**Conclusion:** The majority of colleges provide research-related coursework for their students in PharmD programs. Roughly a quarter of schools require some form of research project be completed prior to graduation, with a large portion offering some form of research experience or elective with research opportunities.
49. **Title:** A Comparison of Pharmacy Student Intern and Nurse Impact on Home Medication List Completeness During Medication Reconciliation  
**Project Advisors:** Linda M. Calkins, RPh; Ferena Salek, PharmD  
**Student:** Michael Ivey  
**Specific Aims:** The purpose of this quality improvement project was to compare the completeness of home medication lists generated upon hospital admission between pharmacy student interns and nurses.  
**Methods:** This project was a retrospective review of completed home medication lists obtained by pharmacy student interns or nurses in a Southern Arizona community hospital. During August and September 2013, medication lists from the previous day’s admissions were collected and de-identified. Medication lists were included in the evaluation if the patient was admitted directly to the hospital or through the emergency department, stayed for at least 24 hours and had at least one home medication upon admission. The primary outcome was the number of omissions left on home medication lists completed by pharmacy student interns or nurses. An omission was defined as any missing information in the medication list categories of drug name, dose, unit, route or frequency.  
**Main Results:** Fifty medication lists that included 519 medications were collected in the pharmacy student intern group and forty-four lists that included 376 medications were collected in the nurse group. Of the total medications, nurses left significantly more omissions in the categories of dose (19% vs. 1.9%), units (20.2% vs. 2.3%), and frequency (11% vs. 0.7%), where the P-value was < 0.05 for each. Lastly, the total number of omissions left by nurses compared to pharmacy student interns was significantly different (201 vs. 35 omissions, P < 0.05).  
**Conclusion:** Compared to nurses, these results suggest pharmacy student interns left fewer omissions and created a more complete home medication list for patients being admitted to the hospital.

50. **Title:** Aerobic exercise and its effects on HbA1c and BMI in patients with type 2 diabetes mellitus: a meta-analysis.  
**Project Advisor:** Marion Slack, PhD  
**Students:** Alejandra Aguilar, Steven Gruhl  
**Specific Aims:** To assess the effect of aerobic exercise dose has on diabetes control monitoring parameter of HbA1c and BMI.  
**Methods:** Studies were found from previous studies and through a search of PubMed. These studies were screened for eligibility and data was extracted using a data extraction tool. The outcomes of HbA1c and BMI were analyzed using Comprehensive Meta-Analysis software and standardized mean difference (SMD) was used to assess the impact of different doses of exercise on the outcome measures. Variability was measured using the I² statistic and publication bias was assessed.  
**Main Results:** Nineteen studies met inclusion criteria and were analyzed. Moderate dose aerobic exercise was found to have moderate effect in reducing HbA1c and BMI (p < 0.01 & 0.03 respectively). Low dose and high dose aerobic exercise did not reduce HbA1c (p = 0.07 & 0.13) or BMI (p = 0.61 & 0.25). There was excess variation found in both the HbA1c analysis and the BMI analysis (I² = 72.28 & 84.04 respectively). There was no publication bias found (Kendall’s tau = 0.809).  
**Conclusion:** Moderate dose aerobic exercise was effective in reducing HbA1c and BMI, while low dose and high dose aerobic exercise were not found to have a statistically significant effect on either HbA1c or BMI.