Resident Research
2019–20

University of
Pittsburgh
School of Pharmacy

Mission

The School of Pharmacy is committed

to improving health through

excellence, innovation, and leadership

in education of pharmacists and pharmaceutical scientists,

in research and scholarship,

in care of patients,

and in service to our communities.

Values

Integrity guides our daily work. We foster:

Passion, commitment, and diligence;

Creativity and personal growth;

Collaboration and teamwork;

A culture of respect for the individual.

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Message from the Dean

Patricia D. Kroboth, PhD

Dear Members of the Resident Class of 2020,

Congratulations! Each and every one of you has distinguished yourself among pharmacy practitioners by completing a residency program at one of the country's finest and largest residency programs. What an intensive year you have had—gaining practice expertise and mastering elements of teaching and research.

As residents, you have enjoyed the best that the academic and practice worlds have to offer through the collaborations between the School of Pharmacy and each of its partners — The UPMC hospitals including Children's Hospital of Pittsburgh, Hamot, Magee-Womens Hospital, McKeesport, Mercy, Presbyterian, Shadyside, St. Margaret, and Western Psychiatric Hospital, UPMC Health Plan, Rite Aid Corporation, Giant Eagle, Inc., Asti's South Hills Pharmacy and CVS Caremark.

You also have three other distinctions. First, you committed to learning and demonstrating clinical research skills, which will serve you well during your career as you are faced again and again with clinically important questions. These skills created a foundation on which to build answers—and to become tomorrow's leaders. Second, you have shown that you are pioneers in what we hope is a once-in-a-century pandemic. You have had to care for and educate patients in new and sometimes creative ways.

And finally, you have each just become an alumnus of our PittPharmacy Residency Program and will forever be a part of our community. It is my sincere hope that you carry with you fondly the rich experiences of the past year and network of colleagues and friends as you launch the next phase of your career. There has never been a better time for pharmacy.

Congratulations, good luck, and keep in touch! Let the Pitt Residents Roar!

Patricia D. Kroboth, PhD, Dean
Dr. Gordon J. Vanscoy Distinguished Service Professor

Valuing Our Partners

The University Pittsburgh School of Pharmacy values our partnerships with UPMC, UPMC Health Plan, Rite Aid, Giant Eagle, and CVS Caremark. It is through these partnerships that the Residency Program has grown in national reputation.

The University of Pittsburgh Medical Center is ranked among the top 15 of "America's Best Hospitals" according to the 2019 U.S. News and World Report rankings and is one of the leading integrated health care delivery systems in Western Pennsylvania. UPMC Presbyterian, UPMC Shadyside, UPMC Magee-Womens, UPMC Mercy, UPMC St. Margaret, UPMC McKeesport, UPMC Hamot, UPMC Children's Hospital of Pittsburgh, and UPMC Western Psychiatric Hospital participate in our residency programs.

UPMC Health Plan, the largest medical insurer in western Pennsylvania, is owned by UPMC, an integrated global health enterprise. The integrated partner companies of the UPMC Insurance Services Division – which includes UPMC Health Plan, UPMC WorkPartners, LifeSolutions (EAP), UPMC for You (Medical Assistance), and Community Care Behavioral Health - offer a full range of group health insurance, Medicare, Special Needs, CHIP, Medical Assistance, behavioral health, employee assistance, and workers' compensation products and services to nearly 3.7 million members.

Rite Aid Corporation is one of the nation's leading drugstore chains with nearly 2,500 stores in 19 states with a strong presence on both the East Coast and West Coast, and 51,000 associates.

Giant Eagle Pharmacy is a leading regional pharmacy with 410 Giant Eagle locations across five states. Customers with qualifying prescriptions benefit from programs including the Giant Eagle $4/$10 generic prescription program, free prenatal vitamins, and high-quality service from expertly trained pharmacists. Additional unique services include Specialty Pharmacy offerings, in-store immunizations, and more.

Asti's South Hills Pharmacy, located in Pittsburgh, PA, is an innovative community pharmacy providing excellent patient care in a family atmosphere. Services include comprehensive medication and chronic care management, extensive immunization services, compounding, HIV specialty care, disease state education programs, medication synchronization and specialty packaging as well as traditional dispensing services.

CVS Health is the nation's premier integrated pharmacy services provider, combining one of the nation's leading pharmaceutical services companies with the country's largest pharmacy chain. CVS Health drives value for pharmacy services customers by effectively managing pharmaceutical costs and improving health care outcomes through its retail stores, pharmacy benefit management division, and mail service and specialty pharmacy division.

Pharmacy Residency Research Program

Sandra L. Kane-Gill, PharmD, MSc, FCCM, FCCP
Director, Resident Research Series

The Residency Research Program at the University of Pittsburgh School of Pharmacy incorporates a structured educational series with longitudinal research working groups. This approach provides a foundation for performing research, gives appropriate mentorship, fosters interactive discussions, allows peer critiques, and individual accountability for each resident project. Within the framework of the Residency Research Program, residents are responsible for the completion of all aspects of their project, from conceptualization to final manuscript preparation. Many of the projects completed this year focused on optimizing medication use in infectious diseases, behavioral health, diabetes, and anticoagulation. Projects also included application of pharmacogenomics; strategies to reduce adverse events; improving medication use during transitions of care; and opportunities for cost saving strategies. In addition, there were several assessments of opportunities in pharmacy practice for enhancing services.

The Residency Research Program requires residents to be certified in research fundamentals through the University of Pittsburgh and the Collaborative Institutional Training Initiative, participate in valuable interactive lectures geared toward the scientific development and management of their projects. They also learn to effectively communicate their project results in both verbal and written formats. Overall, our Residency Research Program contributes to the diversity of residency training with our partners in collaboration with the University of Pittsburgh School of Pharmacy, which ultimately results in well-rounded candidates eligible for a wide range of career opportunities.

Our program is highly successful with publication rates for our residents exceeding the national average by at least three-fold. The success of this program is a result of the efforts of the working group facilitators and other major contributors: Alfred L'Altrelli, Jenn Belavic, Sheava Blackman, Eunice Boo, Rachel Cardinal, Kim Coley, Amy Donihi, Tanya Fabian, Amy Haver. Michele Hebda, Heather Johnson, Carlo Iasella, Levent Kirisci, Mike Kuneman, Melissa McGivney, Taylor Miller, Cody Moore, Rachael Ours, Ryan Rivosecchi, Melissa Saul, Jennifer Shenk, Anne Williams.

The efforts of the program directors and research mentors are greatly appreciated. Amy Seybert, chair of the Department of Pharmacy and Therapeutics and Bryan Yourich, Regional Director of Pharmacy Operations, must also be recognized for their dedication to the program. We greatly appreciate the continued support of Dean Patricia D. Kroboth. We would be remiss not to mention the administrative support of Metanthi Tzanakos, Matthew Freidhoff and Sherri Peterson. Most importantly, this program is successful because of the commitment of our outstanding residents.

Retrospective Review of the Impact of a Basal Insulin Formulary Change on a Medicaid Population

Akers TE, Modany A, McGraw M

PURPOSE: Insulin prices increased by 320% from 2001 to 2014 due to limited competition and barriers to generic entry. Basaglar® was approved in December 2015 as the first follow-on insulin product through an abbreviated approval pathway under the Federal Food, Drug, and Cosmetic Act. As a result of the increasing insulin costs, UPMC Health Plan implemented a basal insulin formulary change in its Medicaid line of business making Basaglar® the preferred product as of May 1, 2018. The primary objective of this study was to determine the percentage of patients who successfully converted to the preferred basal insulin. The secondary objectives were to determine (in the successful switch population): the impact of the formulary management strategy on diabetes associated Per Member Per Month (PMPM) pharmacy costs and medical costs, A1c, and the overall member utilization of insulin and associated blood glucose testing supplies.

METHODS: This retrospective review of pharmacy and medical claims included Medicaid members ages 18 to 75 who were continuously enrolled from November 1, 2017 to January 31, 2019 with both pharmacy and medical benefits through UPMC Health Plan. Members were included if they had a diagnosis of diabetes and at least one 90-day supply or three 30-day supply pharmacy claims of Lantus®, Toujeo®, or Tresiba® in the pre-formulary change period (November 1, 2017 to April 30, 2018). Successful conversion was defined as at least one 90-day supply or three 30-day supply pharmacy claims of Basaglar® in the post-formulary change period (August 1, 2018 to January 31, 2019). A grace period was allotted (May 1, 2018 to July 31, 2018) to allow time for transition. Descriptive statistics were utilized.

RESULTS: Successful conversion to Basaglar® occurred in 72% of the population. Of those members who successfully converted, diabetes associated PMPM pharmacy costs were $855.09 and $872.28 and diabetes associated PMPM medical costs were $164.91 and $158.12 in the pre and post formulary change periods, respectively. A1c level was 8.4% vs. 8.3%, quantity of insulin dispensed was 19 mL vs. 21 mL, and quantity of lancets and test strips dispensed was 383 vs. 423 in the pre and post-formulary change periods. A secondary analysis showed that in the overall population, this formulary change resulted in approximately a $1.6 million cost savings.

CONCLUSIONS: The majority of members successfully converted to Basaglar®. Of these members, a basal insulin formulary change did not appear to impact diabetes associated PMPM pharmacy or medical costs, A1c, or the overall member utilization of insulin and associated blood glucose testing supplies.

Presented at the 2020 AMCP eLearning Days

Taylor Akers, PharmD

Taylor received her PharmD degree from the Duquesne University School of Pharmacy in 2019. She is currently a PGY1 managed care pharmacy resident at UPMC Health Plan. Her current professional interests include utilization and formulary management, clinical outreach programs, and specialty pharmacy management. Upon completion of her residency, she will pursue a clinical pharmacist role in a managed care organization.

Mentors: Ashley Modany, PharmD and Molly McGraw, PharmD, BCPS

Opioid stewardship initiative: a pilot program to guide pain management in health system oncology services

Bacon MF, Belavic J, Kuneman M

PURPOSE: Many hospitals and health systems are beginning to implement opioid-related initiatives; however, discovering the best way to pilot a system-wide program proves challenging. For patients with cancer, pain is one of the most damaging symptoms. A meta-analysis of over fifty studies revealed that more than 50% of patients with cancer in the United States experience major disease burden from their pain. The Eastern Cooperative Oncology Group (ECOG) conducted a study of pain management in 1,308 outpatient oncology patients and found that 42% had inadequate analgesic prescribing. The primary goal of this project is to develop a set of valid and feasible quality indicators to model an opioid stewardship program by first evaluating opioid prescribing habits in a specific subset of oncology patients. Furthermore, we intend to expand the model to other fields where opioids are prescribed within the healthcare system to create a hospital-wide opioid stewardship program.

METHODS: *Setting:* The proposed project will create an organized opioid stewardship program by bringing forward an efficient, all-encompassing, multidisciplinary approach to addressing opioid prescribing challenges within a subset of oncology patients. *Study Design:* This study will be a retrospective review of adult oncology patients cared for by UPMC Hillman Cancer Center through UPMC Hamot oncology physicians and advanced practice providers over a time frame of twenty months (July 2018-March 2020). *Inclusion/Exclusion Criteria:* The stewardship program will focus on outpatient oncology patients ≥ eighteen years of age with multiple myeloma, metastatic bone cancer, or breast cancer. *Data Collection:* Patient data will be collected via retrospective chart review from the electronic medical record. Information collected will include patient age, sex, height, weight, drug allergies, cancer diagnosis, other past medical history, risk factors for opioid use, and prescriber of pain management medications. Individual patient evaluation and documentation of pain will be taken into consideration.

RESULTS: Overall results are in progress.

Conclusions: Pending

Molly Bacon, PharmD

Molly is a PGY-1 pharmacy resident at UPMC Hamot. She is from Fairview, Pennsylvania and received her PharmD from the South Carolina College of Pharmacy in Columbia, South Carolina. Her professional interests include palliative care, pain management, family medicine, oncology, and academia. In her spare time, she enjoys spending time with family and friends, kayaking, hiking, cooking, boxing, and traveling. Upon completion of her PGY-1, Molly will continue her training through a combined PGY-2 residency/fellowship program in pain management and palliative care with Dana-Farber Cancer Institute and Harvard Medical School in Boston, Massachusetts.

Mentors: Jennifer Belavic, PharmD, MBA, BCPS, FASCP, Michael Kuneman, PharmD, MS, Elizabeth Zacharatos, RPh

Incidence of adverse events related to vancomycin in patients with and without a pharmacokinetic consult

Cain AR, Ganchuk S

PURPOSE: Vancomycin is a glycopeptide antibiotic used to treat Gram-positive infections. In order to ensure efficacy and prevent vancomycin induced nephrotoxicity (VIN), therapeutic monitoring of serum concentrations is required. UPMC Mercy currently monitors vancomycin and has set trough goals of 10-25 mcg/mL depending on the source of infection. Literature reports that pharmacist management of vancomycin dosing and monitoring has greatly reduced the risk of VIN while maintaining therapeutic outcomes. UPMC Mercy currently utilizes an "opt-in" approach to employ pharmacist management of vancomycin by placing a consult order. As a result, a pharmacist may not be managing vancomycin dosing and monitoring for all patients receiving vancomycin. The purpose of this study is to determine the incidence of acute kidney injury (AKI) in patients receiving vancomycin with and without pharmacist consultation at UPMC Mercy.

METHODS: A retrospective chart review was conducted for patients admitted to UPMC Mercy between January 1, 2019 and June 30, 2019. Patients included in this study were greater than 18 years of age and had at least four administrations of intravenous vancomycin during their encounter. Data collection included patient demographics, vancomycin regimen, duration of therapy, number of troughs between 10-25 mcg/mL, number of troughs outside of 10-25 mcg/mL, and evidence of AKI. For the purpose of this study, AKI is defined as an increase in serum creatinine of greater than or equal to 0.3 mg/dL based on the 2012 Kidney Disease Improving Global Outcomes (KDIGO) guidelines. The primary outcome of this study was the incidence of AKI in patients with and without a pharmacokinetic consult.

RESULTS: Data collection and analysis are currently in progress.

CONCLUSIONS: Pending. Ideally, the data will demonstrate that patients who receive vancomycin via pharmacist management at UPMC Mercy are less likely to develop an AKI. As a result, a case could be made to require pharmacy consultation for all vancomycin dosing to improve patient safety.

Alexander Cain, PharmD

Alex received his PharmD in 2019 from the St. John Fisher Wegmans School of Pharmacy located in Rochester, New York. He is currently a PGY1 pharmacy resident at UPMC Mercy. Upon completion of PGY1, he will complete a PGY2 in infectious diseases at Allegheny General Hospital.

Mentor(s): Steve Ganchuk, PharmD; Taylor Miller, PharmD; Robert Simonelli, PharmD

Evaluating a novel approach to heparin anti-Xa monitoring in the setting of direct-acting oral anticoagulant use.

Callejas LR, Miller TJ, Simonelli RJ

PURPOSE: Direct-acting oral anticoagulants (DOACs) are widely used for the prevention and treatment of venous thromboembolism as well as the prevention of stroke in patients with nonvalvular atrial fibrillation. For patients admitted to the hospital, heparin continuous infusions will frequently be started in place of DOACs due to the shorter duration of effect which may be advantageous in the setting of procedures or patient instability. Within the UPMC Health System, heparin is monitored using anti-Xa values, which may be falsely elevated if patients have recently taken a DOAC. Across UPMC hospitals, these patients are treated with fixed-dose, weight-based heparin for 72 hours after their last dose of a DOAC. The purpose of this evaluation is to compare safety and efficacy outcomes for patients who were managed using fixed dose heparin versus those who managed using anti-Xa values.

METHODS: Patients who were ordered the IV heparin (DOAC Interference) atrial fibrillation protocol from October 25, 2018 – November 20, 2019 were included in the retrospective chart review. Patients who had duplicate orders and who were ordered heparin for less than 24 hours were excluded. The primary outcome was heparin dose at 24 hours. Secondary outcomes include heparin dose at 24 hours compared to dose at first therapeutic anti-Xa value during monitoring phase, time to therapeutic anti-Xa value during monitoring phase, new thrombosis, and bleeding.

RESULTS: A total of 259 patients were evaluated. The average age was 71.7 years, and the average weight was 96.7 kg. Approximately 90% of patients were white, and 63% were male. The average heparin dose at 24 hours was 911 units/hr. The average dose at first therapeutic anti-Xa value during the monitoring phase was 1105 units/hr. Thromboses occurred in eight patients (3.1%) within seven days of heparin initiation with four of these being stroke and three having underdosed apixaban prior to heparin therapy. A new bleed was noted in 11 patients (4.2%) within 3 days of heparin initiation.

CONCLUSIONS: We conclude that patients required a higher dose to achieve therapeutic anti-Xa values during the monitoring phase than what they received during the fixed-dose phase. New strokes were noted in several patients, but the contribution of incorrectly dosed apixaban prior to heparin initiation cannot be ruled out. Concomitant medications also cannot be ruled out in contributing to newly diagnosed bleeds. Data for patients who were not ordered the fixed-dose protocol are pending and further conclusions regarding safety and efficacy can be made at that time.
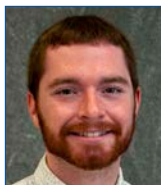
Liam Callejas, PharmD

Liam received his Doctor of Pharmacy degree from the University of Pittsburgh School of Pharmacy and is completing his PGY-1 residency at UPMC Mercy. Upon completion, Liam will continue residency training at The Johns Hopkins Hospital as the PGY-2 pharmacy resident in cardiology.

Mentors: Taylor Miller, PharmD; Robert Simonelli, PharmD

Variations of Pain Medication Use for Patients with Acute Extremity Pain

Cardinal RM, Cassidy EA, D'Amico F, Heath R, Baumgartner MA

PURPOSE: The opioid epidemic has risen dramatically over the last decade and continues to take over 50,000 lives annually. At least 75% of patients present to an emergency department (ED) for pain and have the potential to be prescribed opioids.[1] The Centers for Disease Control and state-run programs have attempted to combat the opioid epidemic. However, there are no set guidelines or algorithms available for providers to use for treatment of acute extremity pain. The objective of this study is to describe the patient characteristic(s) who receive opioid, nonopioid, and combination analgesics in an ED for acute extremity pain.

METHODS: A single-site, retrospective chart audit was conducted within an ED at a university-affiliated community-based teaching hospital. Patients ≥ 18 years old who were discharged from the ED with acute extremity pain and received at least one dose of opioid, nonopioid, or combination analgesic were included. The primary outcome was to determine the characteristics associated with the prescribing of opioid, nonopioid, and combination analgesics. Secondary outcomes included 1) amount of pain score reduction between opioid, nonopioid, and combination analgesics and 2) frequency of prescribing opioid, nonopioid, and combination analgesics to treat acute extremity pain. Statistical analyses included 1) relative frequency distributions for patient factors, 2) various contingency table analyses to look at bivariate combinations, and 3) appropriate multivariate statistical procedures to determine which combinations of analgesics and their characteristics are essential.

RESULTS: 878 patients were identified as having acute extremity pain in an ED between February and April 2019. 335 patients met the inclusion criteria. 200 (60%) nonopioids, 97 (29%) opioids, and 38 (11%) combination analgesics were prescribed. Characteristics associated with a difference in prescribing were an allergy to specific analgesics, diastolic blood pressure > 90 mmHg, heart rate > 100 bpm, opioid use prior to ED admission, level of prescriber, and discharge diagnosis. Difference in pain score pre- and post-analgesia were -0.1 (7.3 to 7.4), 2.1 (8.2 to 6.1), and 3.1 (8.5 to 5.4) for nonopioid, opioid, and combination analgesics respectively.

CONCLUSIONS: There are patient, prescriber, and environment specific characteristics that are associated with pain medication selection in an ED. An area of future investigation would be determining which pain medications are most effective for the treatment of acute extremity pain, with the eventual goal of developing a pain management algorithm.

[1]Downey LV and Zun LS. Pain management in the emergency department and its relationship to patient satisfaction. *J Emerg Trauma Shock.* 2010;3(4):326–330. doi:10.4103/0974-2700.70749

Rachael Cardinal, PharmD, BCPS

Rachael is from Buffalo, NY, and received her PharmD in 2018 from the University at Buffalo. She completed her PGY1 Pharmacy Residency at UPMC St. Margaret and continued as a PGY2 in ambulatory care with a focus in family medicine. Her professional interests include chronic disease state management, transitional care management, and family medicine. Rachael plans to stay in the Pittsburgh area after graduating residency to work as a clinical pharmacist.

Mentor(s): Megan Baumgartner, PharmD, BCPS, Elizabeth Cassidy, PharmD, BCPS

Initiating Venetoclax Treatment in the Outpatient Setting for Acute Myeloid Leukemia: A Quality Improvement Project

Casem KP, Steele J, Bastacky ML, Brenner TL

PURPOSE: Venetoclax is an inhibitor of the B cell lymphoma-2 protein and is approved for the treatment of acute myeloid leukemia (AML) in elderly patients or those who are not candidates for intensive chemotherapy. Initiating venetoclax treatment requires stepwise dose escalation, or "ramp-up", to minimize the risk of tumor lysis syndrome (TLS). However, phase 2 trials showed a rare incidence of TLS in AML patients who were treated with venetoclax. At the University of Pittsburgh Medical Center (UPMC) Shadyside Hospital, AML patients starting venetoclax are admitted to the hospital for treatment ramp-up. The purpose of this two-part quality improvement project was to determine the incidence of TLS during inpatient venetoclax ramp-up in AML patients, and design a process for outpatient venetoclax initiation in patients deemed safe for outpatient treatment.

METHODS: We performed a retrospective chart review of 47 AML patients at UPMC Shadyside Hospital who were started on venetoclax during an inpatient admission between January 1, 2016 and December 31, 2019. Data collection included patient demographics, venetoclax treatment information, laboratory values, prophylactic measures for TLS, TLS management, and length of hospitalization. Laboratory and clinical TLS during venetoclax ramp-up were defined per the Cairo-Bishop criteria. Descriptive statistics were used to determine the incidence of TLS and assess baseline characteristics. Categorical variables were assessed with Fisher's exact test, and continuous variables were assessed with the Mann-Whitney U test. This project was approved by the UPMC Quality Review Committee.

RESULTS: TLS was evaluable in 43 of the 47 AML patients. All patients received prophylaxis for TLS per institutional standards, including intravenous hydration and allopurinol. TLS occurred in 6 patients (14%). One patient had clinical TLS (acute kidney injury), and 5 patients met criteria for laboratory TLS, including 2 patients whose laboratory values increased by at least 25% but remained within normal ranges. TLS was more common in patients with a pre-treatment WBC count of greater than 25×10^9/L (3 of 5 patients, 60%) compared with patients with a lower WBC count (3 of 38 patients, 8%, P=0.01).

CONCLUSIONS: Per the Cairo-Bishop criteria, 6 of 43 AML patients (14%) experienced TLS during venetoclax ramp-up, with only 1 patient (2%) having clinical TLS. Most TLS-related laboratory changes were within normal ranges, and TLS was transient in all 6 cases. TLS was more common in patients with an elevated pre-treatment WBC count. This data will be used to design and implement a process for outpatient venetoclax initiation in AML patients who are at low risk for TLS.

Presented at the Hematology/Oncology Pharmacy Association 16th Annual Conference, Tampa, FL, March 11-14, 2020.

Kristian Casem, PharmD

Kristian is the PGY2 oncology pharmacy resident at UPMC Shadyside Hospital. He received his Doctor of Pharmacy degree from Rutgers University in 2018, and he completed his PGY1 residency training at Saint Peter's University Hospital in New Brunswick, New Jersey. After completion of his PGY2 residency, he plans to work as an oncology clinical pharmacist.

Mentors: Timothy L. Brenner, PharmD, BCOP; Jason Steele, PharmD, BCOP; Melissa Bastacky, PharmD, BCOP; James J. Natale, PharmD, BCOP

Dalbavancin compared to standard of care for the management of osteomyelitis

Chatellier KS, Pickering A, Jacobs M

PURPOSE: Osteomyelitis is a serious infection that affects about 50,000 people annually. Outpatient treatment of this infection can be difficult due to numerous factors including the need for outpatient intravenous antibiotics. Dalbavancin is a parenteral antibiotic FDA-approved to treat acute skin and skin structure infections caused by gram-positive organisms. There is a growing body of research supporting its use for osteomyelitis. It is administered bi-weekly, which is a major advantage to daily administration of more conventional therapy. Administration does not require a peripherally inserted central catheter (PICC) placement, preventing the need for placement in a skilled nursing facility for daily antibiotic administration for populations such as intravenous drug users. The infectious disease clinic at UPMC St. Margaret treats many patients with osteomyelitis using dalbavancin. The purpose of this study is to compare efficacy and safety of off-label dalbavancin for osteomyelitis compared to conventional therapy.

METHODS: The study design is a single-center, descriptive, retrospective chart review conducted at UPMC St. Margaret. The primary endpoint is to compare clinical cure rates as determined by the treating infectious disease practitioner. Secondary endpoints include readmission rates within 90 days of treatment completion and need for additional antibiotics following completion of therapy. Safety will be evaluated by observing difference in treatment-related adverse events. Inclusion criteria include patients who are greater than eighteen years of age, received at least one dose of dalbavancin or standard of care (SOC) during outpatient treatment prior to outpatient treatment. Exclusion criteria include having a previous episode of osteomyelitis and being less than eighteen years of age. Patients treated during the time period of 7/1/2017 to 9/10/2019 will be included. Inpatient data was collected utilizing CERNER for inpatient data and INTERGY for outpatient.

RESULTS: Complete results and analysis pending. 68 patients were eligible for inclusion in the dalbavancin arm and 30 for SOC. 1 patient in the dalbavancin group and 3 who received SOC were not clinically cured at the anticipated end of therapy, resulting in an extended antibiotic course. 1 patient in the dalbavancin group and 2 in the SOC group required antibiotics for skin and soft tissue infections within 90 days of clinical osteomyelitis cure. Each group had 1 patient readmitted within 90 days of completing therapy. Adverse event incidence was similarly minimal in each group.

CONCLUSIONS: We anticipate that dalbavancin will result in similar clinical cure rates compared to standard of care and similar rates of adverse events. These results will add to the growing body of literature regarding the utility of dalbavancin for osteomyelitis. Using dalbavancin will aid in more seamless transitions-of-care by providing patients with a more manageable option for outpatient parenteral antibiotic administration.

Kristel Chatellier, PharmD

Kristel Chatellier is a PGY-1 Pharmacy Practice resident at UPMC St. Margaret. She is from Pittsburgh, PA and received her PharmD from the University of Pittsburgh. Next year, she will be staying with St. Margaret to complete a PGY-2 residency in Geriatrics.

Mentor: Aaron Pickering, PharmD, BCPS

Pharmacist impact on drug related problems at transfer from the ICU: effect on readmission rates

Chiappelli AL, Kane-Gill SL, Groetzinger L, Pelts M, McGinnis C, Moore C, Nguyen V, Rivosecchi R, Smithburger PL

PURPOSE: Drug related problems (DRPs), including medication errors, adverse drug reactions (ADRs), and unintentional discontinuation of medications, occur more frequently when patients are in the intensive care unit (ICU) and during the transition from the ICU to a lower level of care. Pharmacists have demonstrated their positive impact at admission and at discharge in preventing medication errors. However, there is a paucity of literature describing the effect of pharmacist involvement on medication errors and drug related problems (DRPs) at the point of transfer from the ICU. The objective of this quality improvement project was to evaluate the impact of a pharmacist-driven DRP review at the point of transition from an ICU on the resultant 7-day and 30-day readmission rates of patients due to DRPs.

METHODS: This quality improvement project was a retrospective review of hospital readmission rates associated with DRPs. Patients were included if they were 18 years or older, admitted to the 24-bed medical ICU at UPMC Presbyterian for at least 24 hours before being transferred to a non-ICU unit between March 2018 and August 2018 (pre-intervention group) or February 2019 and May 2019 (intervention group). The DRPs were identified in the pre-intervention group through retrospective chart review by a clinical pharmacist while DRPs in the intervention group were identified and intervened upon by a pharmacist within 24 hours of patient transfer from the ICU. Readmission was determined through retrospective review of patients discharged with DRPs on the discharge summary medication list. Data were described using descriptive statistics and presence of DRPs at discharge and readmission were compared used a chi-square or Fisher's exact as appropriate.

RESULTS: Of the 115 patients discharged in the pre-intervention and intervention groups with at least one DRP, 21 patients (18.3%) were readmitted within 30 days of hospital discharge (18 patients (85.7%) in the pre-intervention group vs. 3 patients (14.3%) in the intervention group). Eight patients (7.0%) were readmitted within 7 days of hospital discharge. There were more patients in the pre-intervention group readmitted within 7 days than in the intervention group (75% vs. 25%, respectively). Further analysis of results related to the impact of DRPs on readmission rates are ongoing.

CONCLUSION: Pending

Abby Chiappelli, PharmD

Abby is from Saint Marys, PA, and received her PharmD from the University of Pittsburgh School of Pharmacy in 2018. Last year, she completed a PGY1 Pharmacy Practice Residency at UPMC Mercy, and this year, she is completing a PGY2 Pharmacy Residency specializing in Critical Care at UPMC Presbyterian. After residency, Abby is pursuing a clinical specialist position in critical care and emergency medicine.

Mentors: Pamela Smithburger, PharmD, MS, BCPS, BCCCP, FCCP, FCCM; Sandra Kane-Gill, PharmD, MS, FCCM, FCCP; Cody Moore, PharmD, BCPS

Assessment of Bleeding and Thrombosis after Aspirin Responsiveness Testing in Left Ventricular Assist Device Patients

Colvin B, Rivosecchi R, Kane–Gill S, Horn E

PURPOSE: Bleeding and thrombosis in left ventricular assist devices (LVADs) are common complications during the first year after implantation. Standard aspirin dosing in LVAD patients is 81 to 325 mg daily. Approximately 30% of the population maintains platelet function with aspirin 325 mg daily. Aspirin response assays help guide dosing to ensure platelets are adequately inhibited. This study evaluates bleeding and thrombosis outcomes post-LVAD implantation in patients with VerifyNow Aspirin (VNA) Assay® testing compared to those without testing.

METHODS: A retrospective, pre- and post-quality improvement study was completed at UPMC Presbyterian from 1-1-2010 to 5-1-2019. The pre-group was standard of care before the VNA assay was available and the post-group was after the VNA test became standard of care. Subjects were included for their index LVAD implantation if they were over the age of 18. Individuals receiving dual antiplatelet or direct oral anticoagulant therapy, or who were supported with extracorporeal membrane oxygenation, right ventricular or biventricular assist devices as a bridge to LVAD or within 7 days post-implant were excluded. Patients were evaluated for first occurrence of thrombotic and bleeding events within 3 months post-implant in the pre-group versus the post-group. Thrombotic events included pump thrombosis, transient ischemic attack, and ischemic stroke. Bleeding events included major bleeding and hemorrhagic stroke. All outcomes were defined by INTERMACS. Demographics were analyzed using descriptive statistics. Kaplan-Meier analyses were conducted for time-to-event data.

RESULTS: During the study period 81 LVAD implants were included in the pre-assay group and 102 in the post-assay group. Baseline demographics were similar between groups. Implants included 34 (18.8%) Heartmate II, 28 (15.5%) Heartmate 3, and 119 (65.7%) HeartWare. A thrombotic event occurred in 6 (3.3%) patients in the pre-group and 4 (2.2%) patients in the post-group within 3 months after the implant. There were 46 (25.4%) patients in the post-group and 30 (16.6%) patients in the pre-group who bled. There were no significant differences in time-to-thrombosis or time-to-bleed up to 3 months between groups, p=0.834 and p=0.465, respectively.

CONCLUSIONS: There were no significant differences in thrombotic events or bleeding events at any time point in the assay-guided group compared to the group without assay-guidance. These results in this small sample size of patients suggest the universal use of single-point aspirin response assays to guide dosing in the LVAD population may not impact overall patient outcomes.

Presented at the American College of Cardiology and World Congress of Cardiology Virtual Annual Conference in the PharmD Transition from Training to Practice Forum, April 2020.

Bailey Colvin, PharmD

Bailey is the current PGY2 Cardiology Pharmacy Resident at UPMC Presbyterian Hospital. She received her undergraduate and Doctor of Pharmacy degrees from the Philadelphia College of Pharmacy at the University of the Sciences and completed her PGY1 training at UPMC Presbyterian Hospital as well. Her professional areas of interest include advanced heart failure, mechanical circulatory support, critical care cardiology, and healthcare disparities.

Mentor(s): Ed Horn, PharmD, BCCCP; Ryan Rivosecchi, PharmD, BCCCP; Sandy Kane-Gill, PharmD, FCCM, FCCP

Evaluating barriers to adherence to ticagrelor following percutaneous coronary intervention

Courtney L, Hebda M, Kalsmith B, Kostka S

PURPOSE: The 2016 American College of Cardiology/American Heart Association Guideline Focused Update on Duration of Dual Antiplatelet Therapy in Patients with Coronary Artery Disease recommends dual antiplatelet therapy (DAPT) with aspirin plus a $P2Y_{12}$ inhibitor for at least 12 months in patients with acute coronary syndrome (ACS) who have undergone percutaneous coronary intervention (PCI). Ticagrelor is preferred over clopidogrel for maintenance $P2Y_{12}$ inhibitor therapy in this patient population based on demonstrated superiority of ticagrelor in preventing ischemic events without a significant increase in major bleeding. However, premature discontinuation of ticagrelor prior to the recommended 12 months is common. Therefore, the purpose of this project is to identify barriers to adherence to ticagrelor at our institution in an effort to improve adherence to guideline-recommended DAPT.

METHODS: A retrospective chart review was conducted of all adult patients ($\geq$ 18 years) with ACS who were newly initiated on ticagrelor post-PCI at a tertiary academic medical center between June 1, 2018 and December 31, 2018. DAPT regimens were assessed at discharge, 1 month, 3 months, and 6 months post-PCI based on external fill history in Cerner and review of physician notes in both Cerner and Epic. The primary objective was to determine the frequency of ticagrelor discontinuation within 6 months post-PCI. The secondary objective was to determine the most common reasons for ticagrelor discontinuation.

RESULTS: Seventy-three patients met the inclusion criteria. At 6 months post-PCI, 30 patients (41.1%) were still taking ticagrelor and 30 (41.1%) had been switched from ticagrelor to clopidogrel. The remaining 13 patients (17.8%) either did not have adherence data available or were deceased. Among the 30 patients no longer taking ticagrelor at 6 months, the most common rationales for switching to clopidogrel were dyspnea (11, 36.7%) and cost (7, 23.3%). No rationale for switching to clopidogrel was provided in 8 cases (26.7%). Early de-escalation from ticagrelor to clopidogrel was common, with 19 patients (26.0%) switching within the first month post-PCI.

CONCLUSIONS: The results of this study suggest that many patients with ACS initially started on DAPT with ticagrelor post-PCI do not remain on this regimen in the first 6 months following PCI. The primary barriers to adherence to ticagrelor were dyspnea and cost. Opportunities exist to improve this finding, including better management of ticagrelor side effects via patient and provider education, as well as improved adherence via evaluating strategies for cost savings.

Lindsay Courtney, PharmD

Lindsay is originally from Oak Park, California and received her PharmD from the University of Colorado Skaggs School of Pharmacy and Pharmaceutical Sciences. She is currently a PGY-1 resident at UPMC Shadyside. Upon completion of her PGY-1, Lindsay will be returning to the University of Colorado to complete her PGY-2 in ambulatory care.

Mentor(s): Michele Hebda, PharmD, BCPS, Shayna Kostka, PharmD

Evaluation of a Pharmacist-Led Hypertension Protocol in a Family Medicine Clinic

Dadzie P, Pater K, Yadlosky J

PURPOSE: Uncontrolled hypertension is a significant risk factor for cardiovascular morbidity and mortality. Patient and system barriers aside, clinical inertia is a major contributor to poor blood pressure management, despite pharmacological treatment. A previous needs assessment was conducted at the UPMC Matilda Theiss Family Medicine Clinic that included a retrospective chart review of adult patients seen over a four-month period. The results identified a significant number of patients presenting to clinic with elevated blood pressure, providing evidence for room to optimize hypertension control. The objective of this quality improvement project is to evaluate the impact of a pharmacist-led hypertension protocol on the reduction of blood pressure in adult patients with stage II hypertension according to the American College of Cardiology/American Heart Association (ACC/AHA) guidelines.

METHODS: From October 2019 to March 2020, adult patients with systolic blood pressure (SBP) greater than 140 mmHg or diastolic blood pressure (DBP) greater than 90mmHg at their two most recent clinic visits were identified in one of two ways: during clinical review of the daily patient schedule and routine refill requests. Outreach calls were made to these patients to accommodate scheduling of pharmacist-led blood pressure visits or patients were seen by pharmacists at the time of a scheduled PCP visit. During initial visit, blood pressure was measured, blood pressure education was provided, and current medications were assessed. Pharmacists directly adjusted medications and ordered labs for monitoring as indicated as per protocol. Patients were excluded from analysis if blood pressure was below 140/90mmHg at time of initial pharmacist visit or they did not have at least one follow-up visit between 2 and 6 months after initial visit.

RESULTS: A total of 49 patients were contacted after meeting initial criteria. Of the 49 patients, 32 had at least one follow-up visit, and 14 of 32 patients met all inclusion/exclusion criteria. These 14 patients had a median of 3 (range 1-5) follow-up visits. As determined at the last follow-up visit with each patient, there was a mean change in SBP of 25mmHg ($p<0.001$) and DBP of 10.5 mmHg ($p=0.002$). Twelve of the 14 patients (86%) achieved a blood pressure less than 140/90mmHg. A total of 20 medications changes were made for these patients with a mean of 1.4 changes per patient.

CONCLUSION: Implementation of a pharmacist-led hypertension protocol in a primary care clinic led to reduction in patients' blood pressure to target goals.

Precious Dadzie, PharmD

Precious is a PGY2 Ambulatory Care Pharmacy Resident at UPMC Presbyterian Shadyside under the Traditional Track. She received her PharmD from Virginia Commonwealth University School of Pharmacy. She completed a PGY1 Ambulatory Care Focused Pharmacy Residency at Kingman Regional Medical Center in Kingman, Arizona. Her professional interests include providing care to underserved populations, psychiatry, and chronic disease state management. Upon completion of her PGY2, Precious will continue her career as an Ambulatory Care Clinical Pharmacist in an outpatient setting.

Mentor(s): Karen Pater, PharmD, CDE, BCACP

Optimizing secondary prevention strategies in patients with ASCVD in the primary care setting

Davis KA, Hall D, Hovis Z, Miller T, Aiyer A.

PURPOSE: In 2018, the AHA/ACC updated their guidance to reinstate the low-density lipoprotein (LDL) goal of <70 mg/dl for patients with an established history of atherosclerotic cardiovascular disease (ASCVD). The purpose of this study is to determine if the new guidance of a LDL goal <70 mg/dl is achieved in secondary prevention candidates managed in the primary care setting and determine the impact of pharmacist intervention on optimizing lipid-lowering medication therapy amongst those patients not at goal.

METHODS: This was a two-phase study. In the first phase, a report was generated in August 2019 which identified patients of two internal medicine residency clinics within UPMC who were 18 years or older with a history of ASCVD. Patients were included for evaluation if they were < 75 years old and had been maintained on their current lipid regimen for at least twelve weeks. This evaluation identified patients who would benefit from additional intervention due to persistently elevated LDL above 70 mg/dl. During the second phase, the pharmacist provided recommendations to intensify pharmacologic lipid-lowering therapy to reflect guideline recommendations. These recommendations were made within the patient's chart in the electronic medical record (EMR) and were sent to the PCP for review. The outcomes of the second phase of this study are the rate of acceptance and barriers to acceptance of pharmacist recommendations.

RESULTS: Of the 187 identified patients, 47.5% (89 patients) were not at an LDL goal of <70 mg/dl. The mean age of patients included for phase two was 62 years old, 55% were male, and 22% of patients had a history of statin intolerance. The majority of preliminary pharmacist recommendations involved modification of statin therapy (55%). Additional preliminary recommendations included addition of ezetimibe (23.5%), obtaining an updated lipid panel (12.4%), and referral to cardiology for initiation of a proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitor (4.5%), more than one recommendation (3.5%), and no intervention (1.1%). The second phase of this study is ongoing.

CONCLUSIONS: Phase one of this study identified opportunities for lipid-therapy optimization as evidenced by the first phase of this study. More conclusions to follow.

Kayla Davis, PharmD

Kayla received her PharmD from Albany College of Pharmacy and Health Sciences in 2018 before completing her PGY-1 residency at The University of Vermont Medical Center (UVMMC) in Burlington, VT. Her experience at UVMMC solidified her interest in ambulatory care and academia, which led her to UPMC to pursue a the PGY-2 traditional track ambulatory care program. Her professional interests include academia, chronic disease state management, anticoagulation and development of ambulatory care services.

Mentor(s): Full names with credentials Deanne Hall, PharmD, CDE, BCACP, Zachary Hovis, PharmD, BCACP, Trisha Miller, PharmD, BCACP

Gauging Patients' Understanding of Indications and Side Effects Associated with Chronic Proton Pump Inhibitor Use

DeMarco S, Haver A, Larson P, McKittrick C

PURPOSE: Proton pump inhibitors (PPIs) are one of the most commonly prescribed class of medications in the primary care setting. Chronic use of this medication class is associated with severe adverse events such as include increased risk of pneumonia, vitamin deficiencies, fractures, dementia, and Clostridium difficile infections. Current literature assessing patients understanding of prescribed indication as well as long-term side effects associated with PPIs are limited. The objective of this study is to determine how informed patients are in regards to their prescribed PPI indication as well as side effects associated with chronic PPI use in order to help family medicine practitioners appropriately prescribe, deprescribe, and provide education to patients on PPI medications.

METHODS: Study design: Cross-sectional, point-prevalence, single site, non-invasive survey-based study. Setting/Intervention: A face to face survey will be administered via Ipad to patients hospitalized at UPMC St. Margaret Hospital with a PPI identified on their outpatient medication reconciliation list, patients aware they are on a PPI medication, and ≥ 18 years of age. A follow-up survey will be administered via email or telephone 2-4 weeks after inpatient discharge date. Primary Outcomes: Percent of patients who are able to identify why they are on a proton pump inhibitor, percent of patients able to identify long-term risks associated with chronic PPI use. Secondary Outcome: Percent of patients who follow-up with their primary care physician to discuss their PPI medication.

RESULTS: Research in progress; results are yet to be determined. *Due to COVID-19, only 3 individuals were enrolled in the study before being postponed for the foreseeable future. The original project is currently under review for IRB modification from face-to-face administered to telephone administered survey.*

CONCLUSIONS (ANTICIPATED): The results of this study have the potential to identify deficiencies in patient knowledge regarding their medications, improve patient medication education provided by family medicine practitioners, and promote safe use of PPI medications.

Accepted for presentation at the 2020 Annual STFM (Society of Teachers of Family Medicine) Conference.

Samantha DeMarco, PharmD

Samantha DeMarco received her B.S. from the University of Maryland prior to completing her PharmD. at Virginia Commonwealth University. She is currently a PGY-1 Pharmacy Resident at UPMC St. Margaret and will stay on to complete her PGY-2 in Geriatrics. Her areas of interest include healthy aging and wellness as well as chronic disease state management.

The Effect of Dosing Strategy on Cisatracurium Consumption in Patients with Acute Respiratory Distress Syndrome.

DiBridge JN, Rivosecchi R, Lamberty P, McVerry B, Groetzinger L.

PURPOSE: Acute Respiratory Distress Syndrome (ARDS) is associated with a high mortality rate with a lack of pharmacotheraputic options. Research shows that a trial of continuous infusion of cisatracurium (CIS) leads to improved (P/F) ratios as well as a reduction in serum and inflammatory response. Guidelines recommend a trial of an NMBA in life-threatening situations, yet do not recommend a specific continuous infusion dosing strategy and have not been updated to reflect the most recent trial studying CIS in ARDS. Current practice at UPMC Presbyterian in the ARDS population is varied across our Intensive Care Units. Among the different CIS administration approaches are: a fixed dose (37.5mg/hr), a physician driven ventilator synchrony protocol, and a Train-of-Four protocol. Given the lack of consensus on the appropriate dosing of CIS, we aim to determine the effect of dosing strategy on drug consumption in patients with ARDS.

METHODS: This was retrospective single center chart review of patients with ARDS who received continuous neuromuscular blockade. Data were obtained from Acute Lung Injury Registry (ALIR) and the electronic medical records in Cerner from January 1, 2013 to December 31, 2018. Patients with a diagnosis code (ICD9 and ICD10) of acute respiratory distress who received a dose of CIS were identified for inclusion. Patients were excluded if they were less than 18 years of age, received CIS for less than 36 hours, had an interruption of CIS for greater than 3 hours, or required extracorporeal membrane oxygenation. The primary endpoint was to assess CIS drug consumption within 48 hours. The secondary endpoints were to evaluate efficacy of the neuromuscular block defined as change in P/F ratio, change in oxygenation index (OI), and number of clinically detectable patient-to ventilator asynchronies at 12, 24, and 48 hours.

RESULTS: Pending.

CONCLUSIONS: The results of this study will add to the existing literature regarding paralysis practices in ARDS patients and contribute to standardizing a dosing approach in this population.

Julie DiBridge, PharmD, BCPS

Julie completed her undergraduate and pharmacy school training at the University of Pittsburgh and is currently a non-traditional Acute Care PGY-1 Pharmacy Resident at UPMC Presbyterian. Her interests include critical care and cardiology. She hopes to pursue PGY-2 training in her areas of interest in the next year.

Mentor(s): Lara Groetzinger, PharmD, BCCCP; Ryan Rivosecchi, PharmD, BCCCP

503B Medication Inventory Sustainability

John H. Fawzy PharmD, MBA; Keith T. Hylwa PharmD, MBA; Eric G. Schaefer PharmD, MHSA

PURPOSE: Inventory management has become one of the most important functions in a hospital pharmacy practice. While our frontline team steers orders towards availability, it falls on the inventory team to sustain the entire hospital. In recent years we have been forced to quickly navigate changes in our practices due to product changes. Whether it's a medication specific shortage or a worldwide pandemic. Inventory issues are inevitable. In an ideal world, we would have our own compounding facility to help ensure consistent and secure supply of short dated compounded products. A 503B compounding facility could easily navigate raw materials and tailor supply to the bulk need of large institutions. For sites without personalized 503B compounding facility support, looking at best inventory practices can help aid in times of shortages or at least provide some guidance on decreasing waste and maximizing spend.

METHODS: We looked at our current annual usage utilizing charge on administration (COA) model. We also utilized our ordering records to gain access to what products have been used and at what rate. Products included in these searches were primarily picked based on cost as well as beyond-use dating (BUD). Pricing varied and were only updated on a quarterly basis as the products lines and manufactures change constantly. We do not believe that the change in price affected the overall curve since ordering habits were a major culprit. We looked at data in relation to previous year 2018 and 2019 to consider quantities on hand required of each of the selected medications. We also considered a 10% surge increase as well as dynamic interchange based on other shortages and change in standard of care (these products would have been excluded when identified).

RESULTS: We were able to see significant savings potential with data between 2018 to 2019. Utilization of better ordering patterns could be implemented post COVID19 recovery period. In the first quarter of running the program, we were able to see about $400,000 in potential savings. A major culprit that was identified was shipment availability on products. Ordering more than our utilization rate would leave us wasting the products that expire (without receiving credit). We initially planned to go live with the data driven model in the first quarter of 2020 however, with COVID19, ordering patterns would skew the data towards higher usage in surge times and low usage in low census periods. Plan is to utilize data from 2018-2019 with a 10% increase for the third and fourth quarter of 2020.

CONCLUSIONS: Periods of shortages in medication supply is inevitable. Our practices can help mitigate local service interruptions as well as national shortages. Each hospital plays an important role in mitigating these national inventory drains. A good look at ordering habits in comparison to utilization of this, simple low-maintenance program, could prove beneficial in terms of duplicate orders as well as a cost savings. While it's very easy to proceed with multiple orders, a simple excel sheet or second check help reduce waste. Manufacturers tend to fulfill multiple orders from different days from the same lot number. If run rates are not consistent with the quantity ordered, we create waste that could have easily benefited another facility and reduced overhead spend. Our expected annual cost savings is yet to be determined due to COVID19 however the run rate from the first quarter could be assessed and scaled to a significant yearly savings. Data towards accurate cost savings is to be examined in the fourth quarter of 2020.

John Fawzy, PharmD, MBA

John received his PharmD and MBA from Long Island University in Brooklyn NY. He is currently completing his PGY2 in Health System Pharmacy Administration and Leadership. Upon completing his residency, John plans to join Omnicell for a fellowship and further develop and train in pharmacy automation.

Mentor: Eric G Shaefer PharmD, MHSA – Pharmacy Operations Manager UPMC Presbyterian

Retrospective evaluation of tetracycline-based antibiotics and the effect on microalbuminuria in patients with glomerulonephritis

Fay J, Burke D, Iasella C, Kellum J

PURPOSE: According to the Kidney Disease: Improving Global Outcomes (KDIGO) guidelines, treatment for glomerulonephritis typically include the utilization of immunosuppressive medications including oral corticosteroids and/or alkylating agents. A previous case study identified a glomerulonephritis patient who had a reduction of proteinuria while taking a tetracycline-based antibiotic. The purpose of this study is to determine if there is an association between microalbuminuria reduction in conjunction with tetracycline-based antibiotic exposure.

METHODS: This study was approved by the Institutional Review Board. A retrospective, cohort study utilizing de-identified data was conducted of nephritic patients treated at six UPMC outpatient renal clinics between January 1, 2000 to December 31, 2019. Patients were identified via ICD-9 and ICD-10 codes. Patients were included for analysis if meeting the subsequent criteria: exposure to a tetracycline-based antibiotic for 14 days or greater, documentation of baseline and post-exposure proteinuria. Baseline was defined as documentation of lab data within 1 year pre-antibiotic exposure, post-exposure collected within 90 days of antibiotic administration. Patients were excluded if receiving renal replacement therapy or had an absence of microalbuminuria at baseline. Percent change of microalbuminuria between baseline and post-exposure was evaluated as a primary endpoint. Mortality rate and progression to renal replacement therapy were evaluated as secondary endpoints, as well as the percent change in serum creatinine (SCr) and Blood Urea Nitrogen (BUN).

RESULTS: Of the 459 patients identified with nephritis meeting documentation of lab results within the specified time frame, none of these patients had both pre and post exposure microalbumin for comparison. 190 of these patients had necessary secondary endpoint laboratory values and were included for evaluation. Post exposure values had an overall mean of 1.0% reduction and median reduction of 8.7% of BUN. SCr had a mean decrease of 17% and median decrease of 5.4%.

CONCLUSION: Reduction in proteinuria could not be established through this method of evaluation due to the lack of laboratory monitoring surrounding antibiotic administration. Improvement in BUN and SCr may be suggestive of improved renal function. Future investigation in the form of a pilot study would be appropriate to definitively evaluate the impact of tetracyclines on microalbuminuria.

Jennifer Fay, PharmD

Jennifer received her PharmD from LECOM School of pharmacy in 2005 and practiced as a retail pharmacy manager until beginning residency at UPMC Magee Womens Hospital. Over the course of the year Jennifer has developed skills necessary to practice as a well-rounded clinical pharmacist, assisted in facilitating pharmacy student lectures, and explored opportunities within research. Upon residency completion she plans to seek a position that encompasses and continues to advance these skillsets.

Mentor(s): Clayton Burke, PharmD; Carlo Iasella PharmD, MPH, BCPS; John Kellum MD; Karen Robb, PharmD

Risk of acute cellular rejection in lung transplant recipients receiving granulocyte colony-stimulating factor

Fredrick SR, Iasella CJ, Rivosecchi RM, Sacha LM, Moore CA

PURPOSE: Neutropenia is a common complication of lung transplantation (LT). The causes are multifactorial, including immunosuppressive and antibacterial medications and viral infections. Granulocyte colony-stimulating factor (G-CSF) may serve as a viable option for LT recipients to treat neutropenia. While its primary action is on neutrophils, G-CSF also increases absolute monocyte and lymphocyte counts, thereby potentially playing a role in allograft rejection. LT recipients are among the highest risk for allograft rejection, with up to 35% of patients experiencing acute cellular rejection (ACR) within the first year of transplantation. The objective of this retrospective matched cohort study is to determine whether LT recipients who receive G-CSF have a higher incidence of ACR compared to those who do not receive G-CSF.

METHODS: Patients over the age of 18 who received a single or double lung transplant between January 2010 and October 2019 were identified in an internal database and cross-referenced with inpatient and outpatient charge data. Patients who received one or more doses of G-CSF were included in the G-CSF group, and all others were included in the no G-CSF group. Patients were matched between groups based on transplant indication, age, and sex. The primary outcome was incidence of biopsy-proven ACR within 6 months after the first G-CSF administration in the G-CSF group versus a matched time point in the no G-CSF group. Secondary outcomes included time to rejection, severity of rejection, new or progression of CLAD 1 year, survival at 1 year, and incidence of infections at 6 months.

RESULTS: 470 patients were screened for inclusion. 212 patients were included in the final analysis (106 in each group). 37 patients (34.9%) in the non-GCSF group experienced ACR in the first 6 months, compared to 50 (47.2%) in the GCSF group (p=0.070). Time to rejection was shorter in the G-CSF group (p=0.049). Of the patients who experienced rejection, severity of rejection was similar between groups. Patients in the G-CSF group had higher 1-year mortality, and were more likely to experience CMV and EBV viremia and bacterial pneumonia. In multivariable analysis, G-CSF use was not associated with 6-month ACR.

CONCLUSIONS: In this study, G-CSF was not associated with 6-month acute cellular rejection. Further research is needed to determine the definitive place of G-CSF in the treatment of neutropenia in this patient population.
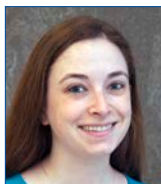
Stacy Fredrick, PharmD, MBA

Stacy did her PGY-1 Acute Care Pharmacy Residency at UPMC Presbyterian, where she stayed on for a PGY-2 in Solid Organ Transplant. She is from Buffalo, NY, and received her PharmD and MBA from the University at Buffalo School of Pharmacy and Pharmaceutical Science. Her clinical interests include solid organ transplant and infectious disease. Upon completion of her PGY-2 residency, she will join the abdominal transplant team at University of Rochester Medical Center as a Clinical Pharmacy Specialist in Transplantation.

Mentor(s): Cody A. Moore, PharmD, MPH, BCPS; Carlo J. Iasella, PharmD, MPH, BCPS; Lauren M. Sacha, PharmD, BCPS; Ryan M. Rivosecchi, PharmD, BCCCP

Informing the development of a transitions of care program between an emergency department and regional supermarket chain pharmacies

Gabriel C, Bedi R, Coley KC, Antinopoulos B, McGivney M, Richardson RM, Vercammen V, Carroll JC

PURPOSE: Patients discharged from emergency departments (ED) often have acute problems, high uninsurance rates, and lack of established physician care. A large proportion of these patients are prescribed at least one medication upon ED discharge While there is an abundance of data to support transitions of care programs following hospital discharges, studies evaluating the impact of these programs following ED encounters are limited. There is a unique opportunity to implement transitions of care programs that connect patients discharged from the ED to community pharmacies.

METHODS: Pharmacies from a regional supermarket chain were identified for inclusion based upon geographic proximity to a local community hospital emergency department. Purposeful sampling of key stakeholders from both the supermarket pharmacy and the ED was utilized. These stakeholders include pharmacy administrators, pharmacists, physicians, nurses, and case managers. Participants were invited to participate in semi-structured, one-on-one interviews with the primary investigator. Interview questions were based on the Consolidation Framework for Implementation Research (CFIR). Four CFIR domains were utilized: (1) include networks and communications; (2) leadership engagement; (3) process; and (4) intervention characteristics. Interviews were audio-recorded and transcribed. A codebook was developed by the research team and two investigators coded each transcript independently. Coding discrepancies were resolved through discussion. The study team is in the process of conducting a mixed deductive-inductive analysis to identify common themes that will inform the development of a future transitions of care program.

PRELIMINARY RESULTS: A total of 19 interviews were conducted with stakeholders from both the community hospital ED (n=10) and Giant Eagle Pharmacy (n=9). Interviews lasted an average of 20 minutes. The study team is conducting a thematic analysis and are in the process of mapping back to domains. Preliminary themes include: 1) enhance communication between ED and pharmacy, 2) establish data sharing across organizations, 3) authorize pharmacy-led medication substitutions, 4) increase patient education, 5) integrate the program into existing pharmacy workflow, 6) identify patients who are most vulnerable to care transition issues, 7) reinforce discharge care plans with patients.

CONCLUSIONS: Results of this research will provide insight for both the stakeholders involved in this study and others who are looking to design a transitions of care program between any emergency department and community pharmacy.

Presented Online At: APhA Virtual Forum

Carly Gabriel, PharmD

Carly Gabriel, PharmD received her PharmD from the University of Pittsburgh in 2019. Carly is currently completing a PGY1 Community-Based Residency with the University of Pittsburgh and Giant Eagle Pharmacy. Upon completion of PGY1, she will complete a PGY2 in Ambulatory Care at UPMC Presbyterian-Shadyside in their Family Medicine Track.

Mentor(s): Kim C. Coley, PharmD, FCCP; Brandon Antinopoulos, PharmD; Joni Carroll, PharmD, BCACP, CTTS; Renee' Richardson, PharmD; Melissa A. Somma McGivney, PharmD, FCCP, FAPhA; Victor Vercammen, PharmD

Evaluation of antithrombin III during extracorporeal membrane oxygenation in neonatal and pediatric critical care patients

Gill ME, Berry D, Stebler J, Crowley, K, Shenk J

PURPOSE: Extracorporeal membrane oxygenation (ECMO) is used for several indications with a primary goal of providing pulmonary and cardiac systems support. The tubing through which blood passes in the ECMO circuit activates both the inflammatory and coagulation cascades which leads to clot formation. In patients receiving ECMO, unfractionated heparin is widely used to achieve systemic anticoagulation. Antithrombin III (AT III) levels are evaluated and can be exogenously replaced. Neonates and pediatric patients have reduced antithrombin levels in comparison to adults. The aim of this retrospective evaluation was to determine the use of AT III in neonatal and pediatric patients on ECMO, evaluate adverse events associated with AT III use, and identify overall cost and waste associated with AT III use.

METHODS: This retrospective evaluation of AT III use at a freestanding children's hospital was approved by the institution's quality improvement committee. All patients less than 18 years of age who received dose(s) of AT III while on ECMO between 1/1/2018 and 9/30/2019 were reviewed. Patient data collected includes demographics, ECMO indication, number of circuit changes, AT III dose information including day of ECMO, date of administration, dose (units/kg), days between doses, number of vials of AT III used, changes in heparin dose, and coagulation parameters. Additional outcome measures include bleeding or thrombosis events. Pharmacoeconomic data associated with use of AT III was assessed to determine potential opportunities for cost savings. Descriptive statistics were used in data analysis.

RESULTS: Forty-eight patients received a total of 129 doses of AT III. All patients received approximately 50 units/kg/dose. Patients were stratified into three age groups: less than 1 month, 1-12 months, and greater than one year. Each age group received an average of three, two, and one dose(s) of AT III per ECMO course. All age groups experienced more bleeding events (32%, 20%, and 50%) than thrombosis events (12%, 7%, 0%). The potential cost savings over the study time period was $19,572 based on AWP of AT III.

CONCLUSION: AT III replacement during ECMO varies according to age. Patients less than one month old received the most AT III replacement per ECMO course. Bleeding events occurred most often in patients greater than one year, but thrombosis events were highest among those less than one month. Replacement with AT III is a costly therapy, but saving opportunities are limited in small patients due to weight-based dosing strategies and available vial sizes of AT III.

Meghan Gill, PharmD

Meghan received her Bachelor of Science in Biology from Muhlenberg College and her Doctor of Pharmacy from Virginia Commonwealth University School of Pharmacy. She is completing her PGY1 residency at UPMC Children's Hospital of Pittsburgh. Following completion of her PGY1 residency training, Meghan will complete a PGY2 Pediatric Residency at Virginia Commonwealth University in Richmond, VA. Her professional interests include pediatric critical care and academia.

Mentors: Jennifer Shenk, PharmD BCPPS, Kelli Crowley PharmD, BCPS, BCPPS, Don Berry, BS Pharm, Cody Moore, PharmD, MPH, BCPS

# Glycemic Control Immediately Following Kidney Transplant

Gregory JA, Donihi AC, and Schonder KS

PURPOSE: Immediately after kidney transplantation, patients receive induction immunosuppression to support a chronic immunosuppression regimen that does not require long-term corticosteroid therapy. Induction therapy at UPMC consists of a regimen of 4 days of a biologic antibody-mediated agent and 6 days of corticosteroids. Chronic use of corticosteroids is associated with hyperglycemia and the many long-term complications associated with persistent hyperglycemia; however, the impact of just 6 days of steroid-induced hyperglycemia immediately following surgery has not been fully studied. The objective of this quality improvement project was to determine if there is a correlation between steroid-induced hyperglycemia immediately following kidney transplant and complications leading to higher 30-day readmission rates.

METHODS: This was a retrospective study that included patients who received a kidney transplant at UPMC Presbyterian between April 2014 through July 2019. Patients were excluded if they (1) received a multi-visceral transplantation, (2) received dextrose containing maintenance fluids, (3) were discharged from hospital on oral steroids not part of the initial 6-day induction protocol, or (4) were discharged on systemic antibiotics for an active infection. Chart review was performed to collect patient demographics, graft characteristics potentially associated with increased readmission risk, and all inpatient point-of-care glucoses obtained during the first 6 days following surgery. Hyperglycemia was defined as any glucose > 180mg/dL, and uncontrolled hyperglycemia was defined by having at least 50% of bedside blood glucoses >180mg/dL.

RESULTS: Of the 1,008 kidney transplants performed, 694 patients were screened, and 443 (63.7%) met the inclusion and exclusion criteria. Of these, 144 (32.5%) had a past medical history of diabetes, 347 (78%) were age >40 years, 108 (24%) were African American, 195 (44%) had BMI >30, and 292 (66%) had a deceased donor. Patients with DM and considered to have uncontrolled hyperglycemia had a longer median LOS (6 days vs. 5 days). Overall 30-day readmission rate was 33%. When considering just the 144 patients with diabetes, the rate of readmission was 37% in patients with uncontrolled hyperglycemia and 23% in those without uncontrolled hyperglycemia (p=0.04).

CONCLUSIONS: Preliminary results indicate that patients with diabetes who have >50% of glucoses >180mg/dL in the first 6 days after kidney transplant have a higher rate of 30-day readmission compared to patients with less (or no) hyperglycemia. Further analyses will be performed to determine if hyperglycemia is an independent risk factor for 30-day readmission in this population.
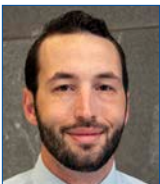
Jacob Gregory, PharmD

Jake is from Murrysville, PA., and received his PharmD from West Virginia University in 2019. He is completing his PGY1 at UPMC Presbyterian and is actively pursuing a career as a clinical pharmacist specializing in either critical care or internal medicine.

Pharmacist peer coaching to increase medication adherence interventions in traditional community chain pharmacies

Hake K, Carroll JC, McGivney MS, Ossman K, Amigh J, Ramanna C, Coley KC

PURPOSE: Community pharmacies are increasingly seeking opportunities to improve medication adherence rates in order to optimize patient care and decrease direct and indirect remuneration (DIR) fees. Peer coaching is one implementation strategy utilized by traditional chain community pharmacies to identify and solve problems when conducting quality improvement projects. The objectives of this project are to (1) evaluate a peer coaching method designed to enhance pharmacists' response to a clinical alert tool that identifies opportunities for adherence interventions in traditional chain community pharmacies, and (2) assess the impact of pharmacist coaching on adherence quality metrics.

METHODS: A mixed-methods approach was used. A pharmacy cohort was systematically selected based on adherence metric performance, geographic proximity, and input from regional pharmacy leadership. Face-to-face peer coaching was performed by a community-based pharmacist resident with each pharmacist at identified pharmacies, followed by a subsequent call for continued support. After the coaching intervention was completed, semi-structured interviews with pharmacists were conducted to assess their perceived impact of the coaching. Interviews were conducted by an impartial third party to limit bias. Interviews were audio-recorded and transcribed, and a full thematic analysis is ongoing. Additionally, participating pharmacies' adherence metrics will be collected and compared to a control group of pharmacies within the same traditional community chain. A one-way ANOVA test will be utilized to assess changes in the mean adherence scores. Frequencies of adherence interventions will also be compared. This project was designated as program evaluation by the University's IRB.

PRELIMINARY RESULTS: Common themes will be elicited from the pharmacist interviews within these topic areas: 1) integration of adherence interventions into workflow as a result of coaching; 2) new strategies for reaching out to patients as a result of coaching; 3) pharmacist perspectives on team member training; 4) ideal frequency for face-to-face coaching; 5) impact of pharmacists' previous training on comfort with adherence interventions; and 6) additional needs to consider with future coaching. Quantitative analysis is still in progress. Results of qualitative analysis will be shared back with pharmacists, regional leadership, and corporate leadership to inform effective coaching strategies for future initiatives.

IMPLICATIONS/CONCLUSIONS: A peer coaching method may enhance the response to a clinical alert tool and increase medication adherence interventions. Quantitative analyses and themes elicited from pharmacist interviews will be formulated into a framework to provide guidance for other pharmacies implementing coaching programs to increase medication adherence metrics.

Presented at: 2020 APhA Virtual Poster Hall Gallery

Kelsey Hake, PharmD

Kelsey is from Pittsburgh, Pa., and earned her PharmD from the University of Pittsburgh with a concentration in Community Leadership and Innovation in Practice. She is the current PGY-1 Community-Based Pharmacy Resident with the University of Pittsburgh and Rite Aid Pharmacy. Her career interests involve advancing the implementation of clinical services in community pharmacies. She wants to play an active part in creating opportunities for all pharmacists to participate in these services, further improving patient outcomes and relationships. Upon completion of residency, she plans to pursue a clinical role within a community pharmacy setting.

Mentors: Kim C Coley, PharmD, FCCP, Kristine Ossman, PharmD

Post-discharge Assessment of Adherence and Barriers to Use of Vivitrol

Halza KG, Smith AF

PURPOSE: Opioid overdose and alcohol related deaths remain leading threats in the United States with an estimated 47,450 people dying from an opioid overdose and 88,000 people dying from an alcohol related death every year. When treating patients that struggle with substance use disorders, along with the behavioral counseling, there are several medication treatment options including, but not limited to, naltrexone (Vivitrol™). Despite high rates of adherence to the medication in trials, real-world practice adherence is suspected to be much lower with increased potential barriers. This QI project is designed to evaluate adherence to Vivitrol™ post-discharge from UPMC McKeesport Inpatient Addiction Medicine Facility and identify barriers to follow-up. Data on patients' use of Vivitrol™ post-discharge is unknown because they do not return to UPMC McKeesport for follow-up injections. By evaluating Vivitrol™ use and treatment barriers, potential solutions and interventions can be made prior to discharge to increase chances at outpatient success.

METHODS: Patients were eligible for enrollment if they were admitted to the UPMC McKeesport Hospital Addiction Medicine unit, were at least 18 years of age, and received their first Vivitrol injection during the enrollment period of October 1, 2019 through March 31, 2020. Follow-up phone calls were conducted by a pharmacist at 1, 3, and 6 months post discharge. Patients that did not continue to receive Vivitrol were not contacted further. During these phone calls, the patients were asked a series of questions to assess their current adherence, barriers they may have experienced, any relapse, and their interest in continuing with Vivitrol™ treatment. Follow up was collected through May 8, 2020. Patients whose 3 and 6-month phone calls are to occur after this cut off will be assessed in future analysis.

RESULTS: Of the 26 patients enrolled, 92% reported alcohol as their drug of choice. At 1 month, 14 patients were lost to follow-up, 5 stopped Vivitrol™, and 7 received Vivitrol™. Of these 7 patients at 3 months, 1 patient was lost to follow-up, 1 stopped the injection, 3 continued their injection, and 2 are pending follow-up. Of the patients reached, 33% had relapse days at 1 month, and 25% of patients had relapse days at 3 months. 6-month data is pending. The most common barriers to continuation were scheduling the next injection and transportation to the injection provider.

CONCLUSIONS: Based on current results, patients experienced more barriers to continuing Vivitrol™ at the 1-month injection as compared with the 3-month injection, and it is projected to have similar results at the 6-month injection. The patients who continued Vivitrol™ injections who reported relapse all had a decrease in usage days from their baseline. Next steps of our project to increase the rates of success are to improve outpatient scheduling for patients at 1-month follow-up while they are still admitted.

Katherine Halza, PharmD

Katherine is from Pittsburgh and received her PharmD at the University of Pittsburgh School of Pharmacy. She is currently completing her PGY1 pharmacy residency at UPMC McKeesport. Upon completion of PGY1, she will start her PGY2 in ambulatory care at UPMC Presbyterian Shadyside in the Traditional Track.

Mentor(s): Ashley Smith, PharmD, Pitt Resident Research Group

Evaluation of Intravenous Immunoglobulin Overall Use

Hand S, Voycik M

PURPOSE: Intravenous immunoglobulin (IVIG) has been reported to cause immediate infusion-related reactions including fever, skin rash, chills, nausea, vomiting, myalgia and headache during 5-15% of infusions. Reactions are not predictable in the majority of patients. Many infusion-related reactions are associated with the rate of infusion, and it is recommended that infusions be started at a low dose and increased as tolerated. Infusion rate and titration are product specific. Currently, there are no formal recommendations for how often patients should be monitored during infusion. At UPMC, there is no current consensus or guideline for monitoring patients during IVIG infusions. There is also no evidence to support premedicating patients who are receiving IVIG for the first time and no standardized protocol for doing so. The purpose of this quality improvement project is to evaluate IVIG administration in first time recipients across the UPMC system.

METHODS: This quality improvement project is a retrospective review of inpatients being treated with Gammagard® for the first time at multiple sites within UPMC. Adults who received Gammagard® from January 1, 2019 to December 31, 2019 were included. Patients were excluded if they were ≤18 years of age, not receiving IVIG for the first time, or receiving IVIG as an outpatient. Data collected included patient demographics, dose of IVIG(g/kg), titration parameters, premedication, vital sign monitoring, reports of infusion-related reactions, and interventions performed for infusion-related reactions. The primary endpoint was an overall evaluation of first-time intravenous immunoglobulin administration across UPMC. Secondary endpoints included incidence of infusion reactions, use of premedication, vital sign documentation, and rate change documentation.

RESULTS: A total of 141 patients were included. Infusion-related reactions occurred in 10 patients (7.1%). Seven of the ten patients who had reactions were premedicated with acetaminophen and diphenhydramine. Premedications were given to 92 patients (65.2%). Of the 49 patients who were not premedicated, 30 patients (61.2%) were receiving steroids for another indication, potentially masking reactions. Vital signs during infusion were documented in 93 patients (66%) and rate change was documented in 18 patients (12.8%).

CONCLUSIONS: Incidence of infusion-related reactions among first time IVIG recipients across UPMC is consistent with reported rates. Premedication regimens used varied by site. Additional studies comparing different combinations of medications will help develop an effective premedication regimen. The roles that infusion rate and titration may have played in causing reactions were unable to be evaluated, and it is not clear if a decrease in rate improved minor symptoms. Work will be done with the UPMC pharmacy informatics group to improve order entry to allow guidance and documentation of infusion rates and monitoring.

Sydney Hand, PharmD

Sydney Hand is from Ford City, Pennsylvania and received her PharmD from Duquesne University School of Pharmacy in 2019. She is completing her PGY1 residency at UPMC Mercy Hospital. Her professional interests include oncology, academia, and ambulatory care. Upon completion of her residency, she plans to practice in a hospital or clinic pharmacy setting.

Mentor(s): Meaghan Voycik, PharmD; Taylor Miller, PharmD

Cost Avoidance of Linezolid Compared to Vancomycin for the Treatment of Nosocomial Pneumonia

Hutchins AT, Groetzinger L, Kane-Gill SL, Kangho S

PURPOSE: The Infectious Disease Society of America (IDSA) recommends vancomycin and linezolid as first-line options for treatment of ventilator-associated pneumonia (VAP) and hospital-acquired pneumonia (HAP) when risk factors increase the likelihood of methicillin-resistant *Staphylococcus aureus* (MRSA) infection. Vancomycin is currently used as the first-line agent for the treatment of both VAP and HAP at UPMC Presbyterian. Increasing literature suggests linezolid may be a cost-effective due to higher survival and clinical cure rates. The cost of linezolid may be lower than the cost of vancomycin regardless of clinical efficacy when considering recent decreases in the acquisition cost of intravenous and oral linezolid, additional costs of vancomycin monitoring, and differences in rates and severity of adverse drug events. Our study aims to quantify the total costs beyond acquisition costs associated with vancomycin for the treatment of HAP and VAP to identify potential cost-avoidance if intravenous and oral linezolid had been prescribed instead.

METHODS: A retrospective single-center cost analysis was performed on patients with an ICD-10 code for pneumonia that received vancomycin for empiric or directed therapy of pneumonia between January 1 and December 31, 2018. 1,237 patients were identified. A random sample of 150 patients were evaluated for resource utilization during their hospitalization for feasibility of chart review. Patients were evaluated for total costs associated with vancomycin therapy including costs of medications, monitoring (laboratory tests, pharmacists' time), administration (nursing time), and the cost of adverse drug event such as vancomycin induced nephrotoxicity and red man syndrome. Calculated costs for vancomycin therapy were then compared to projected costs if each patient had received linezolid for the treatment of pneumonia for the same duration taking into account the ability to transition to oral therapy based on the institutions therapeutic interchange protocol.

RESULTS: Final results are pending cost analysis.

CONCLUSIONS: Results of this study will inform financial decisions for prescribing practices in the management of nosocomial pneumonia at UPMC Presbyterian.

Aaron Hutchins, PharmD

Aaron is a PGY-1 Pharmacy Resident at UPMC Presbyterian. He is from Wheeling, WV and received his PharmD from West Virginia University. His clinical interests include solid organ transplantation and infectious disease. Upon completion of his PGY-1 residency, he will continue at Nebraska Medicine as a PGY-2 pharmacy resident focusing in Solid Organ Transplant.

Mentors: Lara Groetzinger, PharmD, BCCCP, Sandra Kane-Gill, PharmD, MS, FCCM, FCCP, Kangho Suh, PharmD, PhD

A Review of Non-Emergent Drug Induced Hyperkalemia Management-Patiromer

Hylwa, KT, Kane-Gill SL, Culley CM, L'Altrelli A

PURPOSE: The project's goal was to review how our medical center manages drug-induced hyperkalemia. This focused on the drug management strategies used to correct potassium and the time it took to correct the initial elevated potassium level. The project also assessed financial impactors such as length of stay and readmission rates.

METHODS: The project was a retrospective review of an electronic medical chart of admitted patients at a large academic tertiary care hospital between Oct 2015 to July 2019. Patients were identified using a clinical surveillance tool by generated alerts for drug-induced hyperkalemia and critical potassium levels (K>6mmol/L or K<2.5mmol/L). Drugs included for drug-induced hyperkalemia in the alert were: ACEi, ARB, calcineurin inhibitors, K-sparing diuretics, LMWH, heparin, potassium supplements, and sulfamethoxazole-trimethoprim. Patients with emergent hyperkalemia with cardiac arrhythmias, non-drug induced hyperkalemia, peri-operative hyperkalemia, or patient death during admission were excluded. The primary outcome was time to correction of initial critical K lab value to < 5 mmol/L. Secondary outcomes included: median K at 6 hours after alert, median Δ in K after 6 hours, subsequent critical K after correction to < 5 mmol/L, median hospital length of stay, and 30-Day readmission rates.

RESULTS: 130 met requirements for inclusion for retrospective chart review from the control group, 7 patients from the Patiromer group, 77 patients from SPS group, and 15 for the Patiromer and SPS group. The N was not large enough to perform statistical analysis, but we saw similar primary outcome results across each group.

CONCLUSIONS: The similarity in the primary outcomes across the groups seems to indicate that treatment strategies used in addition to traditional management did not result in different K lab values. SPS has since been removed from hospital formulary.

Presented at the Vizient Consortium Pharmacy Network Meeting – Resident Poster Session, Las Vegas, NV, 2019.

Keith Hylwa, PharmD, MBA

Keith received his PharmD from the Albany College of Pharmacy and Health Sciences and his MBA from Clarkson University in 2018. He is currently a PGY2 resident in the Health System Pharmacy Administration and Leadership (HSPAL) track at UPMC Presbyterian. Keith accepted a position to remain at UPMC Presbyterian and will be the Lead for the Neuro/Trauma/Cardio pharmacy service lines.

Mentor(s): Sandra Kane-Gill, PharmD, MS, FCCM, FCCP; Colleen Culley, PharmD, BCPS; Alfred L'Altrelli, PharmD

Oritavancin for the emergency department treatment of skin and soft tissue infections

Richard Jones, PharmD, Rachael Ours, PharmD, BCIDP, Ariel Korlinchak, PharmD, G. Jonathan Lewis, DO, Erik Iszkula, MD, UPMC Hamot

PURPOSE: Treatment of skin and soft tissue infections (SSTIs) represent a significant health care burden in the United States, accounting for over 350,000 inpatient admissions and more than $13 billion/year in health care associated costs. Additionally, as many as 41% of admissions related to SSTIs are only for the purpose of IV antibiotic administration, representing significant inpatient costs that could be avoided if outpatient antibiotics can be optimized to prevent treatment failure. Oritavancin is a lipoglycopeptide antibiotic given as a one-time infusion for the treatment of gram-positive SSTIs that can be utilized to reduce health care costs associated with inpatient admissions. The purpose of this study is to evaluate the potential inpatient day and cost-saving utility that an oritavancin administration protocol in UPMC Hamot's emergency department could present through the treatment of uncomplicated acute bacterial skin and skin structure infections (ABSSSIs) in patients otherwise healthy enough to avoid admission.

METHODS: The study is a retrospective chart review of cases admitted to UPMC Hamot from January 1, 2018-August 31, 2019 with a primary DRG code 602/603 indicating treatment for complicated and uncomplicated cellulitis requiring intravenous antibiotic administration. The chart review was completed to screen for cases that would meet inclusion criteria from an existing oritavancin protocol. Patient admission cost data was compared to predicted costs of administering oritavancin in the ED for potential cost saving analysis and avoidable inpatient days.

RESULTS: A DRG 602/603 admission search yielded 173 admissions during the study window utilized for chart review. Of these admissions, 19 cases met the inclusion criteria listed for oritavancin, and 11 were deemed appropriate for outpatient therapy. Average LOS was 2.66 days, cases received an average of 6.7 doses/admission of IV antibiotics and 6.4 days of PO antibiotic therapy upon discharge with an average cost of $3690.42/admission. Cases accounted for 29.29 inpatient days and $40,594 of associated charges. Based on predicted cost models for oritavancin treatment, results showed a non-significant estimated cost savings of $810.73/per case ($3690.42 vs. $2879.69, p-value= 0.14) and total potential cost savings of $8918.00. There was also one 30-day readmission for complicated cellulitis in the study population with $2410.49 in associated costs over LOS of 3.04 days.

CONCLUSION Retrospective chart review revealed a potential patient population at UPMC Hamot to utilize oritavancin for the treatment of ABSSSIs in the emergency department. Over the 18-month study period use of oritavancin could have prevented admissions for 11 patients accounting for almost 30 inpatient days. Projected cost analysis revealed a non-significant cost savings potential of $810.73/patient case and possibly prevented at least one inpatient admission during the study period. Further analysis and studies would be required once oritavancin protocols are implemented to determine readmission benefit and reimbursement advantages.
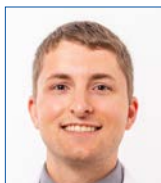
Richard Jones, PharmD

Richard is from Erie, Pennsylvania. He received his Bachelor's degree in toxicology at Penn State University in 2015 prior to earning his PharmD from the University of Pittsburgh in 2019. He is currently a PGYI pharmacy resident at UPMC Hamot. Following residency, Richard hopes to continue practicing in a clinical setting.

Mentor(s): Rachael Ours, PharmD, BCIDP

Experience with a global health concentration within the PharmD curriculum: Assessing perspectives and outcomes

Ko J, Jonkman LJ, Balakrishna V, Liu E, Connor SE

PURPOSE: Global health is defined as an interdisciplinary approach to improving health for poorer, vulnerable, and underserved populations with a population-based and preventive focus at a global scale. There has been a growing focus on global health in U.S. pharmacy education, however the content of global health education varies widely among programs. The primary purpose of this study is to describe current and former student pharmacists' perceptions regarding the impact of participating in a Global Health Area of Concentration (ARCO-GH) on careers, care provision to diverse populations, and awareness of health disparities. Additionally, this study will assess global health competency before and after completing ARCO-GH requirements.

METHODS: This mixed methods study enrolled University of Pittsburgh School of Pharmacy graduates from 2014 to 2019 and current student pharmacists who participated in the ARCO-GH. First, semi-structured interviews were conducted with graduates until thematic saturation. Focus groups were conducted with current ARCO-GH students. Interview and focus group questions assessed the ARCO-GH's influence on career choices, providing care to culturally diverse populations, and awareness of health disparities. Interviews and focus groups were recorded, transcribed verbatim, and coded to determine dominant themes. Graduates also completed surveys to describe their current practice. Second, ARCO-GH graduates and P4 students completed global health self-competency assessments. P4 Spring self-assessments were compared to P3 Fall self-assessments, and statistical significance was assessed using the Wilcoxon signed-rank test.

RESULTS: Twenty-one interviews and two focus groups were completed. Five themes were identified: 1) participants gained skills applicable to wide practice settings; 2) participants found value in personalizing their learning through unique experiences and mentorship; 3) participation impacted the lens through which they viewed their careers; 4) experience working with diverse patients impacted perceptions on patient care; and 5) participation impacted perceptions on complex global health issues. The majority of graduates (77.4%) currently practice in an underserved setting, with the most common practice sites being ambulatory care and community pharmacy. For the global health competency self-assessments, graduates (N=21) and P4s (N=12) reported improvement in 7 out of 7 competencies, which was statistically significant ($p < 0.00001$).

CONCLUSIONS: Graduates and current student pharmacists demonstrated that a global health concentration in pharmacy curricula can facilitate the acquisition of valuable skills and global health competencies that are applicable across a wide variety of patient care contexts. A concentrated experience in global health provided unique opportunities for pharmacists to further develop their career interests and personalize their education, creating a cadre of pharmacists dedicated towards addressing health disparities and serving the underserved.

Jennifer Ko, PharmD, MPH

Jennifer is a PGY2 Ambulatory Care Resident in the Global Health track at UPMC Presbyterian Shadyside. She received her PharmD from the University at Buffalo School of Pharmacy. Last year she completed her primary care focused PGY1 pharmacy residency at Touro University College of Pharmacy/LifeLong Medical Care. Her professional interests include providing care to underserved populations, academia, minimizing health disparities, global health, and public health. After completion of her PGY2 residency, she will continue her career as a clinical faculty member in an ambulatory care setting.

Mentors: Lauren J. Jonkman, PharmD, MPH; Sharon E. Connor, PharmD

Evaluating sedation regimens and time to awakening in post cardiac arrest patients

Levito MN, McGinnis CB, Groetzinger LM, Durkin J, Elmer J

PURPOSE: Sudden cardiac arrest affects approximately 300,000 people annually in the United States. The 2010 American Heart Association Post Cardiac Arrest Guidelines recommend short acting sedation regimens that can be either bolused or administered by continuous infusion for this patient population. UPMC Presbyterian does not have a protocol in place to address selection of sedation regimens in post cardiac arrest patients. Examining the sedation regimens utilized at our institution and the factors associated with delayed awakening is critical for deciding which agents to avoid in this patient population. This quality improvement project aimed to compare sedation with benzodiazepines and non-benzodiazepines in post cardiac arrest patients, as well as examine additional risk factors that are associated with delayed time to awakening.

METHODS: A retrospective, single center study was completed at a tertiary academic medical center from January 2010 to September 2019. Patients included were divided into two groups: those that received benzodiazepines versus non-benzodiazepines as the primary sedative agent. Doses of sedative agents were examined over the initial 72- hour time frame post arrest. The primary endpoint was median time to awakening in days for patients who received benzodiazepine-based sedation regimens versus non-benzodiazepine-based sedation regimens. We further examined the effect of high dose (> 10 milligrams of midazolam equivalents) benzodiazepine versus low dose benzodiazepine regimens. Kaplan-Meier methods were used to generate time-to-event curves for awakening at 7 days post arrest and Cox proportional hazards regression analyses were performed to evaluate independent association of benzodiazepines. Additionally, ICU length of stay, awakening to discharge, duration of mechanical ventilation, and survival to discharge were examined.

RESULTS: 625 patients met inclusion criteria and of those, 213 (34%) patients awakened. High dose benzodiazepine-based sedation regimens utilized over the initial 72 hours post arrest were found to delay median time to awakening when compared to non-benzodiazepine-based sedation regimens (5 days vs. 3 days, p=0.004). High dose benzodiazepines remained an independent predictor of awakening in the Cox proportional hazards regression (P<0.01). Length of stay and awakening to discharge were similar among both groups (P= 0.82, P= 0.79). Although duration of mechanical ventilation was longer in patients that received high dose benzodiazepines, this was not statistically significant (7.5 days vs. 6.4 days, P=0.17). When examining all 625 patients, survival to discharge was significantly lower for patients that received high dose benzodiazepines over the initial 72 hours post arrest (P <0.001).

CONCLUSION: Non-benzodiazepine-based sedation regimens may improve outcomes in post cardiac arrest patients. The results of this study show that utilizing regimens with > 10 milligrams of midazolam equivalents per day over the initial 72 hours post arrest significantly delays awakening when compared to non-benzodiazepine-based sedation regimens. Benzodiazepines may also lead to increased mortality in this patient population, although further studies are needed to evaluate this endpoint.

Marissa Levito, PharmD

Marissa received her PharmD from Massachusetts College of Pharmacy in Boston, Massachusetts. She is completing her PGY1 pharmacy residency at UPMC Presbyterian. Her professional interests include cardiology, critical care, and academia. This year she will continue her training at UPMC Presbyterian as a PGY2 cardiology pharmacy resident.

Mentor(s): Cory B. McGinnis, PharmD, BCCCP; Lara M. Groetzinger, PharmD, BCCCP; Joseph B. Durkin, PharmD

Incidence of AKI with utilization of acyclovir in addition to vancomycin versus vancomycin alone for suspected CNS infections

McAndrew AM, Ganchuk S, Miller T, Andrzejewski C, Arbulu R

PURPOSE: Patients with suspected CNS infections are commonly placed on vancomycin plus ceftriaxone as an empiric antibiotic therapy, administered at high doses to ensure central nervous system penetration. In addition to these two antibiotics, acyclovir is frequently added to treat pathogens that cause viral meningitis. While the empiric addition of acyclovir is indicated to treat herpes simplex encephalitis in patients with a severe clinical presentation, there may be added risk of acute kidney injury. Individually, vancomycin and acyclovir are known nephrotoxins that can cause acute kidney injury, but data is lacking on whether the concomitant use of these medications have a higher risk of acute kidney injury. The purpose of this quality improvement project is to determine the rate of acute kidney injury in patients with suspected CNS infection who received both vancomycin and acyclovir in comparison to vancomycin alone.

METHODS: This retrospective, quality improvement project was conducted at UPMC Mercy. Patients were eligible for inclusion if they received vancomycin, ceftriaxone, and/or acyclovir from January 2018 to December 2019. Data were collected from the electronic health record and patients were identified using charge data for vancomycin 1000 mg, ceftriaxone 2 grams, and intravenous acyclovir. Charge data provided a Financial Identification Number (FIN) for a patient's specific encounter. Patients were included in the vancomycin alone group if FINs matched between charges for vancomycin and ceftriaxone but did not match within the acyclovir group. Patients were included in the vancomycin plus acyclovir group if their FINs matched within all the charge groups. Patients with a baseline serum creatinine > 1.5 mg/dL or previous diagnosis of any stage of chronic kidney disease were excluded. As the primary outcome, the incidence of acute kidney injury was analyzed for differences between the two treatment groups.

RESULTS: A total of 59 patients received vancomycin, ceftriaxone, and acyclovir and a total of 262 patients received vancomycin and ceftriaxone only. A random list of 59 patients was generated within the vancomycin alone group in order to maintain an equal number of patients reviewed between the two treatment groups. Data collection and assessment are still in process.

CONCLUSION: Still pending.

Ann McAndrew, PharmD

Ann is from Downingtown, Pa and received a Bachelor of Science in Biology and then her PharmD from the University of Pittsburgh. She is a PGY1 resident at UPMC Mercy, and her interests include infectious diseases and critical care. Upon completion of her residency, she will be continuing at Mercy as a night shift pharmacist.

Mentor(s): Steven Ganchuk, PharmD and Taylor Miller, PharmD

Family Medicine Residency Practice Collaboration with Community Pharmacists to Augment Prescription Writing Education

Mehta AP, Farrah R, Danko R, Popovich A

PURPOSE: Outpatient prescription writing education is often not a focal part of medical school training. Prescribing errors lead to reduced efficiency for physician practices and community pharmacists, and delay medication fill-time for patients. To address this mutual concern, this study aims to create and evaluate the effectiveness of an educational resource on resident awareness of preventable prescription errors that cause communication burden between community pharmacists and physician offices.

METHODS: This is a two-phase quality improvement project with a quasi-experimental design that includes 13 family medicine residents from Lawrenceville Family Health Center (LV FHC), an academic family health center with 3 attendings, and 2 clinical pharmacists. Data collection will be done at Rite Aid Community Pharmacy that cares for over 1,600 LV FHC patients. *Intervention:* Phase One: Rite Aid Pharmacy will collect data regarding each prescription clarification call made to LV FHC, stratified by type of issue and type of medication. Phase Two: Pharmacists will present this data to an interprofessional team and collaborate to create an educational resource to present to medical residents, which will include best practice prescribing habits for outpatient prescriptions, focusing on solutions to the areas of improvement identified through phase one. *Evaluation of educational resource:* A "pre-intervention" and "post-intervention" survey will be administered to the residents during a virtual educational session, to assess the change in knowledge and awareness of healthy prescribing habits.

RESULTS: Pending

CONCLUSIONS: (anticipated) Increasing awareness of the real-world causes of communication burden has the potential to improve medical resident prescribing and may have long-term implications as residents go into practice. The impact of this resource could improve the way we teach our residents to prescribe.

Amisha Mehta, PharmD

Amisha Mehta completed her PharmD at Rutgers University. She is currently a PGY-1 pharmacy resident at UPMC St. Margaret and will stay on to complete her PGY-2 in Family Medicine/ Ambulatory Care. Her areas of interest include preventative medicine and pharmacist advocation.

Mentor: Roberta Farrah PharmD, BCPS, BCACP

Impact of a medical device prior authorization strategy on device utilization and cost

Mingone C, Jose A, Ni D, Safranyos M, Heasley J, Castner M

PURPOSE: The expedited pre-market notification process for Class I and II medical devices is contributing to a surge of products coming to market with a high list price. These products are oftentimes similar to less-expensive prescription and over-the-counter items. This trend was quickly identified across the healthcare industry, prompting payers to develop a strategy to manage the utilization of these devices. Beginning in June of 2018, CVS Caremark offered an opt-in prior authorization (PA) strategy for commercial clients to help minimize inappropriate use of high-cost medical devices. The PA strategy promotes appropriate use of the medical device products based upon indication and trial and failure of first-line therapies.

METHODS: A retrospective observational analysis was completed on medical device prescription claims data from a cohort of 10 commercial plan clients who opted-in to the medical device prior authorization strategy. Claims data was analyzed for the 6 months pre- and post-implementation of the strategy. The primary endpoint of the study looked at the percentage change in gross cost of the targeted medical devices per member per month for the selected commercial clients. Secondary outcomes analyzed the change in medical device claims both overall and per 10,000 members per month between study periods. In addition, the change in gross cost and prescription claims between study periods were analyzed for the top 5 most-costly medical device classes, which were selected based on total gross costs for the pre-implementation period. Prior authorization approval, denial, and no response rates for the 6 months post-implementation period were also evaluated.

RESULTS: Selected clients had approximately $15.9 million in medical device cost savings after strategy implementation, resulting in a 77.2% decrease in overall costs. The decrease in proportion of prescriptions per eligible member was considered statistically significant for both medical device claims overall, resulting in a 75.8% decrease in overall claims ($P<0.001$), and for medical device claims for each of the top 5 most-costly medical device classes ($P<0.001$). Miscellaneous dermatological and wound care device classes had the greatest impact on gross spend. Of the prior authorizations submitted, 73.4% were approved, 10.9% were denied, and 15.7% had no response from the prescriber.

CONCLUSIONS: (may use pending if no conclusions as of print) Commercial plans who implemented the medical device prior authorization strategy had a noticeable decrease in gross costs and prescription claims on an individual and aggregate basis, when comparing the pre- and post-implementation periods. Miscellaneous dermatological and wound care device classes have the greatest potential for cost savings from medical device prior authorization implementation, as they provide the largest contribution to gross spend. Prior authorizations can be an effective tool in refining the appropriate use of medical device products and therefore decreasing utilization and costs.

Carley Mingone, PharmD

Carley is from Pittsburgh, PA and received her PharmD from the University of Pittsburgh School of Pharmacy in 2018. Upon completion of her managed care residency program at CVS Health, she hopes to continue to develop and promote clinical programs, formulary strategies, and utilization management criteria that are focused on improving patient outcomes within a managed care organization.

Mentor(s): Abraham Jose, PharmD; Danfeng Ni, PharmD

Impact of state-legislated step therapy limitations on prior authorization approval rates for prescription medications

Niehoff K, Jose A, Ni D, Castner M, Heasley J, Kubilius J, Smith–Strutz T

PURPOSE: Step therapy prior authorization criteria are utilized to guide members towards using the most cost-effective, clinically-appropriate therapy. Targeted drugs are those requiring step therapy through a preferred drug. Preferred drugs are considered at least equally efficacious and available at a lower net cost to the plan when compared to the targeted drugs. In an effort to maintain and protect patient access to medication many states have implemented legislation limiting the ability of pharmacy benefit managers (PBMs) to manage member utilization via step therapy criteria. In general, these laws aim to loosen restrictions on medications and increase access for members. The objective of this study was to evaluate the impact of state-legislated step therapy limitations on prior authorization approval rates for prescription medications.

METHODS: We performed a retrospective, episode-based observational analysis of prior authorization data 6 months pre- and post-implementation of restrictive legislation (July 1, 2017 to June 30, 2018). States included in the study must have had similar requirements as established by each respective state's law, as well as have generated a sufficient number of claims. A total of 4 states met this inclusion criteria. Twelve drugs were selected to be analyzed within the 4 states based on the volume of episodes they generated within the study period. The primary endpoint of the study was the prior authorization approval rate as measured by the number of approved episodes for the target drugs in question divided by the total number of submitted episodes during the respective timeframes. Secondary outcomes analyzed drug filling behavior following prior authorization initiation and average cost savings per prior authorization episode. The filling behavior observation period was 90 days post-initiation of the episode.

RESULTS: Plans affected by state-legislated step therapy limitations did not experience a statistically significant difference in either prior authorization approval rates or target drug utilization following criteria implementation. Prior authorization approval rates remained consistent following legislation implementation (77.8% vs. 79.8%), as did target drug utilization (65.3% vs. 64.0%).

CONCLUSIONS: State-legislated step therapy limitations on prior authorizations are not significantly affecting approval rates or target drug utilization among affected members. While these laws aim to expand medication access during specific scenarios which would preclude utilization management, results from this study indicate that current payer strategies already take these into consideration.

Presented virtually at AMCP Managed Care and Specialty Pharmacy Annual Meeting 2020

Kevin Niehoff, PharmD

Kevin received his PharmD from the University of Iowa in 2014. He practiced as a retail pharmacy manager for 5 years prior to starting his PGY-1 residency in Managed Care with CVS Health. Upon completion of his residency, he plans to practice in a managed care/pharmacy benefit management setting.

Mentor(s): Abraham Jose, PharmD; Danfeng Ni, PharmD

Effect of a Pharmacist-Driven Workflow on Implementation of a Transitional Care Management Program

Panjwani S, Haver A, Mohan E, Chou K, Sakely H

PURPOSE: Transitional Care Management (TCM) is a growing area of focus for institutions, as this is a risk point for medication errors, particularly in vulnerable older adult populations. Not only is TCM a way of improving care during transitions, it is also a CMS recognized billable service. TCM has been linked with decreased medication errors and 30-day readmission rates compared to standard of care, particularly when a pharmacist is involved. As patient-oriented outcomes arise in the literature, it is imperative to pair them with key qualitative outcomes in order to describe TCM implementation in a pragmatic manner within real world practice. There are numerous models for TCM process implementation, however there is a paucity of literature on pharmacist-led TCM. Our aim is to evaluate the perceptions of the pharmacist by the interprofessional team in the TCM process as well as the key role of the pharmacist in the workflow.

METHODS: We have implemented a new pharmacist-led TCM workflow within three primary care practices at our community academic teaching hospital (one geriatric practice and two family medicine practices). The PRIME (**P**harmacist-led T**R**ansitions in **I**nterprofessional Pri**M**ary Car**E**) research group conducted focus groups to identify the key roles a pharmacist plays in order to have an effective TCM workflow. Focus groups consisted of 3 groups: clinical staff, pharmacists, and physicians. A qualitative thematic analysis was conducted to describe the results.

RESULTS: During the time of implementation of the TCM workflow, pharmacists used an iterative process improvement strategy to accommodate patient, staff, and provider needs. The thematic analysis revealed seven themes. Three patient care themes emerged: (1) pharmacist involvement in the TCM process provides patients with improved care, (2) accurate medication reconciliation and preventing medication errors are some of the major contributions of the pharmacist, and (3) pharmacists as the medication experts allows for more directed care. Four team-focused themes emerged: (1) pharmacist leadership in implementing, organizing, and modifying the TCM workflow in our offices has been vital, (2) pharmacist integration in the TCM workflow improves efficiency by improving physician wellness and visit preparation, (3) a key value of our TCM workflow is the communication across levels of care, (4) barriers in the TCM process include appointment availability, time commitment needed, and workflow inconsistencies.

CONCLUSIONS: Participants found that integrating pharmacists in the TCM process leads to more efficient offices, increased physician wellness, and improved patient care. Primary care practices should consider integrating pharmacists into their workflow as they are a key member of the interprofessional health care team.

Sehrish Panjwani, PharmD, BCPS

She received her PharmD from Texas Tech University Health Sciences Center School of Pharmacy in Abilene, Texas in 2018. Last year, she completed the ASHP-accredited PGY-1 pharmacy practice residency at UPMC St. Margaret, and is currently completing the PGY-2 geriatric pharmacy residency at UPMC St. Margaret. She is also concurrently completing a Faculty Development Fellowship at UPMC St. Margaret. After residency and fellowship, she hopes to work in an interprofessional geriatric practice or family medicine clinic.

Mentor: Heather Sakely, PharmD, BCPS, BCGP

# Cost avoided in the emergency department and intensive care units due to unit-based pharmacist interventions

Postlewaite MV, Groetzinger L, Rivosecchi R, Kane-Gill SL

PURPOSE: Pharmacists who work directly on Intensive care units (ICU) and within the emergency department (ED) optimize drug regimens, provide antibiotic stewardship, counsel patients and offer expertise on safe and effective therapeutic decision making. There is some evidence that has shown that both mortality and cost are increased in ICUs that do not include a pharmacist on their medical team. The purpose of this study is to quantify the value of unit-based pharmacists in critical care units and the ED by evaluating documented interventions and the associated cost avoided. It is hypothesized that ICU and ED cost are meaningfully reduced by interventions made by unit-based pharmacist.

METHODS: Critical care and ED unit-based clinical pharmacists prospectively documented intervention data at UPMC Presbyterian Hospital from April 1st, 2018 to March 31st, 2019. Each intervention was documented via an electronic form in the health record. The form was comprised of predetermined categories to maintain standardization, but also allowed for free text of any additional information regarding the intervention. All interventions in this one-year time frame were evaluated, except those in which "other" was chosen with no clear description of the intervention details in the additional information box, incomplete interventions and those made outside of the critical care units and emergency department. Based on available literature, a cost avoided was assigned for each intervention type, totaled for the year and averaged per pharmacist FTE. We also performed a hard cost analysis evaluating dollars saved by pharmacists discontinuing unnecessary and duplicate orders as well as IV to PO conversions.

RESULTS: Preliminary results include 22581 of 33949 interventions meeting inclusion criteria. Interventions documented consist of the following: 7314 adverse events avoided, 4125 unnecessary orders discontinued, 1931 administration routes optimized, 1817 drug information questions, 1743 antimicrobial stewardship reviews, 1307 untreated indications identified, 1000 medication histories, 614 pharmacokinetic consults, 591 laboratory monitoring recommendations, 490 intravenous to oral route conversions, 418 bedside monitoring periods, 359 rapid response team participations, 195 initiations of ventilator associated pneumonia prophylaxis, 149 initiations of venous thromboembolism prophylaxis , 116 anticoagulant therapy management, 145 emergency code stroke participations, in addition to 8 other categories including blood factor management. Cost analysis is in progress.

CONCLUSIONS: Pending
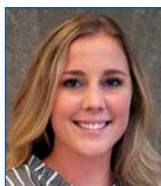
Madison Postlewaite, PharmD, MBA

Madison received her PharmD and MBA at West Virginia University and is completing her first year of the PGY1/2 Health System Pharmacy Administration Residency at UPMC Presbyterian. Her interests include pharmacy operations and automation. She chose this project with the desire to solidifying the benefit of unit-based pharmacists with the hopes of creating pharmacist positions for all units at UPMC Presbyterian Hospital.

Mentor (s): Lara Groetzinger, PharmD, BCCCP; Ryan Rivosecchi, PharmD, BCCCP; Sandra Kane-Gill, PharmD, MS, FCCM, FCCP

Pharmacist-led Transitions in Interprofessional Primary Care (PRIME) – A Subset Time Analysis

Raghavan A, Mohan E, Sakely H, Haver A

PURPOSE: Inadequate transitional care management (TCM) increases medical costs and hospital readmission rates and worsens outcomes for patients. Centers for Medicare and Medicaid Services (CMS) developed billing codes for patients discharged from the hospital to encourage TCM. An eligible patient is contacted within 48-hours and has a face-to face appointment within 14 days of discharge. In a system fraught with administrative burden, it is necessary to evaluate the workflow of TCM in a primary care clinic. This study will analyze the time to perform the 48-hour interactive portion of TCM within a geriatric primary care clinic for pharmacists (Pharm) and non-pharmacist team members (nonPharm).

METHODS: This study used retrospective chart review and time motion techniques (continuous observation and self-report active tracking). It was conducted at UPMC St. Margaret Geriatric Care Centers and included all patients who participated in the 48-hour interactive component of TCM (Nov 2019-April 2020). The primary outcome evaluated time spent on the interactive component for each Pharm and nonPharm groups. A standardized template in the electronic health record included time spent on documentation/chart review and patient outreach. In addition, a pharmacist used a timer and direct observation to determine time spent on each component using a time motion method. The workflow for both Pharm and nonPharm was split into components: selection of eligible patient, chart review, documentation, patient interaction, and patient scheduling. To supplement this data, Pharm and nonPharm were asked to self-report timings. Secondary outcomes categorized interventions through review of TCM note completed during call. Outcomes were reported through descriptive statistics.

RESULTS: Results will show amount of time spent on each component of the 48-hour interactive portion of the TCM process. A time motion method combined with self-reported times will provide initial data on how pharmacists and non-pharmacists use their time in the TCM workflow.

CONCLUSION: This study will add to current literature on the initial interactive portion of TCM at a geriatric primary care office. Although it is known that continuity of care is beneficial for patients, it is important to determine the time it will take for incorporation into a geriatric primary care clinic.

Archana Raghavan, PharmD, BCPS

Archana was raised in California. She received her PharmD from Virginia Commonwealth University and completed her PGY1 pharmacy residency at UPMC St. Margaret. This year she is continuing her training as a PGY2 in geriatrics at UPMC St. Margaret. Upon completion of her PGY2, she will become a Clinical Pharmacy Specialist in Anticoagulation at the Sacramento VA. Her professional interests include chronic disease state management of older adults.

Mentor(s): Amy Haver, PharmD, BCPS, BCGP

Evaluating the performance characteristics of a drug-associated acute kidney injury (D-AKI) clinical decision support alert

Ray LB, Kane–Gill SL

PURPOSE: Acute kidney injury (AKI) refers to sudden decline in kidney function and occurs in about 20% of hospitalized patients and in up 65% of critically ill patients. AKI is associated with drug related causes in 30% of cases. Clinical decision support alerts can aid in the detection of AKI events allowing for early recognition and mitigation of AKI severity. Unfortunately, current evaluations of alerts have yielded mixed results for patient outcomes. Alerts are often too sensitive and not specific leading to alert fatigue. Alert knowledge needs to be modified to include contemporary AKI definitions and actionable nephorotoxin exposure. A new alert was developed to be more specific for drug-associated acute kidney injury (D-AKI) using our clinical decision support system, Theradoc, at UPMC Presbyterian. The objective of this quality improvement project was to determine the alert's performance characteristics for D-AKI in clinical practice.

METHODS: All patients over the age of 18 and had the D-AKI alert fired from August 2018 to August 2019 were included in the evaluation. Patients who had a history of kidney transplant or were on hemodialysis or required continuous renal placement therapy were excluded. A Theradoc report was generated for all alerts generated in 3 intensive care units (trauma, general medicine, and cardiology) and 3 non-ICUs (also trauma, general medicine, and cardiology). A random sample of 300 alerts (150 from an ICU and 150 from a non-ICU) was selected for evaluation. A critical assessment of drug related causes and AKI occurrence was conducted at the time of the alert using three published adverse drug reaction causality tools (i.e. Naranjo, Kramer, Liverpool). A 2 out of 3 agreement between instruments indicated the presence of a D-AKI event. The performance of the alert was determined by the number needed to alert.

RESULTS: A total of 5634 alerts were generated of which 2183 were from a non-ICU and 3451 were from an ICU. Further results are pending.

CONCLUSIONS: Pending

Lauren Ray, PharmD, MBA

Lauren received her Doctor of Pharmacy and Master of Business Administration degrees from West Virginia University. She is now completing her PGY1 Pharmacy Administrative residency at UPMC Presbyterian and will continue to the PGY2 Pharmacy Administrative position.

Mentor(s): Sandra L. Kane Gill, PharmD, MS, FCCM, FCCP

Medication-assisted treatment for alcohol use disorder in a large psychiatric hospital

Sackett RA, Smith AF, Sabol RM, Fabian TJ

PURPOSE: Medication-assisted treatment (MAT) in conjunction with counseling and behavioral therapies is an effective treatment strategy for patients with alcohol use disorder (AUD). MAT in this context refers to any of the four FDA approved medications for AUD, which include naltrexone (oral), naltrexone (intramuscular injection), acamprosate (oral), and disulfiram (oral). Despite evidence to support their effectiveness, rates of prescribing these medications are low. The objective of this study is to evaluate current MAT prescribing practices and identify potential barriers and opportunities to increase access to MAT for patients with AUD through the development of a clinical pathway.

METHODS: A retrospective analysis was conducted of 284 patient encounters with a diagnosis of AUD that were admitted to the substance use disorder unit and discharged between January 1, 2019 and June 30, 2019 at UPMC Western Psychiatric Hospital. Measured outcomes include the number of patient encounters prescribed MAT during admission and upon discharge, the number of patient encounters referred for outpatient addiction treatment services, 30-day psychiatric readmissions rates, and emergency department visits. Upon completion of data collection, a physician survey was created to gather additional information about MAT prescribing patterns.

RESULTS: Out of 284 patient encounters, MAT was prescribed during the inpatient stay for 50 encounters (17.6%) and 46 (16.2%) of those were prescribed MAT upon discharge. A total of 46 patient encounters that had started MAT inpatient were also referred for outpatient services. There were seventeen repeat emergency department visits and thirteen 30-day readmissions. The most common agent started inpatient and prescribed upon discharge was naltrexone 50mg (oral). Preliminary results from physician surveys show that commonly perceived barriers of prescribing MAT include concern for misuse/diversion of MAT products as well as insufficient access to outpatient treatment programs/rehabilitation services post discharge.

CONCLUSIONS: Overall, MAT prescribing rates on the substance use disorder unit at UPMC Western Psychiatric Hospital are lower than expected. Results from physician surveys indicate several factors which may affect MAT prescribing patterns and patient access to MAT services. Further research is warranted to assess barriers and opportunities to expand access to MAT including exploring advanced roles for pharmacists as part of the interprofessional care team.
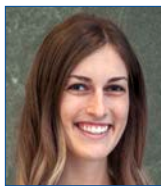
Rena Sackett, PharmD

Rena is originally from Boulder, Colorado, and received her PharmD from Loma Linda University in Southern California. She is currently a PGY1 Pharmacy Resident at UPMC Western Psychiatric Hospital. Upon completion of her PGY1 training, she will begin her Executive Fellowship in Association Leadership and Management at ASHP in Bethesda, MD.

Mentors: Tanya Fabian, Pharm D, PhD, BCPP and Ashley Smith, PharmD

Interprofessional Antimicrobial Stewardship Initiatives to Improve Empiric Antibiotic Selection Accuracy in the Emergency Department (ED)

Schmitz NR, Pickering A, Baumgartner M, D'Amico, F

PURPOSE: Antimicrobial resistance is a critical worldwide issue. While all infectious diseases are subject to antibiotic mismanagement, urinary tract infections (UTIs) are on the forefront of antimicrobial stewardship initiatives due to their prevalence and overall health care system burden (account for more than 1 million ED visits per year in the United States). As the demand for antimicrobial stewardship increases, many institutions are utilizing an inter-disciplinary approach to ensure proper use of antibiotics. Pharmacists embedded into the ED can aid prescribers in antibiotic selection based on current clinical guidelines and institution specific antibiograms. Greater empiric accuracy may lead to decreased complications, readmissions, and formation of drug resistant organisms. This project aims to determine whether having a pharmacist embedded in the ED improves empiric antibiotic selection accuracy.

METHODS: Patients presenting to UPMC St. Margaret (SMH, pharmacist-embedded ED) and UPMC Passavant (PAS, no pharmacist-embedment) ED between August 2018 through July 2019 who had a urine culture performed and were discharged home were eligible for review. The months of October 2018, February 2019, and July 2019 were targeted and patients presenting with urogenital chief complaints (excluding pyelonephritis, pregnant patients), and age >18 years old were randomly sampled. Empiric therapy was determined accurate if the prescribed agent proved sensitive against the urine pathogen and the empiric antibiotic had <20% resistance based on local-antibiogram data. In addition, any treatment of asymptomatic bacteriuria was deemed inaccurate. Symptomatic criteria was adopted from IDSA UTI treatment guidelines.

RESULTS: After random sampling, 297 patients met inclusion criteria (SMH n=149, PAS n=148). Mean patient age was 63 years and were predominately female (66%). Empiric accuracy of symptomatic patients who received an antibiotic was 71% for SMH (n=85) and 70% for PAS (n=79), OR -0.01,95% CI (-0.17 to 0.14). Empiric accuracy of symptomatic patients who did not receive an antibiotic was 96% for SMH (n=26) and 100% for PAS (n=6), OR 0.04, 95% CI (-0.04 to 0.22). Treatment of asymptomatic bacteriuria was 79% for SMH (n=38) and 65% for PAS (n=63), OR -0.14, 95% CI (-0.034 to 0.06).

CONCLUSIONS: Based on this data, ED pharmacist presence does not appear to significantly influence empiric antibiotic accuracy for UTIs or treatment of asymptomatic bacteriuria, specifically. Further research is needed to determine the most impactful use of pharmacist time in improving ED antibiotic prescribing trends for UTIs.

Nolan Schmitz, PharmD

Nolan Schmitz is a PGY-1 Pharmacy Resident at UPMC St. Margaret. He is originally from Omaha, Nebraska and earned his PharmD from the University of Kansas School of Pharmacy. Upon completion of his PGY-1 residency, he will continue with UPMC St. Margaret as a PGY-2 in Ambulatory Care with a Family Medicine focus. Nolan's professional interests include clinical service implementation, chronic disease state management, preventative medicine, and building financially sustainable practice models. Outside of pharmacy, he enjoys cheering on Nebraska Husker football, fitness, cooking, and reading.

Mentor(s): Aaron Pickering, PharmD, BCPS; Megan Baumgartner, PharmD, BCPS

Review of HIV monitoring in a primary care setting

Schoenle MK, Sonoda K, Ballard SL, Salter C, Kolb NR, Mcananey C

PURPOSE: The UPMC Shadyside Family Health Center (SFHC) is an urban family medicine residency training site seeking to increase standardization and optimization of in-house HIV primary care. In December 2019, SFHC implemented HIV care quality reporting and interdisciplinary panel monitoring with specialist consultation, HIV-specific note templates, order sets, and reference materials, and antiretroviral therapy (ART) related pharmacist consults. This study evaluates whether this multimodal approach improves patient care by increasing SFHC adherence to national HIV guidelines and optimizing ART regimens.

METHODS: A baseline drug use evaluation included active adult SFHC patients as of December 2019 with an HIV diagnosis or HIV viral load. Patients who transferred primary care to another clinic were excluded. Primary outcomes included virologic suppression, CD4 count ≥200 cells/mm^3, adherence to recommended lab monitoring and health maintenance, ART optimization, number and severity of drug-drug interactions, and appropriateness of opportunistic infection (OI) prophylaxis. Optimized ART regimens contained an integrase strand transfer inhibitor (INSTI) and two nucleoside reverse transcriptase inhibitors (NRTIs). Demographics and guideline adherence were analyzed using descriptive statistics. Chi-square was used to determine whether sites of care, provider training level, no-show rate, previous pharmacist review, and number of ART or non-ART medications were associated with differences in the primary outcomes. An interdisciplinary team reviewed each patient and wrote a patient note that was forwarded to the primary care provider (PCP) with recommendations regarding medication use or monitoring.

RESULTS: Of the 29 eligible patients, half were black, 86.2% were cisgender men, and the median age was 59. HIV care sites were SFHC alone (55.2%, N=16), Pittsburgh AIDS Center for Treatment (24.1%, N=7), or an external clinic (20.7% N=6). PCP was a family medicine resident for 24 patients (82.8%) and an attending physician for 5 patients (16.7%). Six patients (20.7%) had prior pharmacist review. Six patients (20.7%) had a no-show rate of ≥20%. Viral load was detectable in 10.3% (N=3) and CD4+ count <200 cells/mm3 in 13.8% (N=4). Twenty-one patients (72.4%) were prescribed an optimized ART regimen. There was no significant difference in demographics or outcomes between sites of care, PCP training level, and patient no-show rate. Previous pharmacist review and number of ART or other medications was not associated with ART optimization, number of drug interactions, or type of drug interactions. Between 3 to 15 recommendations were proposed for each patient. A total of 75 lab monitoring recommendations, 40 vaccine recommendations, and 120 screening recommendations were proposed. ART optimizations were proposed for 9 patients. Thirty-six drug-drug interactions were identified, and 19 recommendations were made. Opportunistic infection prophylaxis initiation was proposed and accepted for one patient.

CONCLUSIONS: Developing and reviewing an HIV panel revealed many opportunities for optimization regardless of care site or provider level of training. Study limitations include small sample size and lack of updated records from the out-of-network sites of care. A second chart review will be conducted to determine rate of recommendation acceptance.

Research in Progress Presented at: ASHP 2019 Midyear Clinical Meeting

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Marilyn Schoenle, PharmD

Marilyn Schoenle is a PGY-2 family medicine track ambulatory care pharmacy resident at UPMC Presbyterian Shadyside. Originally from Ann Arbor, MI, Marilyn received her PharmD from Butler University. Her professional areas of interest include geriatric medicine, HIV/HCV antiviral therapy management, and interprofessional education. After graduation, Marilyn plans to move to Houston, Texas and pursue outpatient clinical pharmacy opportunities.

Mentor: Stephanie Ballard, PharmD, BCPS

Evaluating the use of antibiotics for the treatment of burn wound cellulitis

Spencer E; Voycik M; Miller T

PURPOSE: Burn wound cellulitis is defined as a noninvasive infection that extends into the healthy, uninjured skin and soft tissues surrounding the burn wound or donor site. According to the U.S National Burn Repository, burn cellulitis is among the leading causes of morbidity in this patient population. With guidelines and clinical trial data surrounding the treatment of burn cellulitis lacking, there is an uncertainty in the choice of antibiotics and appropriate duration of treatment. This quality improvement project is designed to characterize the variability in treatment of burn wound cellulitis in varying degrees and depths of burn injuries in a nationally certified burn center.

METHODS: This retrospective chart review included patients from 2016-2020 with a diagnosis of burn wound cellulitis at UPMC Mercy, a nationally certified burn center. Patients were identified using ICD-10 codes for burn injury of any degree and cellulitis. Information collected included patient demographics, burn location and severity, cause of the burn, culture data, timing of surgical debridement, antibiotic selection and duration, topical antibiotic usage, and documented resolution/improvement in burn wound cellulitis.

RESULTS: A total of 44 patients treated for burn wound cellulitis were identified. Of the total cases included, 11/44 (25%) cases utilized nafcillin as an initial single agent alone for the treatment of burn wound cellulitis. Another 21/44 (47.7%) cases utilized empiric broad spectrum therapy using either a combination of vancomycin plus cefepime (11/44; 25%) or vancomycin plus piperacillin/tazobactam (10/44; 22.7%). Among the 25% of patients remaining in the study, there were an additional 7 different treatment regimens documented that utilized both narrow and broad spectrum coverage. The median days for duration of therapy was 7 days.

CONCLUSIONS: There is significant variability in the antibiotic therapies prescribed to treat burn wound cellulitis, and the treatment durations are highly variable and inconsistent. Prospective clinical trials focusing on treatment for this indication may lead to a more defined treatment approach including initial antibiotic selection and duration of treatment. Assessing the outcomes of various treatment regimens will help to further define and standardize appropriate treatment courses across nationally certified burn centers.

Emily Spencer, PharmD

Emily received her Pharm.D. from The Ohio State University College of Pharmacy and is completing her PGY-1 at UPMC Mercy. Upon completion, Emily will continue her education as a PGY-2 Emergency Medicine resident at The University of Maryland Medical Center. Her professional interests include trauma/resuscitation, pediatric emergency medicine, and toxicology.

Mentor: Meaghan Voycik, PharmD, BCPS

Impact of Inpatient Psychiatric Hospitalization on Medication Burden in Older Adults

Andreea Temelie, PharmD; Matthew Joseph, PharmD, BCPS; Daniel Varon, MD; Christine Sun, PharmD Candidate; Tanya J Fabian PharmD, PhD, BCPP

PURPOSE: Polypharmacy has been linked to several poor outcomes in geriatric patients, including increased placement in skilled nursing facilities, hospitalization, adverse drug events, morbidity, and mortality. While numerous studies have explored medication burden and deprescribing in geriatric patients in the community and nursing home settings, data in the inpatient psychiatric setting has been limited. This study aims to characterize medication burden after an inpatient hospitalization on a geriatric psychiatry unit and explore opportunities for deprescribing.

METHODS: This study was approved by the UPMC QI Review Committee. The electronic medical record was used to compare medication burden at admission and discharge for all patients ≥ 65 years old discharged from an inpatient geriatric psychiatry unit from January 1,2019 to June 30,2019. Medication burden was assessed retrospectively by the number of total medications, number of scheduled and as needed medications, number of pills taken per day, and number of medication administrations per day. Multum Lexicom was used to classify medications which were then categorized as either medical or psychiatric medications.

RESULTS: Inpatient psychiatric hospitalization was shown to increase medication burden in 65% of patients 65 years of age or older. The average increase in total medications was 1.72 medications per day, primarily attributed to increases in scheduled medications. Patients also experienced an average increase of 3.8 doses per day and 0.8 medication administration times per day. The most commonly prescribed agents at discharge were vitamins (141 times), laxatives (134 times), and atypical antipsychotics (114 times).

CONCLUSIONS: These results highlight an opportunity to reduce medication burden during inpatient psychiatric hospitalization in older adults by reviewing classes of medications prescribed, aligning medication administration times, and identifying opportunities to decrease the number of doses per day.

Presented At: ASHP Midyear Clinical Meeting and Exhibition, Las Vegas, NV, December 2019

Andreea Temelie, PharmD

Andreea is currently a PGY1 pharmacy resident at UPMC Western Psychiatric Hospital. She completed her Bachelor of Science in Psychology from the University of Michigan in 2015 and Doctor of Pharmacy from the University of Minnesota in 2019. Next year, she will be continuing to a PGY2 in psychiatric pharmacy at UPMC Western Psychiatric Hospital. Her professional areas of interest include child/adolescent psychiatry, transitions of care, underserved care, and interprofessional collaboration.

Mentor(s): Matthew Joseph, PharmD; Tanya J Fabian PharmD, PhD, BCPP

Evaluation of Persistence, Switch patterns, and Costs among Migraine Patients Utilizing Calcitonin Gene-Related Peptide Inhibitors

Thompson KM, Crabtree T, Mirzai M, Zhang J, Thomas J, Kustra L

PURPOSE: In the United States, migraine affects over 37 million people and yields an annual health-related financial burden of $11 billion in direct health-care costs. Available preventative options for the treatment of migraine, including beta-blockers, antiepileptics, and antidepressants, have yielded improvement in daily function and number of migraine attacks for some; however, those who have failed these therapies were in need of other options. In 2018, three calcitonin gene-related peptide (CGRP) inhibitors were approved by the Food and Drug Administration. The availability of this novel therapeutic class creates an opportunity to evaluate persistence and switch patterns of CGRP inhibitors for the treatment of migraine and the effect of CGRP inhibitors on migraine-related medical utilization and costs.

METHODS: This retrospective observational study analyzed claims data for adult Medicaid patients with a diagnosis of migraine before the first paid claim for erenumab, fremanezumab, or galcanezumab. Members had continuous enrollment with the health plan for a minimum of 6-months before and after the index date, from December 1, 2017 to November 30, 2019. The index date was the first date a member had a paid claim for an initial CGRP inhibitor between May 18, 2018 to May 31, 2019. Drug persistence was defined as no history of discontinuation of the initial CGRP inhibitor at 6-month endpoint. Discontinuation was defined as a greater than 60-day gap from the last fill of a CGRP inhibitor. Switch was defined as discontinuing the index CGRP inhibitor and starting a different CGRP inhibitor. Migraine related medical utilization included emergency department, specialist, and primary care visits where migraine was the primary diagnosis. Data analysis utilized SAS.

RESULTS: Index drug persistence rates at 6-months for erenumab, fremanezumab, and galcanezumab were 64.9%, 44.4%, and 31.3% and the switch rates were 7.4%, 0%, and 18.8%, respectively. At 6-months post-index date, the accumulated number of migraine attributed medical visits decreased by 25.1% compared to the 6-months before the index date. At the 6-month post-index date, migraine attributed pharmacy and medical costs were $610 per member per month (PMPM) and $76 PMPM compared to the 6-month pre-index cost of $152 PMPM and $80 PMPM, respectively.

CONCLUSIONS: Erenumab had the highest persistence rate, while galcanezumab had the highest switch rate at the 6-month endpoint. Claims analysis comparing the 6-month pre- and post- index timeframes demonstrated that despite lowering migraine related medical costs, the elevated migraine related pharmacy costs do not fully support a return on investment.

Kayla Thompson, PharmD

Kayla received her PharmD from Duquesne University in 2019 and is completing her PGY-1 managed care pharmacy residency at Gateway Health. Upon completion of her residency, she plans to practice as a clinical pharmacist in a managed care setting.

Mentor(s): Timothy Crabtree, PharmD; Mirzai Majid, PharmD; Jeramie Thomas, PharmD

Effective coaching strategies for the "Flip the Pharmacy" practice transformation initiative in Pennsylvania community pharmacies.

Evan S. Turco, Joni C. Carroll, Sara Zale, Philip Mathew, Sophia Cothrel, Ashley Firm, Melissa Somma McGivney, Stephanie McGrath, Christopher Antypas, Kim C. Coley

PURPOSE: Flip the Pharmacy (FtP) is a nationwide, scalable community pharmacy practice transformation effort sponsored by the Community Pharmacy Foundation and led by CPESN-USA to transform community pharmacy practice from a traditional, prescription-driven model to a patient- centered care model. This program utilizes peer coaching and data-driven milestones to measure pharmacy transformation progress. In Pennsylvania, there are over 20 coaches paired into 12 teams supporting pharmacist champions at 40 community pharmacy locations, which are all members of the state's community pharmacy enhanced services network, the Pennsylvania Pharmacists Care Network (PPCN). Coaching teams include pharmacy owners, practitioners, and faculty from Pennsylvania schools of pharmacy. The objective of this project is to identify effective coaching strategies for implementation of the "FtP program in community pharmacies in Pennsylvania.

METHODS: This qualitative study will use semi-structured interviews with key informants within FtP. Coaches and FtP pharmacist champions are eligible for inclusion.. Interview questions were derived from the Consolidation Framework for Implementation Research and include the following four constructs: (1) intervention characteristics, (2) inner setting, (3) characteristics of individuals, and (4) process. Interviews were audio-recorded and transcribed for analysis. Interviews will continue until saturation, defined as when no new information is elicited. A codebook was developed and two investigators are coding each transcript independently. Coding discrepancies will be resolved through discussion. A thematic analysis conducted by the investigative team is ongoing.

PRELIMINARY RESULTS: A total of 18 interviews have been conducted to date with key informants consisting of coaches (n=12) and champions (n=6). The interviews lasted approximately 15-30 minutes and were audio-recorded and transcribed.. Four preliminary themes concerning effective coaching strategies were identified: (1) utilize a multifactorial approach to pairing coaches with pharmacies; (2) approach monthly in-person coaching sessions with a focus on setting and achieving future goals; (3) tailor communication strategies to the pharmacy; and (4) engage multiple team members in practice transformation efforts.

CONCLUSIONS & IMPLICATIONS: There is a need for the expansion of community pharmacy services beyond dispensing to meet patient needs. The implementation of new clinical services at community pharmacies is a complex undertaking, and a broad array of effective strategies are necessary to support the transformation of independent pharmacies. Replicable and scalable coaching strategies gathered from this project can be utilized by others leading community pharmacy practice transformation efforts across the country. Our final results will inform the development of a comprehensive coaching guide that will assist in the continued progression of the pilot FtP cohort in Pennsylvania and future cohorts of the program.

Evan Turco, PharmD

Evan graduated from the West Virginia University School of Pharmacy in 2019. His career objective is to one day own his own independent pharmacy. Evan's passion for community pharmacy led him to the University of Pittsburgh and Asti's South Hills Pharmacy where he is completing a PGY-1 Community Pharmacy Residency. Following residency, Evan has accepted a clinical pharmacist position at an independent pharmacy in West Virginia where he will have the opportunity to develop and enhance existing patient care services.

Mentors: Joni Carroll, PharmD, BCACP, CTTS; Kim C. Coley, PharmD, FCCP

A machine learning approach to predict antiplatelet bleeding outcomes after PCI

Uber RB, Stevenson JM, Kreider MS, Coons JC, Yang D, Empey PE

PURPOSE: Patients who undergo percutaneous coronary intervention (PCI) are recommended to receive aspirin and a $P2Y_{12}$ inhibitor after stent placement. Unfortunately, bleeding is a relatively common adverse event during treatment, and confers an increased risk of both mortality and morbidity. Predicting which patients will bleed while undergoing antiplatelet treatment is clinically relevant, as this may inform treatment selection and duration. Previous literature has demonstrated the success and feasibility of applying regression and machine learning (ML) models to predict bleeding in the post-PCI setting. Genetic information may be predictive as well – ischemic and bleeding outcomes with clopidogrel have been associated with CYP2C19 genotype. It is unknown whether CYP2C19 genotype can improve predictive accuracy of ML models in these patients.

METHODS: A study cohort was created from manually-curated, retrospective data of UPMC patients who received clopidogrel for 1 year post-PCI and were evaluated for bleeding events. Bleeding was defined as Bleeding Academic Research Consortium (BARC) 2 or higher, while those who bled due to trauma or coronary artery bypass grafting (CABG) were excluded. The data were split into model training and validation datasets (90% and 10% of entire dataset, respectively), and supervised ML models were developed and analyzed using the h2o package in R. Variable selection for model development was informed through statistical analyses and known clinical impact on bleeding. Relative prediction accuracy, measured as area under the curve (AUC), was compared between models. The model with the highest AUC was selected for further analyses. Model performance metrics (i.e. AUC, sensitivity, and specificity) were compared with and without genetic data.

RESULTS: 465 patients met the inclusion criteria. Of these, 144 met the bleeding event criteria. A neural network model that included CYP2C19 phenotype data had an AUC, sensitivity, and specificity for the validation dataset of 0.912, 1, and 0.812, respectively. After removal of the CYP2C19 phenotype data, the AUC, sensitivity, and specificity of the model for the validation dataset was 0.895, 0.5, and 0.968, respectively.

CONCLUSIONS: Accurate models predicting clinically relevant bleeding in the post-PCI setting are needed to identify patients who are likely to experience this adverse event. A ML model including CYP2C19 phenotype data had a high sensitivity for predicting bleeding in patients receiving clopidogrel post-PCI. Future work will validate models in a larger independent dataset.

Ryley Uber, PharmD

Ryley Uber is a 2018 PharmD graduate of Cedarville University. He is the second-year clinical pharmacogenomics fellow at the University of Pittsburgh. He wishes to continue using his knowledge of pharmacogenomics to research and develop treatment strategies for patients with unmet medical needs.

Mentors: Philip Empey, PharmD, PhD; James Coons, PharmD, BCCP

IV antibiotics vs. oral step-down therapy with sulfamethoxazole/trimethoprim in patients with gram-negative bacteremia

Welch JT, Ours RL, Shick AR, Lewis GJ, Rosielle LJ

PURPOSE: Treatment of bacteremia has traditionally included intravenous (IV) antibiotics. Long term IV access, however, is not without risk. Potential complications include increased hospital length of stay, central line associated bloodstream infection (CLABSI), and increased overall cost. Treatment of bacteremia with oral antibiotics may reduce the incidence of such complications. In recent studies, gram-negative bacteremia has been treated successfully with oral agents that have high bioavailability such as ciprofloxacin and sulfamethoxazole/trimethoprim (SMX/TMP). Fluoroquinolones carry many Black Box Warnings while SMX/TMP has zero. While SMX/TMP is also studied in this setting, available literature does not contain adequate sample sizes to claim non-inferiority to IV antibiotics. We hypothesize that 30-day mortality in patients who were treated with oral step-down therapy with SMX/TMP will be no worse than patients treated entirely with IV antibiotics.

METHODS: This study is a retrospective chart review of 300 adult patients admitted to UPMC Hamot. Inpatients who have documented gram-negative bacteremia, received appropriate antibiotic therapy within 24 hours of first positive blood culture and completed at least 7 days of appropriate culture-directed therapy will be included. Patients with CLABSI, infection with gram-negative oxidase-positive organisms, co-infection with gram-positive organism or yeast, profound neutropenia, infective endocarditis, CNS infection, osteomyelitis, deep-seated abscess, and patients deceased during first 7 days of treatment were excluded. Aggregate data from a previous durational study completed in 2017 at UPMC Hamot will be used and additional retrospective chart review for the remainder of patients will take place from January 2017 until each group has no more than 150 patients. The primary outcome is 30-day all-cause mortality.

RESULTS: The difference in mortality rates was fairly large (9.5% for the IV-only patients versus 3.5% for the oral step-down patients), however this was not statistically significant due to the low numbers of overall deaths, $\chi2 = (1, 299) = 3.73$, p = 0.053. IV-only patients had a higher Charlson Comorbidity Index score than oral step-down patients (mean = 3.61 vs. 2.90, p<0.001), as well as a longer hospital length of stay (mean = 11.55 days vs. 6.50 days, p<0.001). There was no difference in treatment duration between IV-only and oral step-down patients (mean = 9.48 days vs. 9.37 days, ns).

CONCLUSIONS: In this study, mortality rates were not significantly different between the groups. The CCI scores in the IV-only group were significantly higher which may explain the trend toward increased mortality, although non-significant. Hospital length of stay was significantly higher in the IV-only group, but this may also be affected by the higher CCI scores. Treatment duration did not vary significantly between groups, however Levene's test for Equality of Variances revealed a significantly greater degree of variation for both treatment duration and hospital length of stay for the IV-only patients compared to the oral step-down patients (p<0.05 in both cases).

Joseph Welch, PharmD

Joseph is from Erie, PA. He received his PharmD from Lake Erie College of Osteopathic Medicine School of Pharmacy in 2019. He is currently completing the PGY1 Pharmacy Residency at UPMC Hamot. His professional interests include infectious diseases and internal medicine. Upon completion of residency, he plans to practice in a clinical setting.

Mentor: Rachael Ours, PharmD, BCIDP

Sustainable Practice Models for Clinical Pharmacy Services Within Teaching and Non-Teaching Family Health Centers

Williams A., Klatt P.

PURPOSE: Integration of non-physician providers into family medicine practices is crucial for improving the quality of patient care. Within family medicine practices, clinical pharmacists have been shown to reduce time to care, decrease rates of hospitalizations, increase cost-efficiency and improve patient outcomes. Despite these benefits, widespread integration of clinical pharmacy services into outpatient practices remains limited; one contributing factor being inadequate reimbursement methods. This study aims to support sustainable pharmacy services within teaching and non-teaching family medicine practice by using novel data collection techniques to identify potential third-party reimbursement opportunities.

METHODS: This 12-month prospective study will implement unique data collection methods to capture billing data following each pharmacist patient care encounter at teaching and non-teaching family health centers. Data collected will be de-identified and evaluated by bioinformatic specialists to classify the appropriate level of "incident to" billing; defined as "potential third-party billing". During the entire study period, pharmacist patient care encounters conducted at family health centers will be billed according to current methods; defined as "actual third-party billing". The difference between the potential and actual third-party billing will be analyzed and quantified with assistance from a health-systems analyst and biostatistician.

RESULTS: Preliminary results indicate that over a 5-month period of time, 449 pharmacist patient care encounters were conducted. Of these visits, 99% (n=447) qualify for 99213 and 99214 reimbursement. Despite this, pharmacist-led encounters were billed as 99211 services. Ongoing data analysis will include characterization of pharmacy services and evaluation of underutilized billing opportunities.

CONCLUSIONS: Pending ongoing data collection.

Anne Williams, PharmD

Anne is from Tucson, AZ, and received her PharmD from the University of Maryland School of Pharmacy in 2018. She completed her PGY1 residency at UPMC St. Margaret where she continued on to her PGY2 residency in family medicine. She is also concurrently completing a Faculty Development Fellowship at UPMC St. Margaret and is looks forward to pursuing a career in chronic disease state management.

Mentor (s): Trish Klatt, PharmD, BCPS; Marrianne Koenig, PharmD, BCPS

Impact of Home Blood Pressure Monitoring in Patients with Hypertension in Family Medicine Healthcare Centers (15)

Williams CB, Castelli G, D'Amico F

PURPOSE: An ongoing initiative in the three UPMC St. Margaret Family Health Centers (FHCs) is the donation of home blood pressure (HBP) monitors to underserved patients. It is unknown how the HBP monitors and blood pressure logs are being used by patients and healthcare providers. The specific aims are: to compare office and HBP values assessing when blood pressures are elevated, to identify if HBP monitoring decreased office blood pressure values and to evaluate if HBP measures influenced clinical decision-making. (79)

METHODS: Study design: quality improvement, retrospective chart review. Setting: Three UPMC St. Margaret FHCs (New Kensington, Lawrenceville, and Bloomfield-Garfield). Participants: Patients who received an HBP monitor from one of the FHCs between July 2015 to August 2019. Main Outcomes: Patients' blood pressure values will be collected prior and after receiving HBP monitors. Data describing how healthcare providers utilized patients' HBP values in clinical decision-making will also be collected. Descriptive statistics such as number of times healthcare providers documented HBP values in notes per visit, blood pressure values prior and after receiving HBP monitor, and various others will be used to analyze the data. (102)

RESULTS: Research in progress; results are yet to be determined. (9)

CONCLUSIONS (ANTICIPATED): We anticipate a lack of utilization of HBP values by patients and healthcare providers in a family medicine setting. The results have the potential to create a pharmacist-led algorithm for the dispensing of HBP monitors and patient-care follow-up. (38)

Cassidy Williams, PharmD

Cassidy Williams is from Hammond, Louisiana. She received her Doctor of Pharmacy degree from Xavier University of Louisiana College of Pharmacy. Cassidy is a PGY-1 pharmacy resident and faculty development fellow at UPMC St. Margaret. After completing her PGY-1, she will continue at St. Margaret as a PGY-2 in Family Medicine. Cassidy is interested in academia, chronic disease states, infectious diseases and psychiatry. In her free time, she enjoys spending time with family and friends, traveling, and sightseeing around the city. (80)

Mentor(s): Gregory Castelli, PharmD, BCPS, BC-ADM

Incorporating Motivational Interviewing to Foster Change in Patients' Health Behaviors with an Interprofessional Team

Kevin Wissman, PharmD, Roberta Farrah, PharmD, BCPS, BCACP, Patricia McGuire, MD, James Mercuri, LCSW, Marianne Koenig, PharmD, BCPS

PURPOSE: Healthcare providers frequently encounter patients with ambivalent thoughts towards their health. Patients who have a higher number of healthy lifestyle behaviors have been shown to have a lower risk of mortality, yet many patients continue to battle ambivalence regarding health behaviors affecting their chronic diseases.[1] The goal of this study is to determine if providing brief targeted motivational interviewing interventions within a routine patient encounter by an interprofessional team is an effective method of creating successful health behavior changes for patients.

METHODS: This project was conducted at three academic family health centers within the UPMC St. Margaret Family Medicine Residency in Pittsburgh, PA. The project was implemented on October 1st, 2019 with no expected end date. Interprofessional team consists of: three PGY2 Pharmacy Residents, four Clinical Pharmacists, three Licensed Clinical Social Workers, three Masters of Social Work students, and one Psychiatrist. Patients were identified through Pharmacist led Medication Management Clinics and by way of physician referral. The interprofessional team conducted brief motivational interviewing sessions with patients to help achieve their health behavior change goals. Patients were contacted every 7-14 days by team members for follow up motivational interviewing interventions. Patients were continually assessed for health behavior change progress on a three-point assessment scale: No steps completed, Moderate steps completed, Goal completed. Patients were continually contacted until they reached their health behavior change goal or failed to reach their goal. Measures/Main Outcomes: Average duration of motivational interviewing sessions, frequency of follow up, quantity of follow up sessions before reaching health behavior change, success rate of achieving health behavior change. This project was approved by the UPMC Quality Improvement Review Committee.

RESULTS: Pending

CONCLUSIONS: This quality improvement project will be used to continue providing motivational interviewing techniques to promote health behavior changes for patients. The results of this project will be used to educate UPMC St. Margaret physician residents, pharmacy residents, and residency faculty on the effectiveness, efficiency, and feasibility of conducting motivational interviewing strategies with their patients to create healthy behavioral changes. Would provide a sustainable model for other programs to implement.

Kevin Wissman, PharmD

Kevin is from Albert, KS. He received his PharmD from the University of Kansas and bachelor's in science degree in psychology from Kansas State University. He is currently training as a PGY2 in Ambulatory Care pharmacy practice at UPMC St. Margaret -Lawrenceville Family Health Center. His professional interests include family medicine, academia, global health, serving the underserved and uninsured population, and interprofessional collaboration.

Outside Mentor(s): Marianne Koenig, PharmD, BCPS

Characterization of thrombotic microangiopathy in lung transplant recipients

Woodworth KG, Iasella CJ, Moore CA

PURPOSE: Thrombotic microangiopathy (TMA) is an occlusive vascular disease characterized by hemolytic anemia and thrombocytopenia, and may include immune mediated thrombocytopenia (ITP), thrombotic thrombocytopenic purpura (TTP), and microangiopathic hemolytic anemia (MAHA). There are many potential causes of TMA, including solid organ transplant. TMA in the post-transplant setting has been associated with the use of calcineurin inhibitors and mammalian target of rapamycin (mTOR) inhibitors and is well described in renal transplant recipients. However, data evaluating risk factors for the development of TMA in non-renal transplant are scarce. We sought to assess the incidence of TMA in a cohort of lung transplant recipients and to identify risk factors for TMA development in this population.

METHODS: A retrospective analysis of 513 lung transplant recipients at an academic medical center who consented to participation in an IRB-approved data registry and were transplanted from 2010 to 2019 was performed. Patients screened for a TMA event were identified by the presence of a biomarker test, ADAMTS13. Data collection included review of progress notes, demographic information, symptoms, hemolysis laboratory values, immunosuppression medications, cytomegalovirus and Epstein Barr viral loads, spirometry and lung biopsy results, and TMA treatment. Patients were determined to have TMA if a diagnosis of TMA, ITP, TTP, or MAHA was given in progress notes or if immunosuppression was changed in combination with a high suspicion for TMA in progress notes. The primary outcome was overall incidence of TMA. Descriptive statistics were used to evaluate characteristics of patients with TMA. Multivariable regression models will be used to further identify independent predictors of TMA development.

RESULTS: In our data registry, 101 ADAMTS13 tests were ordered during 85 unique encounters for patients who had received lung transplants. Of these, 39 encounters were determined to be consistent with a TMA diagnosis. In total, 30 unique patients experienced a TMA event, with 6 patients experiencing at least one recurrence. The overall incidence of TMA was 5.85%. The most common immunosuppression medications that patients received prior to a TMA event were prednisone (95%), tacrolimus (72.5%), everolimus (52.5%), and mycophenolate (35%). Analysis of the features of TMA events is ongoing.

CONCLUSIONS: The results of this study are in progress and will add to the existing literature regarding the development of thrombotic microangiopathy in lung transplant recipients and contribute to optimization of immunosuppression in this population.

Katharine Woodworth, PharmD

Katie is from Cary, NC, and received her PharmD from the University of North Carolina Eshelman School of Pharmacy in 2019. She is currently a PGY1 pharmacy resident at UPMC Presbyterian. Next year, Katie will continue her training as a PGY2 oncology resident at UPMC Shadyside.

Mentor(s): Carlo J. Iasella, PharmD, MPH, BCPS and Cody A. Moore, PharmD, MPH, BCPS

Identifying Opportunities for Pharmacist Optimization of Antipsychotic Therapy in Early Psychosis

Melanie Yabs, PharmD, MS; Deepak Sarpal, PhD; Tanya Fabian, PharmD, PhD, BCPP

PURPOSE: Medication nonadherence is the biggest predictor of relapse and hospitalization among patients with severe mental illness. However, by overcoming barriers and optimizing therapy early, pharmacists can promote adherence and achieve better patient and health system outcomes. The objective of the present study is to identify opportunities to optimize antipsychotic therapy in patients with early psychosis. Specifically, we aim to: (1) characterize antipsychotic prescribing practices; (2) analyze patient outcomes and utilization of mental health services (3) evaluate prescribing rationale, including perceptions and barriers; (4) explore patient barriers to adherence; and (5) understand opportunities for optimization of antipsychotic therapy from the perspective of a clinical pharmacist.

METHODS: Included in this analysis were patients enrolled in the Services for the Treatment of Early Psychoses (STEP) between July 1, 2019 and March 31, 2020. Demographic, clinical and pharmacotherapy data were extracted from the electronic health record to evaluate prescribing trends and medication adherence for both oral antipsychotics and long-acting injectable antipsychotics (LAIA). Chart reviews were conducted to evaluate clinical outcomes; and prescriber surveys were conducted to assess perceptions and barriers and identify opportunities for clinical pharmacist intervention to optimize antipsychotic therapy.

RESULTS: Paliperidone palmitate was the most prescribed LAIA, while risperidone was the most prescribed oral agent among STEP patients. The most common barriers to adherence were poor insight due to illness, side effects, and cost of medication. The most considered factor in the conversion of a patient to an LAIA was nonadherence; the least considered factor was patient experience of first-break psychosis. Opportunities for pharmacist intervention to optimize antipsychotic therapy include acting as a liaison between outpatient and inpatient settings, resolving medication access issues, metabolic monitoring with a collaborative practice agreement, and medication education with patients and families.

CONCLUSIONS: Patients experiencing early psychosis are a particularly vulnerable population. Early intervention and effective antipsychotic treatment will allow for the best trajectory of their disease course. As an integral member of the interprofessional treatment team, pharmacists are uniquely positioned to assist in optimizing antipsychotic medication regimens and provide the best potential outcomes for their patients. Future directions include the development of evidence-based clinical pathways and establishment of collaborative practice agreements to advance the role of pharmacists in care coordination, medication management and optimization of therapy for patients with early psychosis.

Presented virtually at the College of Psychiatric and Neurologic Pharmacists (CPNP) Annual Meeting, April 2020.

Melanie Yabs, PharmD, MS

Melanie received her M.S. in Applied Cognition and Neuroscience from the University of Texas at Dallas, and her PharmD from the University of Texas at Austin. She is currently a PGY-2 psychiatric pharmacy resident at UPMC Western Psychiatric Hospital, where she also completed her PGY-1 pharmacy residency. Following graduation, Melanie plans to practice as a clinical psychiatric pharmacist in an inpatient or outpatient setting and pursue board certification.

Mentor(s): Deepak K. Sarpal, MD; Tanya J. Fabian, PharmD, PhD, BCPP

Optimization of diabetic regimens in patients with established cardiovascular disease in outpatient internal medicine clinics

Zenilman D, Hovis Z, Hall D, Miller T

PURPOSE: Recent literature has emerged demonstrating that certain sodium glucose transport protein-2 inhibitors (SGLT2is) and glucagon-like peptide receptor agonists (GLP-1RAs) provide a cardiovascular benefit in patients with type 2 diabetes (T2DM) and established atherosclerotic cardiovascular disease (ASCVD). The American Diabetes Association now recommends these medications in patients with type 2 diabetes and established ASCVD as second line agents in addition to metformin. The purpose of this study was to identify areas for improvement in the treatment of patients with T2DM and established ASCVD by formally assessing current adherence to guideline recommendations.

METHODS: The primary objectives were first to evaluate physician adherence to guideline recommendations for prescription of SGLT2i or GLP-1RA and to evaluate provider acceptance after pharmacist intervention. The secondary objective was to identify barriers to acceptance. An Epic report was generated to identify potential patients with T2DM and established ASCVD at two outpatient internal medicine clinics from October 2018 through October 2019. An initial retrospective review was conducted to establish baseline prescriber adaptation to guideline recommendations. Patients' were eligible for intervention if they were ≥18 years old, had an A1C ≥7%, and were seen by their primary care physician within 18 months of chart review. Recommendations to initiate a SGLT2i or GLP-1RA with established cardiovascular benefit were prospectively made to the providers via electronic health record.

RESULTS: One-hundred and fourteen charts patients were initially identified for chart review. Of these patients, 38 (63.6%) met the inclusion criteria. The mean A1C was 8.2%, approximately 60.5% of patients were male and 47.4% were concomitantly on metformin. The final results of these interventions are still in progress.

CONCLUSIONS: (may use pending if no conclusions as of print) The results of this study will assess the real-world adherence to the most updated literature in the management of diabetic patients with clinical ASCVD. Potential barriers to adherence will be identified to further assess opportunities for optimization of care.

Dodi Zenilman, PharmD

Dodi is originally from Lawrence, N.Y. and received her PharmD from the University of Maryland, Baltimore. She is currently a PGY-1 Pharmacy Resident at UPMC Shadyside. Upon completion of PGY-1, she will be returning to Baltimore to complete a PGY-2 in ambulatory care at the Veterans Affairs.

Mentor(s): Trisha Miller, PharmD, BCACP, Zachary Hovis, PharmD, BCACP, Deanne Hall, PharmD, CDE, BCACP

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Pharmacy Residency Program

Post Graduate Year 1 (PGY1)

Community Pharmacy: Rite Aid Pharmacy,
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Director: Melissa Somma McGivney, PharmD,
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Managed Care at CVS Caremark
Director: Maureen Castner, PharmD, RPh, BCGP

Managed Care at UPMC Health Plan
Director: Molly McGraw, PharmD, BCPS

Pharmacy at UPMC Children's Hospital of Pittsburgh
Director: Jennifer Shenk, PharmD, BCPPS

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Director: Brad E. Cooper, PharmD,
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Pharmacy at UPMC Magee-Womens Hospital
Director: Julie Nowak, RPh, BCGP, FASCP

Pharmacy at UPMC McKeesport
Director: Nicole Likar, PharmD, BCPS

Pharmacy at UPMC Mercy
Director: Robert Simonelli, PharmD

Pharmacy at UPMC Presbyterian Shadyside
Director: Heather Johnson, PharmD, BCPS

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Pharmacy Residency Program

PGY1/PGY2 Health-System Pharmacy Administration and Leadership

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Ambulatory Care at UPMC Presbyterian Shadyside
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Global Health Track Coordinators: Sharon Connor, PharmD;
Lauren Jonkman, PharmD, MPH
Traditional Track Coordinator: Trisha Miller,
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Critical Care at UPMC Presbyterian Shadyside
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**Psychiatric Pharmacy at
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