



**School of Pharmacy**  
UNIVERSITY OF WISCONSIN-MADISON

# 2021 PHARMD AND PHARMTOX RESEARCH SYMPOSIUM

Creating a Healthier Future: Pharmacy on the  
Forefront of Patient Care and Scientific Frontiers

*Abstracts Viewing Guide*

Kenton Cooksey and Thomas Lofy  
kcooksey@wisc.edu & tlofy@wisc.edu

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## Feasibility of Student-Led Osteoporosis Screening in Rural and Urban Veterans

Maija Anderson, DPH-3; Abigail Baniel, DPH-3; Ivy Cannella, DPH-3; Sam Taylor, DPH-3; Edward Portillo, PharmD; Maria Wopat, PharmD, BCACP

**Purpose:** Osteoporosis is a skeletal disorder characterized by loss of bone mineral density putting persons at a higher risk for bone fractures. These fractures are one of the most significant negative consequences of this disorder leading to increased patient mortality and healthcare costs. Early diagnosis, screening, and treatment with oral bisphosphonate therapy has been found to decrease the risk of osteoporotic fractures, but often, this care is not initiated until after patients experience their first fracture. This evaluation assesses a student led program designed to integrate best practices in osteoporosis screening, treatment, and follow-up management of Veteran patients within a primary care clinic. Specifically, the goals of this evaluation are to (1) identify the feasibility of a student-led osteoporosis screening by calculating time saved for other healthcare providers, (2) identify specific risk factors for osteoporosis and osteopenia among rural and urban veterans via chart review and telephone interviews, and (3) use DXA scan results and the FRAX tool to evaluate bone health and provide necessary interventions in urban and rural veteran populations.

**Methods:** This pharmacy-student-led evaluation included 185 urban and 197 rural veteran patients age 70 and older from the William S. Middleton Veterans Affairs (VA) Hospital System in Madison, Wisconsin. Students completed osteoporosis screening through chart reviews and patient phone interviews and scheduled DXA scans for eligible patients. Once scan results were obtained, FRAX scores were used to calculate risk of osteoporotic fracture and classify patients as having normal bone density, osteopenia, or osteoporosis. Patients with osteopenia or osteoporosis were further evaluated and started on treatment, as necessary. Pertinent labs were done to assess for safety of treatment including renal function, calcium, and vitamin D levels. Additionally, feasibility of this service was tracked through documentation of time needed to complete each patient interaction.

**Results and Conclusions:** Data collection and analysis pending. Results and conclusions will be presented at the UW-Madison Research Symposium.

## Biographies:



I am a third-year pharmacy student who is a part of the Rural Health Named Option program. I'm passionate about expanding access to healthcare for patients in rural areas! I am interested in pursuing residency after graduation in an ambulatory care or community-based setting. In my free time I enjoy spending time reading, running, and playing board games.



Hi my name is Abby and I'm a third year student pharmacist in the Rural Health Named Option program at UW-Madison. I'll be completing my fourth-year clinical rotations in my hometown of Green Bay, and I hope to pursue a residency after graduation next year! While I'm not completely sure which area I'd like to practice in after graduation, I really enjoy interacting with patients and building relationships in the ambulatory care setting! When I'm not studying, I love to do anything outside and spend time with my family, and on Sundays you can find me cheering on the Packers at Lambeau Field!



I am a third-year student pharmacist originally from Grand Rapids, Minnesota. I completed my undergraduate coursework at Winona State University in Minnesota to earn a BS in Cell and Molecular Biology with a minor in Biochemistry. During my time at UW-Madison, I have worked at the VA Hospital as an inpatient technician and intern which is where I became involved in this osteoporosis screening project. I have furthered my involvement through participation in the Rural Health Named Option with Dr. Ed Portillo. I hope to practice as an ambulatory care or inpatient pharmacist in a rural community and hope to complete a residency in preparation. In my free time, I enjoy hanging out with my two dogs (Bo and Millie), spending time outside, completing DIY projects, and cooking.



Sam Taylor graduated from the University of Nebraska – Lincoln with a B.S. in biochemistry and biology. He is now a third-year pharmacy student in the rural health named option at UW-Madison and is looking forward to beginning rotations in the La Crosse area this May. After graduation, Sam hopes to complete a residency and enter into ambulatory care.

## Pharmacy Services Survey Tool Development: What Services are Rural Pharmacies Offering their Communities?

Madison Barabas, Kathy Chao, Mathew Heule, Kelsey Rox

Rural Wisconsinites are older, sicker and poorer than their urban counterparts, making access to healthcare important for positive health outcomes. Pharmacies have the capability to provide care and manage medications to help decrease the workload for area physicians, but the service landscape they provide is unknown. To help fill in these unknowns, a survey tool was created to analyze the current service availability in Wisconsin community pharmacies. The aims of this project were (1) Gain an understanding of pharmacy services and survey design, (2) Pilot test the survey tool in 5-10 pharmacists, and (3) Create a survey that consistently and accurately measures services offered by pharmacists as well as additional measures of pharmacist attitude to service implementation and feasibility. The results of this project are currently pending.

### Biographies



Madison Barabas is a current third year pharmacy student from Mosinee, WI. Her current interest in pharmacy practice is inpatient rural health. She also wants to become a preceptor to help continue advancing the pharmacy profession.



Kathy Chao is a current third year pharmacy student from Bloomington, MN. Her current interest in pharmacy is to practice in a rural independent pharmacy.



Mathew Heule is a current third year pharmacy student from Appleton, WI. His current interest in pharmacy is inpatient rural health, specifically critical care.



Kelsey Rox is a current third year pharmacy student from La Crosse, WI. Her current interest is in rural independent pharmacy and ambulatory care.

## Effects of Surfactants on Nucleation of Amorphous Nifedipine

Benson, E. G.; Yao, X.; Gui, Y.; Ishida, H.; Yu, L.

Amorphous solid dispersions (ASDs) are widely used to improve the oral bioavailability of poorly water-soluble drugs. Often, surfactants are incorporated into amorphous formulations to enhance the dispersion of hydrophobic drugs through the formation of micelles, among other processes; however, surfactants' influence on crystallization can result in a net decrease in bioavailability if crystallization rates are excessively increased. The effect of surfactants on the less studied nucleation rate was measured in amorphous nifedipine revealing 10 wt. % Tween 80, Span 80, Triton x 100, Poloxamer 407, and PEO increased both nucleation and growth rate. Poloxamer 407 had the strongest excitatory effect on nucleation followed by Tween 80, Span 80, and Triton x 100 while PEO had the weakest effect. As Tween 80 and Span 80 had similar effects on both nucleation and crystal growth, hydrophilic-lipophilic balance (HLB) is likely not the source for this variation. Additionally, surfactant effects on crystal growth rate are, while more uniform, are similar to nucleation effects suggesting the two processes share a kinetic barrier.

### Biography



Emily Benson is a fourth-year undergraduate in the Pharmacology/Toxicology program. She seeks to characterize and understand nucleation to improve bioavailability of poorly water-soluble drugs using amorphous solid dispersions. A previous publication explored sugar alcohols as a model system to predict nucleation rates from the more easily measurable crystal growth rate. This current project expands this model to nifedipine and observes how surfactants impact the nucleation rate as well as how excipients affect the applicability of the model.

## Characterization of RyR2 Mutations Linked to Long-QT Syndrome

Wenxuan Cai<sup>1,2</sup>, Talia Booher<sup>1</sup>, Songhua Li<sup>3</sup>, Francisco Alvarado<sup>1,3</sup>, Teresa Villareal<sup>4</sup>, Norma Balderabano<sup>5</sup>, Argelia Mereidos-Domingo<sup>6,7</sup>, Pedro Iturralde<sup>8</sup>, Héctor H. Valdivia<sup>1,3</sup>, Carmen R.Valdivia<sup>1,3</sup>

**Background:** Long-QT syndrome (LQTS) is a cardiac disorder characterized by elongated QT interval and abnormal T waves on electrocardiogram of the patients. Electrical abnormality of the heart can lead to severe arrhythmias, syncope and sudden cardiac death. Mutations in genes encoding ion channels or associated proteins account for approximately 80% of all cases; however, the genetic links of the remaining 20% cases are poorly understood. Recent genetic studies on the phenotype-positive genotype-negative LQTS patients revealed novel variants on the cardiac ryanodine receptor (RyR2), a calcium channel localized in the sarcoplasmic reticulum membrane and largely responsible for calcium-induced calcium release and excitation-contraction coupling. Given the important roles of RyR2 in the electrical activity of cardiomyocytes and prior implications in arrhythmia, we hypothesized that RyR2 mutations lead to functional alterations of the channels and contribute to dysregulated calcium release and pathological electrical remodeling.

**Methods:** RyR2 mutations were generated using site-directed mutagenesis and expressed in HEK293 cells. [<sup>3</sup>H] ryanodine binding assay to measure the overall proportion of the open RyR2 channels in relationship to Ca<sup>2+</sup> concentration. HEK293 with inducible and stable expression RyR2 mutants were used to investigate luminal Ca<sup>2+</sup> sensitivities of the RyR2 channels.

**Results and Discussion:** In this study, we first characterized the intrinsic properties of RyR2 channels harboring ten novel mutations linked to LQTS in patients, including, S166C, H877P, R1760W, G2094S, R2824W, R2920Q, R3673W, Y4287N, V4298M, P4534S and K4594Q. Using the [<sup>3</sup>H] ryanodine binding assay to measure the proportion of the open RyR2 channels with varying Ca<sup>2+</sup> concentration, we found that the LQTS mutations cause a variable functional response of the channel, resulting in gain-, loss-of-function, or a “silent” phenotype. Next, we generated HEK293 cell lines with stable expression of LQTS-associated mutant RyR2 to investigate the sensitivity of RyR2 to luminal Ca<sup>2+</sup> load, by measuring Ca<sup>2+</sup>-overload induced Ca<sup>2+</sup> release (SOICR). We found that the LQTS-associated RyR2 mutations increased the sensitivity of RyR2 channels to activation by luminal Ca<sup>2+</sup> at high Ca<sup>2+</sup> concentration, except R2920Q. Stable HEK293 cells expression R2920Q RyR2 showed an increased sensitivity to luminal Ca<sup>2+</sup> at low Ca<sup>2+</sup> concentration. These results suggest that disease-causing RyR2 mutations, by enhancing RyR2 luminal Ca<sup>2+</sup> activation, increases the propensity of RyR2-mediated Ca<sup>2+</sup> release and the likelihood of triggered arrhythmias.

Our future directions include investigation of the effects of LQT-associated RyR2 mutations on post-translational modifications of the channel by various signaling pathways, and further characterize the opening and conduction properties of the mutant channel at the single molecule level.

## Biography



Wenxuan Cai is a DPH-3 student. She earned her BS in Molecular Biomedical Science from the Hong Kong University of Science and Technology, and her PhD in Molecular and Cellular Pharmacology from the University of Wisconsin-Madison. During her doctoral training, she developed a strong desire to be more directly involved in patient care and, thus, after receiving her PhD in 2018, she enrolled in the PharmD program at UW-Madison. During pharmacy school, Wenxuan has remained active in research and is currently working at the Cardiovascular Research Center under the supervision of Drs. Carmen and Héctor Valdivia. Her research focuses on understanding the pathogenic mechanisms underlying long-QT syndrome-associated mutations in the ryanodine receptor. Outside of the lab, Wenxuan enjoys making good food, watching video games, and collecting cats.



# A Survey of Wisconsin Pharmacists About Cannabinoid Products: Are We Ready to Recommend?

Stephen Emmerling

**Background:** In today's culture, cannabis is used for both recreational and medicinal purposes. Patients are able to obtain prescription and commercial cannabis related medications. Pharmacists should feel comfortable counseling their patients due to the increased interest and access of these products.

**Objectives:** The objective of this survey was to assess the familiarity, attitudes, and knowledge of Wisconsin pharmacists regarding cannabinoid products.

**Methods:** An anonymous, web-based survey was administered to 511 Wisconsin pharmacists using the Pharmacy Practice Enhancement and Action Research Link (PearlRx). The survey was adapted from a nationally developed survey with established validity evidence. Survey items evaluated pharmacists' knowledge of the legality, pharmacokinetic and pharmacodynamic properties of cannabis. The survey included knowledge (22 items), familiarity (14 items) and attitude (8 items) scales as well as pharmacist demographics and workplace type. Descriptive statistics, Fisher's Exact test and Cronbach's alpha were calculated.

**Results:** The survey received 99 responses (19.3% response rate). Nearly 75% of respondents were unfamiliar with the testing practices and pesticide regulations on cannabis production. Pharmacists were unfamiliar with doses related to commercially available cannabis products. A quarter reported that they counsel at least monthly on cannabis therapies, but results showed that the majority are uncomfortable with the pharmacology and pharmacotherapy of cannabinoids. Over two-thirds reported they need further education on cannabis and ranked continuing education credits and webinars as their preferred method of learning. Over two-thirds at least somewhat agreed they would feel comfortable recommending an FDA approved treatment but a similar proportion reported they would not recommend non-FDA approved cannabis treatments.

**Conclusion:** Wisconsin pharmacists require more education to fill knowledge gaps regarding the therapeutic uses of cannabinoid products.

## Biography



My name is Stephen Emmerling and I'm a fourth-year pharmacy student. I am from Sheboygan, Wisconsin but spent eight years in Illinois before starting high school. I earned my bachelor's degree in biochemistry from UW Madison in 2014. Then I spent a few years in protein manufacturing before starting pharmacy school where I found my interest in critical care. The research we performed contributes to the progression of cannabis therapies and we are excited to share the results with the world! My key to destressing is opening packs of Pokémon cards, board games, and playing Stardew Valley with the new multiplayer patch.

## Implementation and Impact of Advanced Practice Pharmacist into Mental Healthcare Team at Ho-Chunk Health of Wellness

Brianna Filtz, PharmD Candidate; Katelyn Johnson, PharmD Candidate; Marcus Pribyl PharmD Candidate; Kiah Weseli PharmD Candidate; Hussain Huran, PharmD, CDE; Casey Gallimore, PharmD, MS; Dave Mott, PhD, FAPhA, RPh

**Purpose:** The combination of lack of access to mental health services for rural America and the shortage of mental health specialists leave patients with undiagnosed conditions and poorly controlled mental health disorders. The shortage of mental health physicians leaves primary care physicians, for which there is also a shortage of, providing a large proportion of mental health services for patients in rural areas. Advanced Practice Pharmacists (APH) are well positioned to help fill this gap but there is no data quantifying the actual benefits from patient and provider perspectives. This project addresses this gap in literature through assessing the value of adding a pharmacist within the mental health team within Indian Health Services (IHS) in rural settings. The goal of this project is to quantify the impact of adding mental health pharmacists to the mental health team by analyzing impact on (1) patient satisfaction and (2) provider satisfaction within IHS.

**Methods:** A team of 4 pharmacy students collaborated with 2 advanced practice pharmacists at the Ho-Chunk House of Wellness in Baraboo, Wisconsin to gain an understanding of the services provided by APHs and their roles within the mental healthcare team. To gain an understanding of the satisfaction from the patient's and provider's perspective of the role of APH, survey questionnaires based on the 5 point likert scale were drafted based on the aims of the project, then compared and finalized with validated satisfaction surveys published in current literature. Patient participant lists were developed from each APH who practices at the Ho-Chunk House of Wellness using a computerized system. Survey collection was completed through a secure and anonymous electronic system. The researchers then evaluated the level of patient satisfaction by calculating the average scores from the surveys.

**Results/Conclusions:** Data collection and analysis is currently ongoing and results will be presented at a later date.

### Biographies



My name is Brianna Filtz. I grew up in Cedarburg, WI. I am currently attending UW-Madison as a PharmD class of 2022 candidate and am also in the rural health named option in the school of pharmacy. My pharmacy interests include small-town community pharmacies and rural critical access hospitals. My interests outside of school include waterskiing, kayaking and cross-country skiing.



My name is Katelyn Johnson. I lived in Janesville, WI until I was 10 years old and then moved to Arizona but have now found my way back to Wisconsin. I earned my Bachelor of Science degree at Northern Arizona University and am now attending the University of Wisconsin- Madison School of Pharmacy. I am part of the Rural Health Named Option through the School of Pharmacy as I have always had an interest in practicing pharmacy in an independent community pharmacy. My interests outside of pharmacy include running, hiking, and reading.



My name is Marcus Pribyl. I grew up in Denmark, WI. I am currently attending UW-Madison as a PharmD class of 2022 candidate and am also in the rural health named option in the school of pharmacy. My pharmacy interests include rural pharmacy practice and pharmacy management. My goal is to own my own pharmacy clinic someday to expand access to rural patients. Outside of pharmacy I enjoy watching and playing sports, board games, and working in agriculture.



My name is Kiah Weseli. I grew up in Hudson Wisconsin, in the St. Croix Valley. I earned my Bachelor of Science degree at the University of Wisconsin - River Falls. I am now attending the University of Wisconsin - Madison as a PharmD class of 2022 candidate, with an emphasis of rural health. My pharmacy interests include in independent retail pharmacy, and pharmacy in rural settings. My interests outside of pharmacy practice include downhill skiing, kayaking, and hiking.

# Risk Factors for Acute Kidney Injury after the Use of Antibiotic Loaded Bone Cement in Orthopedic Surgery – a Retrospective Case-control Study

Darina Georgieva

**Background:** As the number of joint replacement surgeries continues to rise, so does the number of joint infections. Many patients end up needing the implantation of antibiotic loaded bone cement (ALBC) to treat their infection. The use of localized high dose vancomycin, tobramycin, and gentamicin may be linked to acute kidney injury (AKI) in certain patients. Our hypothesis is that patients who developed AKI after receiving a joint spacer had a predisposition to AKI due to other comorbidities, high antibiotic doses in ALBC, immunosuppression, or the use of other nephrotoxic drugs pre-op. These patients may need close monitoring of their renal function and serum antibiotic levels after surgery.

**Methods:** We performed a chart review of 428 patients who underwent an orthopedic surgery that involved insertion of ALBC at our institution between 2015 and 2018. We excluded patients under age 18, those who had antibiotic irrigation only, trauma patients, non-arthroplasty surgeries (such as fractures and debridement of deep wounds), and patients with missing data for 30 days after the surgery. We identified 57 patients who fit our inclusion criteria and received a bone cement spacer or beads to treat an infection of the hip, knee, shoulder, or ankle. We matched patients who had AKI to 2 patients who did not have AKI. Matching was based on age ( $\pm 5$  years), joint operated on, and antibiotics used.

**Results:** 15 patients showed an elevated serum creatinine level of over 1.2 within 30 days of surgery. 86.7% of these patients were male, their average age was 64.1 ( $\pm 6.2$ ) years old, 40% had hip surgery, 46.67% knee surgery, 6.67% ankle, and 6.67% shoulder. All received vancomycin and tobramycin in Palacos bone cement. Compared to their case-control matches, these patients had more frequent use of immunosuppressive medication, a history of malignancy, a history of previous kidney disease, and obesity. The use of combined intravenous vancomycin and piperacillin-tazobactam post-operatively may also be linked to higher rates of AKI.

**Conclusions:** Immunosuppression, obesity, male gender, and history of kidney injury and cancer are factors associated with AKI after ALBC spacer implantation. Further analysis and study are needed to identify potential causation between ALBC use and AKI.

## Biography



My name is Darina Georgieva and I am currently a 3rd year pharmacy student at UW-Madison. I am completing the OTM named option and work as an ambulatory pharmacy intern at UW Health. My practice interests include specialty pharmacy, pharmacy operations/administration, and infectious diseases. In my free time I enjoy spending time outdoors with family and friends, traveling, and trying new restaurants.

## Pharmacy Students' Response to the Addition of a Synchronous Discussion within an APPE Seminar

By Brianna R Groen, 2022 PharmD Candidate, Amanda R Margolis, PharmD, MS, BCACP, Denise Walbrandt Pigarelli, PharmD, BC-ADM, Catherine Lea, RPh, BCACP, Claire Lee, PharmD, BCPS, Mara Kieser, MS, RPh, BCGP

**Objective:** Doctor of Pharmacy students at the University of Wisconsin-Madison School of Pharmacy participate in a year-long Advanced Pharmacy Practice Experience (APPE) seminar, which moved to a virtual format in 2020 due to the COVID-19 pandemic. Seminar delivery model for blocks 1-3 was asynchronous and included a pre-assignment, a 50-to-60-minute pre-recorded presentation, and a post-assessment. The delivery model for block 4 included an asynchronous 30-to-40-minute presentation with post-assessment and a 30-minute synchronous discussion. There were two seminars each block. The objective of this evaluation was to determine students' perceptions regarding APPE seminar delivery.

**Methods:** APPE students completed a baseline survey at the end of block 3 which included questions focused on understanding of content, seminar engagement and seminar delivery preference. Using a 4-point Likert scale, students responded to statements ranging from 1=not at all agree to 4=completely agree. Students completed a similar survey at the end of block 4 after seminar was altered to include synchronous discussion.

**Results:** The proportion of students completing both surveys was 87% (125/144). Students' perception of their understanding of content did not change with the addition of a discussion (mean pre=3.32, post=3.34,  $p=0.532$ ). Students rated "the time spent completing seminar assignments reasonable" higher after block 4 (mean pre=3.43, post=3.61,  $p=0.019$ ). Students felt more engaged in APPE seminar after the inclusion of a synchronous discussion (mean pre=3.02, post=3.29,  $p=0.005$ ). Students' responses increased toward agreeing that APPE seminar facilitated discussion (mean pre=2.76, post=3.23,  $p<0.001$ ) but reported preference for asynchronous presentation without discussion (62%).

**Conclusions:** The synchronous discussion created a more engaging experience and facilitated discussion. However, it did not impact student reported understanding of seminar content and students preferred asynchronous seminar.

### Biography



Third year student pharmacist at the University of Wisconsin-Madison School of Pharmacy.

# Characterization of Metabolic Changes of Activated Neutrophils to Establish Optical Metabolic Imaging as a Neutrophil Activation Identifier

Stephen Halada

## Abstract:

Neutrophils are abundant cells of the immune system responsible for responding to infections and cell injury. While the functionality of activated neutrophils relies on energetic compounds, the metabolic landscape of activated neutrophils is only just beginning to be studied.

Additionally, there is clinical need for a reliable, efficient, and non-interfering way to monitor longitudinal neutrophil activation within small cellular samples. Optical metabolic imaging (OMI) utilizes the endogenous fluorophores of the metabolic cofactors nicotinamide adenine dinucleotide (NAD(P)H) and flavine adenine dinucleotide (FAD) to monitor cellular metabolism in a nondestructive manner. Using OMI, we investigate the metabolic changes in neutrophils during activation with a variety of chemical activators, and we hope to provide evidence for OMI as a tool for detecting activated neutrophil populations.

## Biography



Stephen Halada is a senior in the Pharmacology/Toxicology program at UW-Madison. He has been involved with human neutrophil research in Dr. Melissa Skala's lab and plans to pursue a medical career focused on therapeutics and pediatrics.

## Incorporation of Student Pharmacists into a Proton Pump Inhibitor Deprescribing Telehealth Program for Rural Veterans

Sonia Bhardwaj, DPH-3; Stephanie Garvin, DPH-3; Sierra Kuehl, DPH-3; Johanna Van Epps, DPH-3; Frederick Dunkerson, PharmD; Stephanie Gruber, PharmD, BCACP; Mara Kieser, RPh; Molly Lehmann, PharmD, BCACP; Edward Portillo, PharmD

**Background:** Proton pump inhibitors (PPIs) are the most widely prescribed class of medications in the United States. Although effective for acid related disease, PPIs are often used longer than recommended. Long-term use has been associated with many adverse effects, such as micronutrient deficiencies, falls, fractures, and *Clostridium difficile* infections. Because of the adverse effects associated with PPIs, this class of medication is potentially inappropriate for older adults. Inappropriate PPI use may be especially detrimental in rural adults, as they tend to be older, sicker, and face greater financial burdens compared to their urban counterparts. In addition to pharmacists, student pharmacists are well-positioned to assist patients who are on inappropriate PPI therapy beyond the standard of care.

**Objectives:** This evaluation explores the novelty of a pharmacist and student-pharmacist directed PPI deprescribing telehealth program with the goals of (1) determining whether PPIs are appropriately prescribed in Veterans via remote student-led chart reviews, (2) identifying if a gap exists between urban and rural Veterans prescribed a PPI, and (3) assessing the feasibility of integrating student pharmacists into the PPI deprescribing process utilizing telehealth visits through a pilot study.

**Methods:** This project was conducted in three phases as outlined by the objectives listed above. Four third-year doctor of pharmacy students with a team of pharmacist preceptors evaluated 170 Veterans with PPI prescriptions. Students conducted chart reviews and evaluated Veteran PPI appropriateness. After chart reviews were completed, the percentage of rural versus urban patients on inappropriate therapy was compared using statistical analysis. A pilot call study was then conducted in rural Veterans on inappropriate PPI therapy as identified by the chart review process. The practicality of the pilot call study was assessed by measuring the proportion of Veterans willing to participate, time spent calling Veterans by students, and outcome of PPI deprescribing. Both the chart review process and pilot call study utilized the Madison VA PPI deprescribing algorithm.

**Results:** Data collection and analysis is ongoing.

**Conclusion:** Data collection and analysis is ongoing.



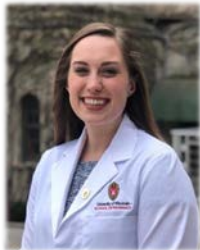
## Biographies



My name is Sonia Bhardwaj, and I am a third-year pharmacy student at the University of Wisconsin-Madison School of Pharmacy. I am also a student in the Rural Health Named Option program. Throughout the Rural Health curriculum and beyond, I have learned about the use of dissemination science to implement evidence-based practices in the clinic setting. I am interested in getting more involved with pharmacy-driven primary care services in the community or institutional setting beyond graduation. I hope to serve the needs of underserved populations, including rural communities, by working to improve transitions-of-care and increase access to services that help patients manage their chronic conditions in the outpatient setting.



My name is Sierra Kuehl, and I am a third-year pharmacy student here at the School of Pharmacy. I am currently a student in the Class of 2022 rural health named option. Throughout the course of this 2-year program, a longitudinal project is completed, with the focus being on rural populations of patients. This program has made it clear that working as a rural pharmacist is something that I am aiming for in the future. Beyond graduation, I am interested in pursuing clinical pharmacy in a rural setting.



My name is Stephanie Garvin, and I am a third-year pharmacy student in the UW-Madison School of Pharmacy, Rural Health Named Option. Throughout pharmacy school, I have become interested in learning how pharmacists integrate new services into their practice that benefit the health of their community. My main interest is in tobacco cessation and lung health. After graduation, I plan to work in an independent, community pharmacy in a rural area with the hopes of increasing access to health in rural communities.



My name is Johanna Van Epps and I am a third-year pharmacy student in the Rural Health Named Option at UW-Madison's School of Pharmacy. I grew up in Wild Rose, a small rural town in central Wisconsin. Outside of rural health, I'm interested in managing drug therapies for heart health and substance use disorders. I plan to pursue a residency after graduation and am open to practicing in both community and institutional settings at this time. As a future pharmacist, I'm most excited to collaborate with other members of the healthcare team and form meaningful relationships with my patients.

# Integration of a Student Pharmacist in the Workflow of a Proton Pump Inhibitor Deprescribing Program at a Rural Veterans Affairs Clinic

Anna Lattos, DPH-3, Erica Wagner, PharmD, BCACP, Ed Portillo, PharmD, Mara Kieser, MS, RPh, Stephanie Gruber, PharmD, BCACP

## **Background:**

Proton pump inhibitors (PPIs) are commonly used for the management of gastroesophageal reflux disease (GERD), prophylaxis/treatment of GI ulcers/bleeds, and in combination for treatment of *Helicobacter pylori*.<sup>1,2,4</sup> The Food and Drug Administration (FDA) and the American Gastroenterology Association (AGA) advise short-term length of therapy for these indications.<sup>3</sup> However, it has been found that PPI prescriptions are renewed for long-term therapy without appropriate indications.<sup>7,8</sup> Risks of long-term PPI use have been described in the literature, and yet remain overprescribed.<sup>1,2,5-8</sup> Therefore, the opportunity exists to explore models to ensure patients on PPIs require continued use. The primary objectives of this project were developed to reflect the integration of a student pharmacist into a PPI deprescribing service. Objectives included (1) developing tools and resources required to guide the student pharmacist, (2) designing processes to complete service initiatives in a rural setting, (3) evaluating clinical pharmacist specialist (CPS) time saved through incorporating the student pharmacist.

## **Methods:**

The student met with the CPS in September 2019 to discuss the model of incorporating a student pharmacist into the PPI deprescribing service. A chart review was conducted by the student on 92 patients currently on PPI therapy and receiving care at a rural outpatient clinic affiliated with the William S. Middleton Veterans Affairs (VA) Hospital. A report was run by the CPS to identify this panel of patients that were considered to be on long-term therapy PPI therapy. Patients included were those who had an active prescription of a PPI for greater than 30 days with more than 2 refills. The VA PPI deprescribing algorithm protocol was used by the student to assess for inappropriate PPI use. Calls were completed by the student November 2019 – March 2020 alongside the CPS. The primary outcomes of this project were to design, implement and evaluate a model integrating a student pharmacist within the primary care clinic to support a PPI deprescribing program. Project deliverables included the percentage of patients on inappropriate PPI therapy and of those eligible, the number of patients deprescribed and visits/time needed to complete the tapering process for these patients.

## **Results:**

The population management initiative conducted by the student found that 53/92 (58%) patients were on long-term PPI therapy for an inappropriate indication. The most common inappropriate long-term use of PPIs was treatment of uncomplicated GERD in the subset of rural Veterans reviewed (44/53 = 83%). Of the 53 patients who were on long-term PPI therapy for an inappropriate indication, 10 were contacted and 9 of these patients were willing to trial PPI tapering. Of the 9 patients that enrolled in the service, 2 patients completed PPI tapering, 4 patients were still in progress, and 3 patients stopped trial due to return of symptoms. The

average time for patients that completed a PPI taper was 8-9 weeks (4-5 encounters). It is estimated that the integration of a student pharmacist in this service saved the pharmacist an average of 45 minutes per taper trial.

### **Conclusions:**

Veterans who are on long-term PPIs for inappropriate indications are open to trials of tapering these medications. In its early stages, the project has demonstrated the benefit of designing processes for a student pharmacist to complete service initiatives in reaching rural patients. Student pharmacist outreach to eligible rural Veterans with pharmacist oversight provides a unique opportunity to achieve deprescribing therapy in an effective and efficient manner in the ambulatory care setting. Future directions of this project are to package this service into other pharmacists' and clinics' workflows to help reach more patients while also facilitating student learning.

### **Biography**



Anna is fourth-year pharmacy student at the University of Wisconsin School of Pharmacy

# Synthesis and Characterization of Potential Antigenic Opioid AGEs

Mason McGuire

**Abstract:** Advanced glycation end-products (AGEs) are biomarkers of advanced disease states and ageing. AGEs are present in diabetes and cancer patients, those with atherosclerosis, smokers, and patients with end-stage renal disease. These AGEs accumulate irreversibly over time and result in negative health effects related to loss of protein function and immune responses against AGEs, which in turn results in inflammation. Having recently identified anti-oxycodone and anti-hydrocodone antibodies in the serum of lower back pain (LBP) patients using chronic opioid therapy, we hypothesize that small molecule drugs such as opioids become immunogenic through formation of AGEs. If opioid-based AGEs are formed, it is possible that they could contribute to the pathology of LBP by causing excess inflammation and pain, lowering the efficacy of opioid-based pain management. Excess pain prompts higher dosing of opioids, potentially causing more AGEs, inflammation, and pain, ad infinitum. Given that we have not yet identified the antigenic species that may promote formation of these antibodies, we aim first to investigate the practicality of opioid AGE formation via the Amadori rearrangement of Schiff base intermediates involving various biologically relevant carbohydrates. This will be done using organic synthesis, purification, and analytic approaches. Such intermediates are typically formed from reaction of terminal amines of lysine residues with sugars, but the simplicity of the chemical requirements for formation of Amadori products, and subsequently, AGEs (an open-chain sugar, an amine, and acid/base catalysis) provides for innumerable substrates to be able to undergo the reaction, making the etiology of AGE accumulation complex. We have generated analytical standards for detection of drug-associated AGEs through the reaction of a suite of biologically available sugars with the amine groups present in nicotinic and opioid molecules. Should formation of opioid AGEs be plausible, we seek to assess opioid AGE reactivity with endogenous proteins under biologically relevant conditions. Ultimately, assessment of this reactivity may be applied through use of baseline markers of endogenous immune response to opioids to predict subsequent responses to opioid vaccines in clinical development.

## Biography



Hello! I am Mason; I am a junior majoring in Pharmacology and Toxicology here at the School of Pharmacy. I joined the Wenthur Lab in spring of 2019. I started in the lab studying endogenous anti-opioid antibodies in patients with chronic lower back pain. Since publishing that study, I have moved on to studies of the chemistry of advanced glycation end-product formation. I am excited to pursue a career in research and I am privileged to work in my lab with passionate people pioneering a new generation of research where all ideas are welcome, “untreatable” patients are served, and new methods in data collection, presentation and collaboration are shattering precedents. I plan to attend graduate school in fall of 2022 to continue to perform research in the realm of the life-sciences. For fun, I am an avid runner and also have my private pilot’s license, so you have probably seen me circling the isthmus in a plane at some point. I play bass and a little bit of piano and guitar in my free time, and I love to foster cats to keep me company.

## Analysis of Cannabidiol (CBD) in Nonprescription Consumer Products for Cannabinoid Content Consistency, Label Accuracy, and Stability.

Owen Miller

**Purpose:** CBD products remains largely unregulated in the US. Unlike the Rx formulation of CBD [Epidiolex<sup>®</sup>], little information is available regarding labelling accuracy (does the product contain what the label says it does), lot to lot variability, nor long-term product stability. Understanding these properties are fundamental if these products are to be used in patients with epilepsy, where product variability of traditional AEDs has been suspected to result in inadequate seizure control. Therefore, we analyzed commercial CBD products, including oils, aqueous products (i.e. beverages), and various other products for cannabinoid content vs label claims and stability under United States Pharmacopeia (USP) standards.

**Method:** Samples were diluted and analyzed by HPLC for CBD, THC, and Cannabinol (CBN) concentrations in order to assess product label accuracy. Products with <90% of label claim CBD were denoted over-labeled, products with >110% of label claim CBD were denoted under-labeled, and products between 90% and 110% of label claim CBD were denoted appropriately labeled, per USP standards.

**Results:** Among commercial CBD Oils (n=11), mean CBD concentration vs label claim was 91.56% [95% CI, 66.02%-117.10%], although 18.18% of oils (n=2) made nonspecific label claims of “hemp extract” in lieu of CBD. Among all oils, 36.36% (n=4) were appropriately labeled, another 36.4% (n=4) of all oils were under-labeled, maximum 128.3% label claim, and finally, 9.09% (n=1) of oils were over-labeled. The remaining 18.18% (n=2) of oils lacked specific CBD label claims, minimum of 0.3 mg CBD per 1 ml “dose”. Among aqueous products (n=21) tested, only 66.67% (n=14) gave specific CBD label claims, with mean CBD concentration vs label claim of 59.93% [95% CI, 38.24%-81.63%]. Only 7.14% (n=1) of aqueous products with a label claim were appropriately labeled, 14.29% (n=2) were found to be under-labeled, and 78.57% (n=11) over-labeled. Aqueous product CBD concentrations vs label claim varied widely, from undetectable to 115.38% of label claim. THC was detected in 23.81% (n=5) of the aqueous products tested, maximum THC concentration of 0.0005% w/v. “Other” products (n=7) tested ranged from chocolate bars to transdermal patches. Some “Other” products (n=3) gave specific CBD label claims, with mean CBD concentration vs label claim of 67.01% [95% CI, 0.87%-133.14%]. Among these “Other” products with specific label claims, 33% (n=1) were appropriately labeled, and 66.67% (n=2) were over-labeled, with CBD concentrations vs label claim ranging from a minimum of 39.30% to a maximum of 101.99%. The remaining 57.14% (n=5) of “Other” products tested made nonspecific CBD label claims, denoting CBD content in terms of “full spectrum hemp extract” or “activated cannabinoids”. One such product was labeled with a “40 – 50 mg CBD” range instead of a single, specific value. Finally, THC was detected in 71.43% (n=5) of all “Other” products tested, though none exceeded a THC concentration of 0.0047% w/w.

## Biography



Owen Miller is third year pharmacy student at the UW-Madison School of Pharmacy. He is originally from Kentucky but came to Wisconsin to obtain his Bachelor of Science degree in Biochemistry here at UW-Madison. He currently works at UW-Health as a Pharmacy Intern, where he will also complete his fourth year as an APPE-RT student. His strong interest in research, particularly in the field of Neurology, is a result of being able to work under Professor Barry Gidal to complete multiple projects focused on Cannabidiol, Epilepsy, and potentially novel drug interactions. He hopes to further pursue research in his pharmacy career, either in academia or in clinical trials and drug development.

# Characterizing Medication Management and The Role Of Pharmacists In Caring For People Living With Cystic Fibrosis: A Work System Approach

\*Grace Nixon<sup>1</sup>, BS, 2023 PharmD Candidate, Olufunmilola Abraham<sup>1</sup>, PhD, MS, BPharm, Sarah LeMay<sup>1</sup>, BS, 2022 PharmD Candidate, Andrew T. Braun<sup>2</sup>, MD, MHS, Catherine A. Decker<sup>2</sup>, PharmD, BCACPS, Lisa Szela<sup>1</sup>, BS

## Institutions:

1. School of Pharmacy and Administrative Sciences, University of Wisconsin-Madison- Madison, WI
2. School of Medicine and Public Health, University of Wisconsin-Madison, WI

**Contact Email:** [ganixon@wisc.edu](mailto:ganixon@wisc.edu)

**Background:** Cystic fibrosis (CF) is an autosomal recessive genetic disease requiring complex, lifelong medication regimens. Given the importance of medication in CF treatment, pharmacists are vital CF care team members in the care of people living with CF (PwCF).

**Objectives:** This study aimed to (1) define patients' CF medication experiences and educational needs and (2) investigate the CF outpatient clinic and community pharmacist's role in addressing patient challenges.

**Methods:** A work systems approach informed by the Systems Engineering Initiative for Patient Safety (SEIPS) model was used to characterize knowledge and perception of CF medication regimens, educational modalities, and pharmacist interactions for PwCF. Semi-structured interviews were conducted with adults living with CF at a CF center clinic. Data analyses identified relationships between themes in the data and four SEIPS work system domains: tasks, tools and technology, person, and environment.

**Results:** Thirty PwCF interviews highlighted four themes regarding healthcare experiences: (1) medication use experience, (2) medication education needs, (3) disease experience, and (4) pharmacist and pharmacy interactions. Patients reported complex medication regimens leading to challenges with medication adherence, although the benefit of treatment was recognized. While a high level of disease-state knowledge was identified among participants, PwCF desired to learn about CF medication benefits and side effects through credible sources using multiple modalities. Many reported a benefit of pharmacist involvement in their care.

**Conclusions:** Pharmacists are well-positioned to support PwCF in adherence, medication regimen management, and medication education. Opportunities exist for growth in these supportive roles of a pharmacist in both community and outpatient clinic settings.

## Biographies



Grace Nixon is a second-year Pharm.D. candidate at the University of Wisconsin-Madison School of Pharmacy. She received her Bachelor of Science degree in Topical Studies-Rural Health Studies from the University of Kentucky, where she investigated the modification of pre-pharmacy curriculum to inspire and prepare students for rural pharmacy practice early in their educational careers. Currently, Grace enjoys actively engaging as a member of Collaborative Research on MEducation use & family health (CRoME) team under the direction of Dr. Olufunmilola Abraham, with a research focus on pharmaceutical care in cystic fibrosis and family-centered opioid medication safety interventions. Grace is interested in pursuing a career in ambulatory care or inpatient pharmacy, with a particular interest in serving underserved populations.



Sarah LeMay is a third-year pharmacy student at the University of Wisconsin Madison. She earned a Bachelor of Science in Biology from St. Norbert College. She currently works in the ambulatory department as a pharmacy technician for UW-Health. She started doing research in January 2019 and has since gained valuable experience in learning about teen and adolescent perspectives of safe opioid use. Her current research focuses on pharmacist intervention in the care of patients with cystic fibrosis. She joined the CRoME team to learn about how patients want to be educated on medications and disease prevention, something she hopes to translate to her future pharmacy practice.



# Retrospective Review of Heparin-Induced Thrombocytopenia Testing in Pediatric Patients at an Academic Medical Center

Nick Olszewski

Heparin-Induced Thrombocytopenia (HIT) is a life-threatening, immune-mediated adverse drug reaction. The incidence of HIT in the pediatric population is significantly less than in adults, leading to a lack of evidential support in how to diagnosis and treat HIT in pediatrics. This encourages interpretation and extrapolation from adult guidelines; in this case, the guidelines recommend using clinical and laboratory evaluation to diagnose HIT. The clinical evaluation is characterized using the 4T score, a validated clinical risk stratification tool for HIT. It numericizes the risk of HIT based on four categories: extent of thrombocytopenia, time since initiation of heparin, presence of thrombosis, or other causes of thrombocytopenia. The score is useful to estimate the likelihood of HIT and if further diagnostic workup is needed for diagnosis. The laboratory portion of diagnostics includes the anti-PF4 heparin enzyme-linked immunoassay (ELISA), which is an assay that can aid in the diagnosis of HIT. This test has a high negative predictability but may also provide false positive results. Another test, the serotonin release assay (SRA), is the gold standard for diagnosing HIT due to its high sensitivity and specificity; however, this test has a longer result time and is more expensive than the ELISA test. A review of currently available adult literature suggests a significant decrease in laboratory testing and decreased drug costs when both clinical and laboratory findings are evaluated prior to laboratory testing. The purpose of this study is to collect and assess data related to the current process of diagnosing HIT in pediatric patients in order to evaluate need for a guideline-directed approach.

A retrospective data review was conducted in pediatric patients who were subject to HIT testing between 2016 and 2020. A patient list was established, and a manual chart review was conducted to reveal the indications and dosages of heparin, types of HIT laboratory tests ordered, and the respective results. Finally, a retrospective calculation of what the patient's 4T score would have been prior to laboratory testing was recorded. Analysis of the data will be used to evaluate the current process of diagnosing HIT in pediatric patients.

Of the 26 total confirmatory laboratory tests, retrospective 4T scoring indicated that 11 patients were at an intermediate risk for HIT and 15 patients were at low risk. Out of those 11 intermediate risk patients, only one child tested positive for the Heparin-Induced Platelet Antibody, confirming the diagnosis of HIT in that child. Of the 15 patients at low risk, 0 tested positive for the Heparin-induced platelet antibody. If the 4T scoring were in place, it would have prevented 58% of patients from undergoing unnecessary laboratory testing. This evidence suggests utility in stratifying the testing for HIT in pediatrics by a 4T score

Additional study and data review are warranted to assess statistical significance of 4T score risk evaluation in pediatrics. A multi-institution study would provide an adequate sample size to assess the stratification of the diagnosis of HIT with clinical and laboratory methods. Institutions

may consider protocol modification or clinical practice guideline implementation to enhance appropriate laboratory testing of HIT in pediatrics.

### **Biography**



Nick is a 3rd year Pharmacy Student at the University of Wisconsin, School of Pharmacy. He did his undergraduate pre-requisite coursework at UW-Madison; and has worked at UW Health for the past 5 years as a student technician and now intern. In this role, he has developed an interest to conduct research alongside UW Health pharmacists and residents to improve the understanding and evolution of pharmacy care at this institution.

## Illustrating Access To Community Pharmacies In Wisconsin

Look KA, Dekeyser C, Conjurske S, et al. Illustrating access to community pharmacies in Wisconsin [published online ahead of print, 2021 Feb 17]. *J Am Pharm Assoc (2003)*. 2021;S1544-3191(21)00072-8. doi:10.1016/j.japh.2021.02.004

### Abstract

#### Objectives

Community pharmacists also play a vital public health role in increasing access to health care services and information during times of public health crisis. To examine access to community pharmacies in Wisconsin and the relationship between pharmacy locations and primary care health professional shortage areas (HPSAs).

#### Methods

A list of licensed pharmacies in Wisconsin was screened to identify community pharmacies. Rural-urban commuting area codes were used to classify the rurality of pharmacy locations. Descriptive measures and pharmacy location maps were used to assess access to community pharmacies in the state as well as the relationship between pharmacy locations and primary care HPSAs. Spatial analysis was conducted to estimate the percentage of the population that lives within 10-, 20-, and 30-minute drive times of each community pharmacy.

#### Results

Of the 837 community pharmacies in Wisconsin, 73 (68.5%) were located in metropolitan areas, 95 (11.4%) in micropolitan areas, 112 (13.4%) in small towns, and 57 (6.8%) in rural areas. A total of 265 (31.7%) community pharmacies were located in a primary care HPSA. The drive-time analysis found that 99.7% of the population lives within 30 minutes of a pharmacy, 98.7% within 20 minutes of a pharmacy, and 89.3% within 10 minutes of a pharmacy.

#### Conclusions

Nearly the entire Wisconsin population has convenient access to community pharmacies. Community pharmacies are ideally located in underserved areas with shortages of other health professionals, which may provide an opportunity for pharmacists to take on additional clinical roles to support health care providers and facilities in these areas.

## Biography



My name is Morgan Platta, DPH-4. I am from a small town called Waupaca, Wisconsin. I have been incredibly passionate about rural health and public health for several years prior to this opportunity to look at access to community pharmacies in Wisconsin. In my free time, I enjoy spending time with my chocolate lab, hiking, hunting, fishing, riding horses, and refinishing old furniture. I hope to own a Christmas tree farm in the future. I still don't know what I am doing after graduation, but hopefully it will be able to support my tree farm. I look forward to finding a small town to settle into and becoming part of that community.

I would also like to give a shout out to my amazing, student colleagues who made this project possible; Courtney Dekeyser, Sarah Conjurske, and Carly Bohnen.

## Addressing Medication Nonadherence in African Americans with Type 2 Diabetes: A Pilot Study of Peers LEAD

Luke J. Schwerer, Nassim R. Sarkarati, BA, MPH, Mattigan L. Mott, Martha A. Maurer, MSSW, MPH, PhD, Olayinka O. Shiyabola, PhD, PharmD

**Background:** African Americans (AAs) are 60% more likely to be diagnosed with type 2 diabetes compared to non-Hispanic whites and are more likely to experience diabetes-related complications such as stroke, chronic kidney disease and amputations. There are several reasons for these disparities including poor diabetes medication adherence. AAs are 25% less likely to take their medicines compared to non-Hispanic whites. Based on our prior focus group research among AAs with type 2 diabetes, we found that poor medication adherence was, in part, due to psychosocial factors such as their perception of medicines (e.g., concerns about side effects, doubts about the effectiveness and safety of medicines), their perception of illness and challenges communicating with providers. Perceived solutions to addressing medication nonadherence included education, support, and increased self-efficacy. Therefore, an 8-week culturally tailored intervention was developed for AAs, Peers Supporting Health Literacy, Self-Efficacy, Self-Advocacy, and Adherence (**Peers LEAD**). The Extended Self-Regulatory Model and Information Behavioral Skills Model were the theories guiding the study. Intervention participants (Peer Buddies, AAs with type 2 diabetes who self-reported having challenges with medication adherence, participated in group provider-led education and received peer support from an AA Peer Ambassador who also had type 2 diabetes but was adherent and managing their medications well.

**Objective:** The objective of this study was to pilot Peers LEAD using a single group pre/post design to evaluate the feasibility, acceptability, and preliminary effectiveness of the intervention on improving medication adherence and blood glucose levels.

**Methods:** Peers LEAD was implemented in Madison and Milwaukee. Data on clinical measures (HbA1c and blood pressure) and a questionnaire with validated psychosocial measures including medication adherence were collected prior to and one month following the completion of the intervention to examine primary and secondary outcomes. Semi-structured interviews were conducted with all peer buddies after the intervention to get their feedback on acceptability and perceptions of how the intervention affected changes in outcomes. The interviews were audio recorded and transcribed professionally. Qualitative content analysis was completed by a team of four trained researchers using an inductive open coding approach. Final themes were identified after discussion and consensus among the team and the PI.

**Results:** Twenty-one peer buddies completed Peers LEAD with support from 16 peer ambassadors matched by age ( $\pm 20$  years) and gender. Of the buddies, the majority were female ( $n= 13, 62\%$ ), with a mean age of  $56 (\pm 8.7)$  years and a mean length of diabetes diagnosis of 10 years ( $\pm 7.3$ ). Results demonstrate moderate improvements in the primary outcome of medication adherence (effect size of 0.35) and HbA1c (low effect size of 0.14 but a trend towards change). There were also moderate effects in the secondary outcomes including less negative

diabetes beliefs (effect size of 0.38) and increased recognition of the necessity of diabetes medicines (effect size of 0.30). Peer buddies reported a change/reinforcement of their beliefs about diabetes and diabetes medicines. As well, themes showed an improvement in knowledge about diabetes, diabetes self-management behaviors, communication with healthcare professionals, and social support.

**Conclusion:** Results from this pilot trial demonstrate the preliminary effectiveness and acceptability of a culturally tailored intervention to address medication adherence for AAs with type 2 diabetes. Qualitative results confirm the quantitative outcomes and demonstrate the need to incorporate psychosocial factors in the implementation of medication adherence interventions for AAs. Peer buddy interviews indicate the necessity of peer support, increasing patient self-efficacy to improve provider communication skills, and addressing illness perceptions for diabetes self-management among AAs. Future research is needed to evaluate the sustained effects of the intervention over time, specifically for the HbA1c measure which represents a three-month average of a person's blood glucose.

## Biographies



Luke Schwerer- Luke is a Doctor of Pharmacy Candidate 2023. Luke joined Dr. Shiyanbola's lab during the Summer of 2020 after his first year of pharmacy school. He joined the lab as a way to stay engaged during the COVID-19 pandemic. As a student with career goals within the field of Global Health, Luke values the opportunity to engage with individuals in under-served communities. Luke deeply appreciates the focus of Dr. Shiyanbola's work on culturally unique patient populations and how to improve access to care. Luke also really enjoys being able to work with fellow classmates in this smaller group setting. Aside from his schoolwork and research, he enjoys playing trumpet, exercising outside, and traveling.



Nassim Sarkarati- Nassim is currently a Doctor of Pharmacy candidate, Class of 2023, with a Master of Public Health (MPH) degree. She joined Dr. Shiyanbola's lab in spring 2020 after attending her lecture regarding public health in the pharmacy practice. Nassim appreciated that Dr. Shiyanbola's work combined both her passion of pharmacy and public health by focusing on community health promotion and health literacy. After graduating, Nassim hopes to become a clinical pharmacist working in a clinic or hospital setting while intertwining public health. Before, she was not sure how to bring the two topics together, however, Dr. Shiyanbola's work showed Nassim the path to do so. Aside from school, Nassim enjoys teaching yoga as a way to find balance in her life while connecting to the community around her. Finally, Nassim loves walking and spending time with her dog, Scout.

# A Longitudinal Survey Studying The Effect Of Psychosocial And Interpersonal Factors On Medication Adherence In Blacks With Type 2 Diabetes

Bailey E. Stevenson\*, Deepika Rao, BPharm, M.S., Olayinka O. Shiyanbola, PhD, BPharm

University of Wisconsin-Madison School of Pharmacy, Social and Administrative Sciences Division—  
Madison, WI

Contact email: [bstevenson2@wisc.edu](mailto:bstevenson2@wisc.edu)

**Background/Purpose:** Despite new interventions for medication adherence, Black patients continue to have lower rates of adherence than whites. Medication adherence is a dynamic process that changes as an individual's social and environmental context changes and must be evaluated over time. The study objective is to examine the role of key psychosocial and interpersonal factors in Black patients' medication adherence and evaluate changes over time.

**Methodology:** An explanatory sequential mixed methods design is being used, comprising of surveys at baseline and 1-year follow-up, followed by an interview. We applied the Integrated Theory of Health Behavior Change, theorizing that patients are adherent if they embrace beliefs consistent with their adherence behavior, develop self-regulation abilities to change their adherence behavior (psychosocial), and experience social support encouraging their adherence (interpersonal). The questionnaire included self-reported measures of medication adherence (Adherence to Refills and Medication Scale-Diabetes), psychosocial constructs – illness and medication beliefs (Brief Illness Perception and Belief about Medicines Scales), self-efficacy (Self-efficacy for Appropriate Medication Use Scale), and depressive symptoms (Patient Health Questionnaire-9). Interpersonal constructs – social support (Diabetes Care Profile Social Support), and patient-provider communication (Patient Perceived Involvement in Care Scale), as well as sociodemographic/clinical factors were also assessed. Convenience sampling was used to recruit English-speaking adults with type 2 diabetes who self-identified as African American/Black through a community pharmacy chain in Milwaukee. Surveys were mailed or phone-administered to eligible participants (n=232) and responders received follow-up surveys. Descriptive, mean differential, and bivariate correlational analyses were conducted on initial baseline survey data. Follow-up response analysis is being completed.

**Results:** Currently, 64 initial responses and 30 follow up responses (47% response rate) have been received. On average, participants were about 59 years old (SD = 11.76), took two oral medications and had three chronic illnesses. Majority of the participants were female (77.4%), had a high school education or less (74.2%), and had poor or fair self-reported health status (54.8%). Overall, the sample reported good medication adherence at baseline (Mean=15.31, SD=4.51) and high self-efficacy (Mean=31.42, SD=8.23). Participants with different levels of education differed on their perceptions of illness ( $F(8,53)=2.57, p<0.05$ ), and the necessity of medications ( $F(8,53)=2.95, p<0.05$ ). Illness perceptions significantly differed among people who took  $\leq 2$  diabetes medications and  $\geq 5$  diabetes medications ( $F(8,53)=2.57, p<0.05$ ). Negative perceptions of diabetes were significantly correlated with higher necessity ( $r=-0.27, p<0.05$ ) and concern ( $r=-0.41, p<0.01$ ) beliefs regarding diabetes medications, lower adherence ( $r=0.30, p<0.05$ ), and higher depressive symptoms ( $r=0.47, p<0.01$ ). Lower adherence was significantly correlated with higher depressive symptoms ( $r=0.25, p<0.05$ ). Follow up results are forthcoming.

**Conclusion:** Baseline results show negative diabetes perceptions was an important psychosocial factor for medication adherence in Blacks with diabetes in this study. Significant relationships were found between necessity and concern beliefs in medicines, health literacy, and depression. There was also a significant relationship between adherence and depressive symptoms. Results of follow-up surveys will be used to evaluate changes in medication adherence and the effect of psychosocial and interpersonal factors over time. The results of this study may be used to design medication adherence interventions, tailored to important psychosocial and interpersonal factors among Blacks with diabetes.

## Biography



Bailey is a third-year pharmacy student who has been working with the Shiyabola Research Group for 2 years. She was drawn to join the lab after learning about the major health disparities in Black patients and was looking for a way to help. This project focuses on adherence to diabetes medicines in Blacks. Outside of the research lab, Bailey works in 2 different pharmacy settings and spends her extra time with friends and family!



# Evaluating Non-IHS Health Insurance Coverage Among Ho-Chunk House Of Wellness Patients

Presenters: Taylor Hauser\*<sup>1</sup>, Jenevieve Van Order\*<sup>1</sup>,

Preceptor: Hussain Harun<sup>2,3</sup>

Faculty Preceptors: Ed Portillo<sup>2</sup>, David Mott<sup>4,5,6</sup>

PharmD Candidate 2021<sup>1</sup>, PharmD<sup>2</sup>, CDE<sup>3</sup>, PhD<sup>4</sup>, FAPhA<sup>5</sup>, RPh<sup>6</sup>

Ho-Chunk House of Wellness- Baraboo, WI

Contact Email: [jvanorder@wisc.edu](mailto:jvanorder@wisc.edu)

**Background/Purpose:** American Indian/Alaska Natives (AI/AN) enrolled in federally recognized tribes and their descendants qualify for Indian Health Service (IHS) insurance coverage, and can also enroll in insurance outside of IHS, termed billable health insurance (BHI), which can help improve access to care, while also saving IHS facilities money. The percentage of AI/AN patients that have BHI coverage is low, even after implementation of the Affordable Care Act (ACA). The purpose of this project is to determine the proportion of AI/AN and descendant patients at Ho-Chunk House of Wellness (HOW) without BHI, calculate total IHS dollars spent on clinic visits for those without BHI, and determine common thoughts about and barriers to BHI enrollment through staff surveys.

**Methodology:** An evaluation was completed of the Ho-Chunk House of Wellness clinic's current process for collecting BHI information and helping AI/AN and descendants enroll in BHI. Clinic claims from the 2019 calendar year (approximately 30,036 lines of data) was evaluated to calculate proportion of patients without BHI coverage and total dollars spent on patients without BHI, as well as other baseline data. Staff surveys were created to evaluate perceptions of BHI, potential barriers to enrolling in BHI, and willingness to either learn more about BHI or participate in a project to attempt to improve AI/AN and descendant patient BHI enrollment.

**Results:** The authors found that 30.8% of AI/AN patients at HOW did not have BHI coverage and accounted for \$472,155.91 used for clinical services. Of the 21 employees surveyed, 85.7% agreed or strongly agreed that patients benefit from BHI, 95.2% agreed that increasing rates of BHI will save HOW money, and 28.6% of employees agreed or strongly agreed that they would be comfortable answering questions from patients about obtaining BHI. The majority of employees (61.9%) answered that they would be willing to be part of a project to increase patient awareness and education about BHI.

## **Conclusion:**

Nearly half a million dollars was spent by the HOW to cover clinical care for AI/AN patients that did not have BHI coverage. This is money that the HOW could have saved and utilized to provide additional services to IHS patients. The majority of employees working at the HOW see the benefit of BHI for patients and the HOW, but are not comfortable answering patient questions regarding enrolling in BHI. The authors conclude that the HOW would likely benefit from increasing BHI rates as well as employee and patient BHI education.

## Biographies



Jenevieve (Jenny) Van Order is a 4th year pharmacy student and part of the inaugural class of the Rural Health Program. Jenny has a strong interest and dedication to working in tribal communities and hopes to start a career with Indian Health Service (IHS) or a tribal clinic upon graduation. Outside of pharmacy, her hobbies include spending time with friends and family (especially her 5 nephews and 1 niece), gardening, watching the Packers/Brewers/Badgers, going for walks, and cooking.



Hi there! My name is Taylor Hauser, and I am a fourth-year pharmacy student. I am from a small town of just 500 people in northern Wisconsin. I love spending my free time outdoors, and my favorite outdoor activities include hunting, fishing, swimming, kayaking, and \*trying\* to waterski. After graduation, I plan to move back to the Northwoods and work at a community pharmacy. I hope to use my pharmacy education to help rural Wisconsin residents live their healthiest lives.

# Characterizing the Implications of the Epithelial-To-Mesenchymal Transition in Pancreatic Adenocarcinoma on the Tumor Microenvironment

Nate Verhagen

**Background:** Pancreatic ductal adenocarcinoma (PDAC) continues to have a dismal prognosis due to its treatment-resistant tumor microenvironment (TME) and metastatic potential via epithelial-to-mesenchymal transition (EMT). Macrophages are the most abundant cell type within the TME and play pivotal roles directing tumor growth, metastasis, and therapeutic resistance. Specifically, M2 macrophages which can be polarized via MCSF-1 signaling are associated with immunosuppression and worse overall survival. A deeper understanding of how EMT can alter critical signaling pathways raises potential for improving the dismal response rate in PDAC.

**Methods:** Pancreas and ascites fluid-derived tumors were obtained from the *LSL-KrasG12D/+;LSL-Trp53R172H/+;Pdx-1-Cre* (KPC) murine model, and spheroid lines were established from their respective tumors. Well-characterized spheroid lines were engrafted into B6 mice and formed tumors. Primary tumors, spheroids, and allograft tumors were stained using H&E and immunohistochemistry (IHC) for E-cadherin, vimentin, arginase-1 (Arg-1), inducible nitric oxide synthase (iNOS), and alpha smooth muscle actin ( $\alpha$ SMA). The production of macrophage colony stimulating factor-1 (MCSF-1) and transforming growth factor beta (TGF- $\beta$ ) by the spheroid lines was analyzed by western blotting. The RNA expression levels of six key cytokines were compared across spheroid lines using qPCR.

**Results:** IHC analysis validated an EMT phenotype of higher vimentin and lower E-cadherin expression in the primary lesion of the mouse with ascites-fluid disease; in addition, the EMT phenotype was identified in the generated spheroids and subsequent allografted tumor lines from this mouse. Western blotting of the spheroids further confirmed EMT in the ascites-fluid spheroids. H&E and brightfield images of organoids recapitulated similar nuclear pleomorphism, nuclear-to-cytoplasmic ratio, and organization as the primary tumor from which they were generated. IHC staining of the respected primary and allografted tumors demonstrated equally abundant M2 macrophages (Arg-1), sparse M1 macrophages (iNOS) and less organized and reduced myofibroblasts ( $\alpha$ SMA) in the line engrafted from the ascites-fluid spheroids. Western blot analysis of PDAC spheroids identified greater MCSF-1 and TGF- $\beta$  production in spheroids that underwent EMT. Additionally, qPCR exhibited three cytokines differentially expressed in EMT PDAC cells (TGF- $\beta$ , IL-6 and IL-10;  $p < 0.01$ ).

**Conclusion:** EMT status is maintained *in vitro* as PDAC spheroids and reconstituted *in vivo* to allow for a greater understanding of its role in the microenvironment. PDAC spheroids that underwent EMT exhibited increased cytokine production in signaling pathways associated with worse prognosis. Further characterization of EMT is necessary to explore the potential of exploiting these differences therapeutically.

## Biography



I am a fourth-year undergraduate student in the Pharmacology - Toxicology program at the University of Wisconsin-Madison. I work in the lab of Dr. Dustin Deming investigating immunotherapy in pancreatic cancer with a focus on the tumor microenvironment. Research has been a cornerstone throughout the Pharmacology - Toxicology curriculum and has positively impacted my own research; it has surrounded me with peers and faculty that have challenged me to expand my scientific knowledge. Following graduation, I will join the Medical College of Wisconsin - Milwaukee Class of 2025, where I will be working towards a medical degree. I am intrigued by the possibility of incorporating cancer research into my future occupation and am thankful for the opportunities offered by the School of Pharmacy that have nurtured my growth along the way.