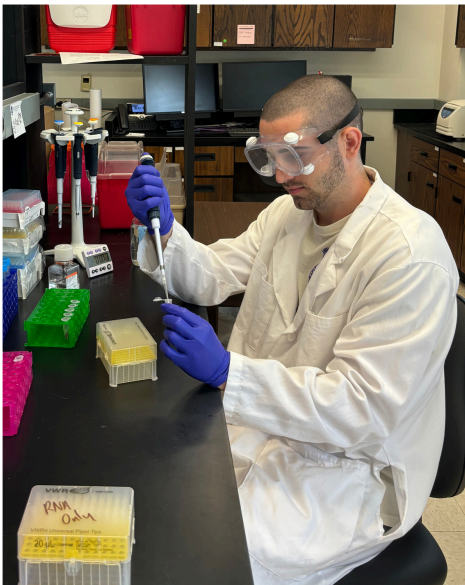


EAST CAROLINA UNIVERSITY

27th ANNUAL

MEDICAL STUDENT SCHOLARSHIP FORUM

JULY 2024
ABSTRACT BOOK



Acknowledgments

The Brody School of Medicine Summer Scholars Research and Distinction Track Programs would like to express sincere gratitude to the following individuals and participating faculty of the following departments for their support of the 2024 Program. Those listed provided financial support for student stipends, research resources, and/or administrative support for the 2024 Summer Immersion and Medical Student Scholarship Forum. These generous contributions make it possible for BSOM students to learn and make their own contributions to the field of medicine through scholarly pursuits.

Rosemary B. Allen Summer Scholars Research Fund

Dr. Davis Allen III, BSOM Class of 2006

Nitin Gupta Research Endowment

Dr. Nitin and Mrs. Mousami Gupta

John and Ann Laliotes LINC Scholars Endowment

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Health System Transformation & Leadership Distinction Track

Program Director: Weili Chang, MD

Reducing Unsuccessful Intubation Attempts in the Neonatal Intensive Care Unit

Authors: Isaac Asemota¹, MS; Meredith Chanas², PharmD, MSCR, BCPPS

Affiliations: ¹LINC Scholar, Brody School of Medicine, East Carolina University, ²ECU Health Maynard Children's Hospital

Background: Each time a healthcare provider tries to intubate a newborn and fails, that newborn is more likely to experience life-threatening medical complications. The largest contributing factor to unsuccessful intubation attempts is lack of experience. Unfortunately, providers cannot gain experience without first being inexperienced, so the contributing factor of inexperience cannot be eliminated. However, it may be possible to substitute instruction for experience through the use of standard operating procedures. By designing and implementing procedural guidelines and pre-made order sets, this project aims to increase the percent of successful first-try intubation attempts from 39% to 49% in ECU Health's neonatal intensive care unit within 3 months.

Methods: The PDSA (plan, do, study, act) cycle methodology will be used to measure the impact of interventions and adjust them accordingly. The intervention will consist of the creation and implementation of standardized procedures and pre-made order sets. It will take place in ECU Health's neonatal intensive care unit and will include all newborns intubated in the unit. The team implementing the intervention will consist of Uduak Akpan, MD, FAAP, C-ELBW (Neonatologist), Meredith Chanas, PharmD, MSCR, BCPPS (Pharmacist), Brandy Davis, BS, RRT-NPS, ACCS (Respiratory Therapist), Lindsey Gieselman, MSN, RN, NNP-BC (Nurse Practitioner), Mary Iwaszewski, DO (Neonatology Fellow), and Jessica Yelverton, MSN, RN, NNP-BC (Nurse Practitioner). The number of unsuccessful intubation attempts will be the outcome variable measured.

Results

Work in progress

Conclusion

Work in progress

A Look at the Social Determinants of Health of Williamston, North Carolina

Authors: Grant Brown, Michael McFayden

Affiliations: LINC Scholars, Brody School of Medicine, East Carolina University

Background: Social determinants of health are non-medical circumstances that impact an individual's health outcomes. This may include factors such as socioeconomic status, safety, education, food access, infrastructure and more. This project will explore these determinants in the context of Williamston, North Carolina, with a specific focus on the environment and safety.

Methods: The primary active portion of this project involved performing some background research before traveling to Williamston to conduct research in person. The trip to Williamston entailed a walk around the town, observing aspects such as the city's infrastructure, as well as local businesses, including healthcare offices. To get a better understanding of the town, we interviewed several residents. The first interview was with the owner of a local coffee shop, B-mocha Coffee Shop. The second interview involved asking questions of a group of firefighters at their station. The third interview was with a pharmacist, at the Piggly Wiggly pharmacy.

Results: Many strengths and weaknesses of the town were illuminated by this project. The population's access to healthcare is the most glaring social challenge that Williamston faces. On August 3rd, 2023, Williamston's only hospital, Martin County General Hospital, permanently closed. Since its closure, all but one primary care office closed their doors in Williamston. This closure became a prominent topic in nearly all of our research and interviews, as its impacts have been felt in many aspects of the town's social determinants of health. Overall, many of the town's residents gave differing opinions regarding the state of Williamston, thus displaying the complexity of assessing an entire town's social determinants of health within one project.

Discussion: Although the focus of this study was Williamston, many of these issues are generalizable across the region of eastern North Carolina. These problems need to be addressed directly at both at a local and state level, in order to improve the health and well-being of the town of Williamston, as well as similar towns that constitute eastern North Carolina. Future research should look more in depth at how Williamston compares to the rest of the state of North Carolina in various metrics regarding the social determinants of health.

Investigating Vasopressor Therapy Administered by Pitt County EMS Personnel

Authors: Noah Holcomb¹, Roberto Portela, MD, FAEMS, FACEP²

Affiliations: ¹LINC Scholar, Brody School of Medicine, East Carolina University, ²ECU Emergency Medicine, Assistant EMS Medical Director, Pitt County, ECU EMS Fellowship Program Director.

Background: Hypotensive shock can be caused by conditions such as trauma, myocardial infarction, and sepsis. Treatment is usually in the form of a vasopressor such as epinephrine or norepinephrine. Last year, Pitt County Emergency Medical Services (PCEMS) changed their standard hypotensive shock and sepsis treatment from epinephrine to norepinephrine. Since this change PCEMS personnel have received feedback from physicians that they are overusing norepinephrine. The initial goal of this project will be to establish if norepinephrine is being overused by PCEMS personnel. If it is, the goal will be to reduce the number of PCEMS calls where norepinephrine is inappropriately used by 20% within 6 months of implementing a new educational program.

Methods: First, we will review all EMS calls where norepinephrine has been used since the protocol change. We will compare the data collected from these calls to the existing protocol. This will determine if norepinephrine was used correctly or not. Then we will look at arrival actions in the emergency department to see if norepinephrine was continued or discontinued, and if any other acute interventions were administered. The number of calls with the correct use of norepinephrine and hospital continuation will be compared to the number of calls with incorrect norepinephrine use and hospital discontinuation. If norepinephrine has been consistently overused, we will implement a county-wide education program. After the education roll out, we will repeat our measurements over a 6-month period to determine the success of our intervention. The success, or failure, of the education program will determine our next steps.

Results: This project is ongoing. No results as of this time.

Conclusion: This project is ongoing. No conclusions as of this time.

Assessing the Social Determinants of Health in Chocowinity, North Carolina

Author: Saba Ijaz, MS2

Affiliation: LINC Scholar, Brody School of Medicine, East Carolina University

Background: The social determinants of health (SDOH) are the non-medical factors that greatly affect health care outcomes. The Office of Disease Prevention and Health Promotion identifies five domains for the SDOH including economic stability, education access and quality, health care access and quality, neighborhood and built environment, and social and community context.¹ When compared to the nation as a whole, rural communities not only face more inequalities but are also more vulnerable to the SDOH.² It is important for medical education to incorporate the SDOH into its curriculum in order to meet the goals of the Quintuple Aim.³ Windshield tours are interesting ways to actively conduct a community assessment. This method can help to assess the needs of a community and to understand the physical, social, and economic components of a community.⁴

Purpose: A windshield tour was conducted to assess the impacts of the SDOH on the citizens of Chocowinity, North Carolina. There was a targeted focus on the social determinants of education and health care access.

Results and Observations: The findings of the windshield tour were documented through photographs and interviews with community members. The population of Chocowinity, North Carolina is 749.⁵ 41.7% of residents have completed high school and 10.8% have a bachelor's degree or higher.⁶ There are three schools in Chocowinity: Chocowinity Primary, Chocowinity Middle, and Southside High School. This tour focused on Southside High School. A 2023 school profile report showed that from a class of 96 graduates, 32% intended to go to a 4-year college/university, 48% intended to go to a 2-year community college, 13% enlisted in the military and 7% intended to enter the workforce. The profile also reported that the Southside High School offers three AP courses (English Language and Composition, English Literature and Compositions, and US History).⁸ The 2023 NC School Report Card shows that only 9.2% of students took the AP exam and 38.5% received a passing score of 3 or higher. 30.8% of students had an ACT of 19 or higher. The overall school rating for 2023 is C.⁷ Interview with a rising 11th grade student revealed that Southside is overall an enjoyable school to attend. It was reported that the counselors are very helpful and support students in whatever pathway they choose. The student also revealed that ACT prep classes are offered to students, and she plans on taking advantage of this opportunity. There is also an opportunity for students to take college classes at Beaufort Community College. This student does state that the school culture is "sports center", and she would like more opportunities for those students who are interested in the arts. There is one Family Medicine clinic that is associated with ECU Health, one dental office (Angie S. Rhodes, DDS), and one pharmacy (O'Neal Drug Store). There is one EMS station that is heavily relied on by the community for health care and transportation. Interview with EMS staff revealed that Chocowinity EMS transports around 1000 patients yearly to appointments. Staff also revealed that due to recent budget cuts, they will lose around 9 full-time members and will only have one EMS truck available.

Conclusion: There is strong evidence to suggest that social determinants have major impacts on health outcomes. One study shows that they can affect up to 50% of health outcomes.⁹ For this reason it is important for organizations such as ECU Health to invest resources in communities such as Chocowinity. As a major institution, ECU could work with Chocowinity schools to offer tutoring services, especially for preparation of AP exams and the ACT. ECU can also hold workshops to mentor high school students and encourage them to pursue a college education. ECU Health can also improve the health of Chocowinity by filling in the transportation gaps resulting from the EMS budget cuts.

Investigating Housing and Employment as Social Determinants of Health in Grifton, NC

Author: Thomas Grant Irons, III

Affiliations: LINC Scholar, Brody School of Medicine, East Carolina University

Background: As part of the Healthy People 2030 initiative, the Office of Disease Prevention and Health Promotion defines social determinants of health (SDOH) as “the conditions in the environments.... that affect a wide range of health, functioning, and quality-of-life outcomes and risks.”¹ The initiative grouped SDOH into 5 domains, for the purposes of this project we investigated economic stability and the built environment. Specifically, we set out to learn more about housing and employment in Grifton, NC. Home ownership in Grifton exhibited a sharp decline in 2020, dropping from ~55% to ~40% in just one year. Currently, home ownership in Grifton is 38.4%, with 55.2% of homeowners having a mortgage.² Grifton has a population of 2,617 citizens and is located on the border of Pitt and Lenoir counties in eastern North Carolina. The town has a median income of \$34,609 and a poverty rate of 27.8%.² A large majority of the population commutes outside of town for work with an average commute time of 28.4 minutes.² Many of these individuals travel to Greenville, while others travel to outlying towns such as Kinston, or to manufacturing plants in the surrounding countryside. There are ~1,100 employed individuals in Grifton. This figure declined ~10% from 2021 to 2022.²

Assessment: To further investigate SDOH in Grifton, NC we conducted a “windshield tour” and spent an afternoon in town, on foot. We documented the town's infrastructure and conducted interviews with town citizens.

Need: After collecting our observations we have identified the most significant areas of need in Grifton, NC are employment and housing. The most significant barrier to employment appears to be transportation. Anecdotally, there is a large portion of the impoverished community without access to a car. There is no public transportation in Grifton, and much of the population is uninformed on how to access ECU Health transportation services. Due to the timing of the decline in home ownership, one may hypothesize that the COVID-19 pandemic played a role, but this is merely speculation. In addition to this decline, we gathered anecdotal evidence of predatory leasing practices.

Future Directions: Moving forward, the exploration of transportation initiatives is most needed. Citizens report being unable to travel to work and access health services. There are few job opportunities within the town, and zero physicians that treat adults. There is one pediatrics office. This severe lack of physician services is another avenue to explore. Furthermore, the sharp decline in home ownership is cause for investigation.

NICU Early Discharge: A Process Improvement

Authors: Michael McFayden¹, Jacqueline Brady NNP², Lindsey Gieselman NNP², Mary Iwaszewski DO², and Uduak Akpan MD²

Affiliations: ¹LINC Scholar, Brody School of Medicine, East Carolina University, ²ECU Health Division of Neonatology and Newborn Medicine, East Carolina University

Objective: The goal of this project is to improve NICU discharge rates to increase patient throughput and develop a standard for discharge within the department. Over the course of 9 months, aim to have 60% of our discharges occurring by 2pm on discharge day. Accomplishing this goal will lead to timely discharge for families and increased bed availability for incoming patients.

Methods: Our project is utilizing a series of PDSA cycles to target three key discharge processes. The first of these targets is to determine a standard discharge time. The established timeframe is now to request that family members arrive by 9 AM for necessary preparations with a target discharge time of 12 PM. Secondly, we revised the car seat testing policy from the initial requirement of completion within 24 hours of discharge to allow for testing to take place at any time as long as the patient meets other medical pre-requisites. Lastly, we have developed a discharge checklist and algorithm to streamline the discharge requirements amongst all providers within the unit.

Results: Data regarding our progress has mostly been reviewed in the form of run charts in relation to three categories: discharge orders placed before 12 PM, patients discharged before 2 PM, and discharge occurring within 2 hours of order placement. We have seen some improvement in the number of patients discharged by 2 PM, increasing from approximately 35% in March 2024 to 50% by June 2024. There were times in which this rate reached our goal of 60% in April and May but was not maintained. We are struggling more with order related metrics as rates of discharge within 2 hours of orders have remained steady between 40 and 55 percent. We have also seen swings in the rates of discharge orders being put in before 12 PM, beginning with 55% in March 2024, increasing to 75% in April, and coming back to their baseline in June.

Next Steps: We are approximately 2-months into a 9-month timeline. We can achieve our end goal of 60% discharge by 2 PM but have difficulty maintaining it. We are struggling when it comes to our process measures related to timeliness of discharge orders, but these do not always correlate with improved discharge times. A discharge algorithm that includes all processes needed for discharge will be implemented in the next PDSA cycle to target these gaps.

Decreasing Outpatient Times for Pediatric Specialty Care Clinic Visits

Authors: Alissa Meyerhoffer¹ and Jennifer Sutter

Affiliations: ¹LINC Scholar, Brody School of Medicine, East Carolina University, ²ECU Health Pediatric Specialty Care Clinic, Brody School of Medicine, East Carolina University

Patient Navigation Experience

Care Experience Setting: Aim to reduce the time patients spend during an appointment at the ECU Health Pediatric Specialty Care Clinic.

Touchpoints:

- Check in with staff at the front desk and wait in the waiting room
- Nurse takes the patient's vitals and gains a brief understanding of the medical history and medications
- Physician discusses the nurse encounter and proceeds with their encounter with the patient
 - The physician encounter includes a history, physical exam, assessment, and plan
- Patient visits the outpatient laboratory for blood draws and imaging (if needed)
- Patient checks out at the desk and schedules a follow-up appointment

Care Givers and Role: The ECU Health Pediatric Specialty Care Clinic consists of a large interprofessional team. Staff at this clinic include specialty care physicians, fellows, residents, nurses, check-in and check-out staff, and phlebotomists.

Missed Opportunities: Extra time spent waiting in the examination room between touchpoints often results in more time spent in the clinic. This not only leads to decreased patient satisfaction, but also prolongs the time before children can return to school following their doctor appointment.

Ideas for Improvement: Time spent in the outpatient clinic can be decreased by limiting the time spent in the waiting room and the time spent between touchpoints. This can be achieved through more efficient communication processes and lab draws that can occur between touchpoints. For example, a diabetic patient needs an A1C lab every three months. If the chart indicates it is time for another A1C lab, this could be performed between taking vitals and the physician encounter.

Positive Actions and Hospitality: This specialty clinic has a friendly staff consisting of strong office and nursing support. Additionally, the office is organized to contain multiple specialty offices and is decorated in a child-friendly manner.

Social Determinants of Health in Bethel, NC

Author: Abby Ulffers

Affiliations: LINC Scholar, Brody School of Medicine

Background: Social determinants of health are widespread and impactful in Eastern North Carolina and beyond.

Purpose: The purpose of our windshield tour assignment was to immerse ourselves into the community of Bethel, NC and gain an understanding of what barriers exist for the population that lives there. We researched general social determinants of health and focused specifically on education and spiritual health.

Methods: Prior to visiting Bethel, we researched the town and demographic information. We scheduled a meeting with a church member to gain firsthand insight on the spiritual health of the community and mapped out locations we wanted to drive and walk by. We planned our trip for a Tuesday afternoon and began with a meeting with Rose Parker, a member of Bethel Baptist church. Our conversation focused on spiritual health in Bethel, education, access to health care, health food options, and Bethel's changes over the course of her lifetime. Following our meeting, we drove through Bethel to photograph and document businesses, healthcare facilities, and community engagement opportunities

Results and Observations: The community members that live in Bethel have many opportunities for engagement with the Rotary club, senior center, and youth center. In addition, there are 11 Christian churches located within Bethel suggesting ample opportunity for Christian worship and religious involvement. The closest places of worship for other religions are all located in Greenville. Although there are many places to build community in Bethel, there are not many opportunities for physical health and well-being. There are no primary care offices or grocery stores resulting in individuals having to travel to Tarboro, Robersonville, or Greenville for groceries or health care services. On a positive note, there is a dentist in town to provide local dental care.

Conclusions: Bethel is a close-knit community with high levels of religious engagement. Two major determinants that were identified were the absence of formal grocery stores and primary care offices. The only sources of groceries in Bethel are Family Dollar and Dollar General making it difficult for community members to access fresh produce and health food options. There is one school in Bethel, Bethel Elementary that educates PK through 8th grade. Beyond elementary school and middle students must attend North Pitt High School which is outside the Bethel city limits. There are several action items the city of Bethel could adopt to help reduce social determinates of health within the community. First, opening a grocery store in Bethel that primarily stocks fresh produce, meats, and healthy foods would improve dietary intake of the community members and increase overall health. Expanding Bethel Elementary school to be a Pre-K through 12th grade school would decrease the number of students commuting outside the city limits for schooling. Lastly, ECU Health establishing a rural primary care clinic in Bethel would improve health outcomes by increasing access of community residents to medical care.

Medical Education & Teaching Distinction Track

Program Directors: David Eldridge, MD & Kacie Lord, MAEd

Students' Asynchronous Lecture Viewing Habits and Their Relationship to Student Performance

Authors- Isabel Elssner¹, David Gilbert², MD, Dmitry Tumin³, PhD

Author affiliations ¹MET Scholar, Brody School of Medicine, East Carolina University, ²Director of Clinical Skills for Medical Education, Department of Family Medicine, Brody School of Medicine, East Carolina University, ³Assistant Dean of Clinical and Educational Scholarship, Brody School of Medicine, East Carolina University

Idea: The purpose of this study will be to retrospectively analyze how the timing of when students watch asynchronous lectures impacts exam grades of first- and second- year medical students at the Brody School of Medicine (BSOM).

Need/Rationale: At BSOM, lectures are available to be viewed in-person or asynchronously via recordings. Nationwide it has been found that 37.0% of medical students “almost never” attend lecture and this trend has only been increasing due to factors like COVID (Huerta et al., 2023; Wu et al., 2021). While these asynchronous lectures allow for student autonomy in their studying, it has also decreased attendance and many professors worry that it is decreasing the socialization among medical students (Bridge et al., 2009; Franklin et al., 2011). Many studies have already been conducted on the resources that medical students use to study, but there have been few on how medical students use these resources and how that effects their performance on exams.

Methods: The sample will include first- and second- year medical students at BSOM over the past three years. To investigate this question, Panopto online lecture data will be organized and compared to de-identified exam grades. The viewing habits to be analyzed are when throughout the day students are starting their lectures, total views, total time spent watching lectures, and the percent who start watching the lectures in the last week before an exam to investigate any bingeing or cramming behaviors.

Evaluation Plan: The data will be analyzed using a linear regression model to determine if there is a statistically significant relationship between students' asynchronous lecture viewing habits and their exam grades.

Potential Impact: If there is a statistically significant relationship between students' asynchronous viewing habits and their exam grades, then future medical students can be advised on how to best utilize the asynchronous lectures as a resource, and the data could create a metric to check-in on struggling students and intervene if their viewing habits are not beneficial.

Simulation Modules for the Identification of Heart Murmurs: Supplementation of a Heart Murmur Flipped Classroom

Authors: Hunter J. Geneau, BS¹, Philip J. Boyer, MD, PhD², Walter C. Robey III, MD^{3,4}, Rebecca M. Gilbird, MPH⁴

Affiliations: ¹MET Scholar, Brody School of Medicine, ²Department of Pathology and Laboratory Medicine, ³Department of Emergency Medicine, ⁴Office of Clinical Simulation, East Carolina University

Idea: Since the transition to pass/fail STEP 1 grading, medical schools across the country have seen a decrease in student performance on both STEP 1 and on rotations in the M3 and M4 year.^{1,2} Historically, the cardiology section has been one of the most underperforming sections on internal, Brody made exams, and STEP 1. One aspect of the cardiology section assessment is knowledge of heart murmurs and congenital heart disease. On STEP 1, students will have questions where they need to identify a heart murmur from a clinical vignette, or possible audio or ultrasound clip. Supplemental simulation may help students to practice hearing and visualizing murmurs and better relate them to clinical questions.

Rational: The purpose of this project is to explore the need for supplemental resources in the cardiology unit at the Brody School of Medicine and understand if there is a difference in auscultation or ultrasound in helping students identify heart murmurs.

Methods: Students will attend a flipped classroom on congenital heart defects and heart murmurs that is part of the normal M2 curriculum. Then students will complete a pre-test with clinical scenario questions focused on identifying heart murmurs. Students will then voluntarily attend a simulation using a SAM II Auscultation Manikin by Cardonics and a Point of Care Ultrasound machine by Simbionix, where they will be able to practice auscultating heart murmurs and visualizing them on an ultrasound machine. After completing the module students will then complete a post-test with questions similar to the pre-test.

Evaluation Plan: Pre and post-test data will be compared using a paired T-test to evaluate if the implementation of the simulation helped in student's ability to answer questions.

Potential Impact: The potential impact of this implementation is to help students better conceptualize heart murmurs and relate the sound and appearance of a murmur to a clinical scenario question that may appear on Brody exams and STEP 1. The hope is that the simulation will ultimately aid in improving student performance, at least on this aspect of the cardiology section.

The Implementation of Sexual Assault Education for Second Year Medical Students

Authors: Vedika Modi

Affiliation: MET Scholar, Brody School of Medicine, East Carolina University

Idea: To ensure that all students can have the tools and experience to properly treat patients who have experienced a sexual assault (SA) in an empathetic and non-traumatizing manner, a hands-on program will be developed to teach second year medical students (M2s) about SA treatment and forensic collection.

Need/Rationale: SA impacts over 460,000 people in the US annually. One out of six women and one in thirty-three men have been victims of SA. 94% of SA victims have symptoms of PTSD after their assault. Due to the widespread nature of SA in the US, students should be prepared to conduct forensic collections on SA patients and collect a pertinent medical history on patients in a trauma informed manner (TIM).

Methods: This program will be a required clinical practice session for M2 students, structured similarly to sessions that the Brody School of Medicine routinely implements. This program will have an hour-long didactic session about SA and trauma informed care (TIC), proper interviewing skills, and forensic collection procedures. This information will then be practiced in a standardized patient interview and a simulated forensic collection on a low fidelity pelvic model. This study will use a mixed methods design to determine student knowledge and comfort level surrounding TIC and SA.

Evaluation Plan: This study will utilize a quantitative and a qualitative evaluation approach to determine overall knowledge on the subject of SA and their comfort level and self-efficacy to treat a SA patient in a trauma informed manner (TIM). Students will complete a pre-test and a likert scale test assessing their current knowledge and comfort about SA, TIC, and forensic collection. After successful completion of the session, students will take the same tests to determine if the intervention was successful in improving student knowledge, comfort, and self-efficacy on the listed topics.

Potential Impact: This program has the potential to bring awareness to the need for TIC for SA patients and allows students to practice skills used in SA treatment in a safe environment with instructor feedback. By completing this program, future doctors should be able to reduce the risk of re-traumatization in SA patient care.

Medical Education Factors That Impact Intent to Practice Rural Medicine

Author: Dylan Pressnell¹, Dmitry Tumin, PhD², Kori Brewer, PhD³

Affiliations: ¹Medical Education and Teaching Distinction Track, Brody School of Medicine, East Carolina University, ²Academic Affairs, Department of Pediatrics, Brody School of Medicine, East Carolina University, ³Department of Physiology, Department of Emergency Medicine, Brody School of Medicine, East Carolina University

Idea: To aid medical schools in promoting rural medicine, this project aims to illuminate which factors, if any, exist within the medical education curriculum that impact a student's willingness to practice rural medicine in the future. This phenomenological study hopes to discover themes within medical education that either positively or negatively influences one's likelihood to pursue medicine in a rural area.

Need/Rationale: Current disparities exist within the intersection of rural America and the healthcare system, with eighty percent of rural-designated areas (population clusters of less than 2,500 people) being medically underserved. One of the driving forces for these disparities is a shortage of physicians which contributes to longer distances for care as well as less accessible care overall. Institutions have made efforts to combat this problem, such as government interventions which provide financial incentives or loan forgiveness in certain states, as well as medical schools through favoring applicants which have stated they wish to practice rural medicine or are statistically most likely to practice rural medicine (applicants from rural areas). Despite these efforts, disparities still exist with only eleven percent of physicians practicing in rural areas while one out of every five Americans live in a rural-designated area. Surprisingly, this issue is worsening, with as little as 3.5% of matriculants stating they would like to practice in a rural area in the future. Even more surprisingly is that this number is nearly halved to 1.9% by the time medical students reach graduation.

Methods: This will be done through individual interviews of medical students across all points of progression in medical school as well as medical residents across various specialties, with an emphasis in specialties that have a rural presence. Questions will target how individuals define and view rurality and rural medicine. Along what trajectory they become interested or disinterested in rural medicine, and what factors caused them to have their current stance.

Evaluation Plan: Answers from interview questions as well as survey questionnaire will be contrasted amongst those who have a current interest in rural medicine against those who previously but no longer have an interest in rural medicine. Themes between the two cohorts will be sought after to evaluate factors that causatively impact intent to practice in a rural setting.

Potential Impact: The results of this study could have large implications as medical schools may promote factors which encouraged students to work towards rural medicine while simultaneously reevaluating factors that discouraged a path towards rural medicine.

Service-Learning Distinction Track

Program Director: Jennifer Crotty, MD

Youth Substance Use in Pitt County

Author: Kaitlyn Baxter

Affiliations: SLDT Scholar, Brody School of Medicine, East Carolina University

What? The role of this project is to determine the current statistics of substance use in adolescents within Pitt County. The current knowledge about substance use in the youth population in Pitt County is outdated.

So What? Youth drug abuse is a high public health concern, with at least 1-in-8 teenagers abusing an illicit substance in the last year. From the National Center for Drug Abuse Statistics, the number of overdose deaths in individuals aged 15-24 years old has quadrupled over the last 20 years. Marijuana and alcohol are the most abused substance among teens and young adults. The CDC states that high-risk drug use in youth increase the likelihood that they will engage in risky behaviors that can drastically affect their health and academic performance. Schools, parents, families, and community organizations can help prevent high-risk drug use, both individually and working together.

Now What? Updated statistics about youth substance use will allow for PCCSU to host a Youth Summit in the spring of 2025. The main focuses of the Youth Summit are on youth empowerment, mental health, education on substance use, and parent resource fair. The PCCSU strives to achieve a community of youth who reject substance use and educate their peers on the risk of substance misuse and prevention strategies. With the knowledge of what is occurring amongst the youth within this community allows for adequate resources to be provides to parents to encourage an open conversation with their children about substance use.

Centering Births Childbirth Education

Authors: Madison Kendrick, MS¹, Karlene Cunningham, PhD²

Affiliations: ¹SLDT Scholar, Brody School of Medicine, East Carolina University, ²Department of Psychiatry and Behavioral Medicine, Brody School of Medicine, East Carolina University

What? Centering Birth Childbirth Education is a community-based education program, working with underserved populations. The program consists of 3–25-minute sessions weekly on essential topics: Medical Terminology and Stages of Labor, Comfort Measures: Moving Beyond Medicine, and Emotional Readiness. Participants will receive a resource list covering local lactation consultants, local pelvic floor therapists, and online based support groups.

So What? Engagement with childbirth education is low across all ages but especially among communities of color. A study conducted by Evidence Based Birth revealed that only 53 percent Hispanic, 58 percent Black, and 61 percent White nulliparous women will take a childbirth education class. Greenville, North Carolina offers one public childbirth education class via ECU Health Main Hospital at a cost of \$75 which can still be prohibitive to parents of low socioeconomic status. Furthermore, childbirth education can support initiatives of the American College of Obstetrics and Gynecology, such as teaching birthing persons coping skills to be used in early labor supporting the recommendation that admission into labor and delivery is delayed in the latent phase.

Now What? The childbirth education sessions will be 25 minutes per topic with an interactive activity to be completed in the clinical space to remove the barrier of transportation. The goals are to provide fundamental knowledge to promote readiness and confidence, bridge the gaps between conversations with healthcare workers and birthing persons by providing tools of learning and advocacy, and minimize barriers to access of childbirth education specifically targeting cost and transportation. Patients will be assessed to complete a satisfaction and brief review survey and receive handouts that further support their education.

Establishing The Joy Community Center and Soup Kitchen Clinic

Author: Christopher Lovick, MS

Affiliations: SLDT Scholar, Brody School of Medicine, East Carolina University

What? Joy Community Center and Soup Kitchen fights food insecurity by providing meals to the Greenville community, largely serving our unhoused population. HealthAssist, an arm of the local non-profit organization Access East, provides services to meet the medical needs of the uninsured. They have partnered with Joy to provide toiletries, medical supplies, clothing, and support with navigating our health care system to our unhoused population during Joy's operating hours. In addition to providing these services, Access East and HealthAssist plan to open a clinic at the community center.

So What? The CDC reports that the rate of visits to hospital emergency departments by persons experiencing homelessness increased from an estimated 141 visits per 100 persons per year during 2010–2011 to 310 during 2020–2021. Visit rates for persons experiencing homelessness were higher than rates for persons not experiencing homelessness in all years. The National Low Income Housing Coalition states that housed people use the ED at the same rates as unhoused but sheltered people while unhoused and unsheltered people use the ED at a much higher rate. They believe that sheltered unhoused people use the ED more than unsheltered unhoused people because there are social workers, other resources, and even clinics at shelters that unsheltered people do not have access to. This new clinic at Joy Community Center could help close the gap in ED usage between the two populations.

Now What? My plans for the rest of the summer and for the duration of the service-learning track is to establish a relationship with the community to improve trust via volunteering with the HealthAssist foot clinic, clarify details on the clinic start date and schedule, organize supplies for clinic start, assess and plan for clinic improvement according to its needs once it begins, and to plan to incorporate more Brody student involvement

Improving Education Disparities Experienced by Homeless Youth in Eastern North Carolina

Authors: Aundria Moss

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What? Community Crossroads Center in Greenville, North Carolina is the only homeless shelter in eastern North Carolina. On average, Community Crossroads Center has 15-school aged residents at any given time. Research has shown that children and adolescents experiencing homelessness face a variety of challenges related to their health, emotional well-being, safety, and education. Homelessness during the school-aged years, can lead to frequent school changes, difficult attending school regularly, and barriers to completing homework and studying. Without adequate intervention, students experiencing homelessness are at risk of falling behind academically, perpetuating the cycle of poverty and homelessness into adulthood.

So What? Education is a means for homeless children and adolescents to break the cycle of poverty. A solid education can be the foundation for one's future, however, housing instability creates a significant barrier to obtaining a quality education. There are currently no youth-centered service initiatives at Community Crossroads Center. Nationally 75 percent of homeless youth perform below grade level in reading, 72 percent perform below grade level in spelling, and 54 percent perform below grade level in STEM courses. According to the North Carolina Housing Coalition, the average high school graduation rate among homeless students is 69 percent. This is 12 percentage points below other low-income students and 18 percentage points below students at-large in North Carolina. Moreover, young adults without a high school diploma are 4.5 times more likely to experience homelessness in adulthood. Investing in education interventions for homeless students is not just a moral imperative, but also a strategic approach to break the cycle of poverty and housing instability.

Now What? During my time at Community Crossroads Center this summer, I have noticed that the shelter desperately needs a service project aimed at youth residents. My goal is to develop a sustainable project in which weekly volunteers tutor or assist students with schoolwork at the shelter. In the long term, I would like to establish both after-school and summer enrichment programs for children and adolescents at the shelter. I hope to create hands-on activities that will enhance gross motor, social, emotional, and intellectual development. My service initiative will not only benefit individual students and their families but also contribute to breaking generational poverty cycles.

Integrating Medical Food Pantry Voucher into HER for Increased Use

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What? Food insecurity is a growing problem in the United States as well as in North Carolina. In 2022, more than 44 million people in the United States experience food insecurity. In Eastern North Carolina's 34-county area, as of 2024, more than 560,000 people are food insecure. This number is 111,000 more than the previous year. The ECU Health Medical Food Pantry was established in 2018 by Brody School of Medicine graduates as part of their service-learning distinction track project. Currently located in Doctor's Park in Greenville, the Medical Food Pantry serves ECU Health's patient population across various clinics. Providers fill out a voucher if food insecurity is identified. Then, the patient takes the voucher to the pantry to collect a bag of food. Some clinics have pre-made bags delivered to clinic so they can be provided as needed.

So What? Currently, in order to receive a bag of food, patients must bring the voucher with them to the pantry. However, some patients experience transportation barriers in getting to the clinic for care followed by getting to the pantry. Individuals with Medicaid and Medicare have access to free transportation that will take them to medical appointments and pharmacies. Unfortunately, they do not stop at grocery stores or food pantries. Additionally, in 2023, the pantry gave away 574 bags. This number can and should be higher, but due to the voucher form not being integrated into EPIC, it can be forgotten by physicians.

Now What? One short term goal I hope to accomplish is organizing a food drive during the academic year to donate food items that are most needed and run out quickly. Currently, the food pantry staff are working on creating a SmartPhrase for EPIC that physicians can integrate into their notes. Moving forward, once the SmartPhrase is created, I will provide education to healthcare providers on how to use it and information to share with patients about the pantry. A long-term goal would be to eliminate the transportation barrier by establishing with Medicaid a transportation option to the pantry for those who need it.

Bridge to Medicine: Addressing Underrepresentation in Medicine

Authors: Julie Seung, BA, MS2

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What? Bridge to Medicine is a mentorship organization dedicated to supporting minority populations in the medical school application process. Our mission is to provide mentorship, resources, support, and a sense of community for minority students, aiming to address the racial disparities among medical professionals. Each mentee is paired with a mentor who shares similar racial or ethnic backgrounds, interests in specific medical fields, or personal experiences. Our mentees receive a monthly digital program focused on various aspects of the medical school application process, including application overviews, the MCAT, interviews, extracurricular activities, letters of recommendation, and personal statements. Additionally, mentees have the opportunity to participate in mock interviews conducted by current medical students.

So What? Research indicates that mentorship in medicine, especially for Black and Latinx students, significantly alleviates the challenges and feelings of isolation encountered during the medical application process. Underrepresented students often report a lack of mentorship as a substantial barrier when navigating the medical field. Successful mentorship programs for underrepresented students have demonstrated effectiveness in mitigating the issues of underrepresentation in medicine. Our goal is to foster a community where participants not only build strong connections with their mentors but also network with other minority applicants, thus encouraging more minority students to pursue careers in medicine.

Now What? Applications for the 2024 program cohort closed on July 20th, and we are in the process of finalizing mentor-mentee pairings. We have scheduled a cohort engagement event for August 3rd to launch the program, facilitating in-person meetings between mentor-mentee pairs and providing an opportunity for the entire cohort to connect. Over the next three years, we aim to increase awareness of our program and its resources, expanding our reach to schools beyond eastern North Carolina. Our vision is to develop a multi-state program and support network, ultimately increasing the number of minority healthcare providers and addressing healthcare disparities within minority populations.

Increasing Mental Health Services to Hispanic Migrant Farmworkers in Pitt County

Authors: Deanna Torres

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What? Access East provides comprehensive care management to 34 counties in Eastern North Carolina, allowing the at-risk population to access primary care and specialty providers. The goal has been to improve patient health outcomes and healthcare costs through programs such as Healthcare Assist and Affordable Care Act (ACA) Marketplace Navigators. Health Assist offers free and reduced healthcare services for low-income, uninsured residents of Beaufort, Greene, Edgecombe, Hertford, Martin, and Pitt counties. ACA Navigators aids individuals exploring health coverage options through North Carolina's federally funded Healthcare Insurance Marketplace. A key component of the ACA Navigators program is the Farmworker Program, which assists members of the ENC H-2A (temporary visa) farmworker community to enroll in low-cost insurance and connects them with healthcare options.

So What? Migrant workers leave their home country and arrive in rural locations to work in the fields. The rural locations create physical isolation, often miles away from grocery stores, laundry mats, and churches. Lack of transportation deprives the farmworkers of independence and isolates them to their camps. Farm owners normally transport the workers to town for their necessities, which creates a level of dependency. During the week, amid isolation, loneliness, and dealing with their medical issues the farmworkers have a greater participation in alcohol consumption/abuse. Many other social determinants of health contribute to the poor mental health of migrant farmworkers. The living conditions in the camps are not suitable and many camps have housing violations which further contribute to the deterioration of farmers' mental health. Farmworkers experience acculturative stress, isolation, strenuous work conditions, discrimination, language barriers, wage theft, and loss of control which contributes to 20-50% of farmworkers' poor mental health with high levels of depression, anxiety, and substance abuse.

Now What? The short-term goal is to provide stress management educational workshops. The longitudinal goal is to offer therapy sessions to improve farmworkers' mental health and decrease unhealthy habits such as substance abuse. To successfully provide therapy sessions, mental health professionals and interpreters will need to be recruited. Logistically, we need to arrange accessible areas, that meet confidentiality measures, and determine how frequently we can meet to provide longitudinal care.

Falls Prevention and Education in Eastern North Carolina

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What? Did you know that a fall is one of the most endangering events an older adult can face in their life? Did you know that 1 in 4 older adults reports falling each year? As Schweitzer Fellows and medical students, we are addressing falls risk in eastern North Carolina by implementing a falls prevention and education program centered at the Pitt County Council on Aging, while fostering interdisciplinary collaboration with PT.

So What? Our project is based on the Falls Cycle which consists of the following components in order: (1) the act of falling, (2) increased fear of falling again, (3) decreased physical activity, (4) decreased physical ability, (5) increased risk of falling, and repeat. We aim to address different stages of the Falls Cycle through four main community initiatives. We will continue to attend health fairs in Pitt County in order to disseminate educational materials related to falls prevention. Secondly, we lead 1-hour falls education workshops at senior centers and assisted living facilities. We also conduct four-week long, twice-weekly evidence-based A Matter of Balance classes at the Council on Aging. Lastly, we screen for Social Determinants of Health (SDOH) needs in the community and provide access to relevant resources. We utilize multiple proven measures to track our participants' progress and to meet our goals: the Falls Risk Assessment Tool (FRAT), the Activities-specific Balance Confidence (ABC) scale, the Mini-Balance Evaluation Systems Test (BEST), and a workshop survey that we created.

Now What? As of July 2024, we have conducted three falls prevention workshops in the community, 2 at community/senior centers and 1 at an assisted living facility. A total of 68 participants ages 60+ years old have attended these workshops. We have identified 12 SDOH needs and have addressed or will address these in the near future. We have also completed one four-week long A Matter of Balance course as Master Trainers, with a total of 8 participants. In the future, we hope to do the following: (1) continue to host falls prevention workshops in the community and include caregivers in these discussions, (2) conduct at least two more A Matter of Balance sessions, (3) create falls educational posters for our sites, (4) brainstorm a computer-based program that can tailor falls prevention strategies based on individual characteristics and preferences, and (5) help the Eastern NC Falls Coalition and Council on Aging plan for Falls Prevention Week in September.

Summer Scholars Research Program

Program Director: Johanna Hannan, PhD

15dPMJ2's Cytotoxic Action is not Hindered by Immune Checkpoint Inhibitors in Combined Therapy for Murine Melanoma (Preliminary Results)

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Background: Late-stage melanoma has limited treatment options and a poor prognosis. Immune checkpoint inhibitors (ICIs) have significantly improved melanoma outcomes, but only 40-60% of advanced melanoma patients respond to ICIs. There is a need for agents that increase tumor sensitivity to ICIs, allowing more patients to benefit from treatment and improving therapeutic outcomes.

15-deoxy, Δ 12,14-prostaglandin J2-ethanolamide (15dPMJ2) is a patented compound that induces melanoma cell death *in vitro* and *in vivo* by activating the endoplasmic reticulum (ER) stress pathway. 15dPMJ2 utilizes the PERK pathway of the unfolded protein response to upregulate CHOP10, a pro-apoptotic transcription factor. PERK pathway activation also promotes damage-associated molecular pattern (DAMP) expression on a tumor's cell surface, which leads to dendritic cell maturation that can trigger an adaptive anti-tumor immune response. Furthermore, 15dPMJ2 increases tumor infiltration of dendritic cells and cytotoxic T cells, which is associated with higher tumor sensitivity toward ICI therapy.

Objective/Hypothesis/Aim Statement: We aim to determine whether 15dPMJ2 cytotoxic action will be affected by ICIs in melanoma treatment. We believe that ICIs will not hinder 15dPMJ2-induced CHOP10 signaling.

Methods: Tumors were obtained from a survival study of syngeneic, immunocompetent C57BL/6 mice injected with B16F10 murine melanoma cells. Mice had been treated with either saline, IgG, 15dPMJ2, anti-PD-1, anti-CTLA-4, 15dPMJ2 with anti-PD1, 15dPMJ2 with anti-CTLA-4, anti-PD-1 with anti-CTLA-4, or all three compounds combined. Tumors were placed in formalin and embedded in paraffin blocks, then sectioned into 5 μ m-thin slices and placed on slides. Slides were de-waxed and rehydrated, and 95-100°C EDTA was used for antigen retrieval. Tissues were stained with anti-CHOP10 primary goat antibody followed by anti-goat Alexafluor 488 secondary rabbit antibody. Cell nuclei were stained with DAPI. Immunofluorescence microscopy was performed on four regions of interest for 2-3 tissue sections per primary tumor, assessing for CHOP10 positive cells via colocalization with tumor cell nuclei.

Preliminary Results: *15dPMJ2 upregulates CHOP10 expression alone and in the presence of anti-CTLA4 and anti-PD1. ICI monotherapies do not appear to increase CHOP10 expression.*

Conclusion: ICIs do not appear to hinder 15dPMJ2's cytotoxic action, though further analysis is needed. 15dPMJ2 should be further assessed for additive/synergistic apoptosis induction with ICIs in melanoma treatment.

Understanding 4-AP's Capabilities to Enhance Axonal and Glial Spinal Cord Regeneration After Injury Utilizing a Zebrafish Model

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Background: Acutely after spinal cord injury (SCI) glial cells form a barrier around the lesion protecting the area from tissue loss while also causing a barrier to regeneration.¹ A resourceful model for studying SCI is the zebrafish, as it is proregenerative and has substantial genetic commonalities to vertebrates.² Many pharmacological therapies are being studied in zebrafish and one of interest is 4-Aminopyridine (4-AP) which has previously showed enhancements to ambulation in MS patients.³

Hypothesis: 4-AP's ability to increase action potentials may promote earlier regeneration after spinal cord injury in both the glial and axonal tracts.

Methods: A complete spinal cord injury was performed on an *Tg(gfap:EGFP) x Tg(elavl3:mcherry)* transgenic zebrafish line five days post fertilization. On one day post injury, continuous dosing of E2 recovery buffer supplemented with either DMSO or 4-AP was given to an equal number of transected zebrafish and uninjured zebrafish. Utilizing the Leica Thunder System, Z stack images at 20x were taken from day of injury until five days post injury to analyze pixel intensity of the glial and axonal cell bridging progression and to ensure a complete transection. Zebrafish were fed starting day one of recovery period and multi-well plates were replenished with new recovery buffer each day.

Results: Continuous dosing of low dose 4-AP one-day post injury increased axonal cell proliferation at both the rostral and caudal sides of the lesion site as early as 2 days post injury. The 4-AP zebrafish also had narrower injury sites by the fifth day post injury seen after pixel intensity analysis. The DMSO treated zebrafish showed higher proliferation at the rostral side of the lesion site in the glial tract. The overall survival for the spinal cord injury zebrafish was 20% for DMSO and 37.5% for 4-AP.

Conclusion: In conclusion, it was found that continuous dosing of 4-AP one day post injury enhances glial and axonal cell bridging, promoting regeneration of the spinal cord in the zebrafish model. Varying dosing schedules of 4-AP and monitoring of locomotion behavior variations are needed in future studies to advance the knowledge of 4-AP's effects on spinal cord regeneration.

Impact of SARS-CoV-2 Virus on MPTP-induced PD in Mice: Behavioral Analysis

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Background or Problem Statement: SARS-CoV-2, the virus responsible for the COVID-19 pandemic, is a highly contagious virus that impacts multiple organ systems. The virus enters the body via inhalation of viral particles and then the respiratory tract through binding its spike protein to Angiotensin-Converting Enzyme (ACE2) receptor of the host cell. From there, the virus can spread to the central nervous system. To date, an accumulating amount of information implicates previous SARS-CoV-2 infection as a risk factor for Parkinson's Disease (PD). One mechanism through which SARS-CoV-2 contributes to PD is through inflammation and oxidative stress, resulting in apoptosis of dopaminergic neurons. This study will evaluate whether the SARS-CoV-2 virus will cause similar effects if contained to the respiratory tract.

Objective/Hypothesis/Aim Statement: This study aims to investigate SARS-CoV-2 infection by making mice susceptible via intranasal AAV-hACE2 then testing the sensitivity to MPTP following recovery from SARS-CoV-2 infection. The purpose is to determine whether AAV infection produces the same SARS-CoV-2 neurological effects compared to K18-hACE2 mice. We hypothesize that SARS-CoV-2 viral entry by AAV-hACE2 will have no effect on MPTP-induced PD.

Methods: An MPTP mouse model is used to mimic the suspected effects of the SARS-CoV-2 virus on brain tissue. MPTP administration results in the production of superoxide radicals, producing oxidative stress and apoptosis of dopaminergic neurons. Adeno-associated virus (AAV) will be administered to the mice, causing ACE2 receptor expression in the lungs alone, isolating infection to the respiratory tract. Seven days post-AAV, mice will be given either intranasal PBS or intranasal SARS-CoV-2. On Day 30 post-intranasal administration, mice will be injected with either saline or MPTP, yielding four different groups of mice: Mock-Vehicle, Mock-MPTP, SARS-Vehicle, and SARS-MPTP. On Day 36 post-intranasal administration, behavioral testing, including Open Field, Y Maze, Rotarod, and O maze, will occur until Day 40.

Results: No statistically significant difference was evaluated between any of the four groups for any of the behavioral testing.

Conclusion: These findings were not anticipated. As this study is in progress, the next steps are to section mice brains and stain for markers of AAV, SARS-CoV-2, dopaminergic neurons, and microglia. Further investigation could include repeating experiments to determine if similar results are yielded.

Exploring dopamine receptor and beta-2-adrenergic receptor signaling in modulating the expression of MMPs and TIMPs in human cardiac fibroblasts

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Background or Problem Statement: Beta-blockers are used to inhibit β -adrenergic signaling that consequently lower heart rate and contractility, culminating in lower blood pressure. Dopamine has long been implicated in cardiovascular disease, with its receptors in cardiac tissue have been pharmacological targets for congestive heart failure. Although the interaction between these two signaling pathways has been shown in cancer cells, their relationship in cardiac fibroblasts remains unknown.

Objective/Hypothesis/Aim Statement: The objective of this study is to understand whether there is crosstalk between β 2 and dopamine D1 receptors, as well as any effect on the expression of matrix metalloproteinases (MMPs) and tissue inhibitor metalloproteinases (TIMPs). Understanding the interaction between these two signaling pathways can provide deeper insights into the cardiac remodeling process following physiological stress.

Methods: Human cardiac fibroblasts were cultured and treated with β 2 agonist isoproterenol in the presence of dopamine (DA), with or without D1R antagonist SCH 39166 hydrobromide (SCH), and D3R agonist pramipexole dihydrochloride (PPX). Cells were collected and RNA was extracted RT-qPCR was used to measure gene expression.

Results: The combination of β 2 agonist and dopamine treatment decreased expression of β 2R ($p < 0.0001$) as compared to dopamine-only treated control. Also, β 2 agonist showed marginal increase in MMP1 expression when in combination with D1R antagonist, as compared to D1R antagonist alone. Our data showed that D1R antagonist significantly increased expression of D1R ($p < 0.01$), β 2R ($p < 0.001$), MMP1 ($p < 0.05$), TIMP1 ($p < 0.05$), and TIMP2 ($p < 0.0001$) genes.

Conclusion: Our study concluded D1R antagonist increased levels of β 2 to maintain contractility properties, suggesting its antagonistic properties might help prevent ventricular arrhythmia. This suggests some cross-talk between the two receptors. β 2 levels decrease under a negative feedback system when exposed to isoproterenol, potentially serving as a mechanism for preventing tachycardia. MMP1 and TIMPs were found to be upregulated by D1R antagonist, and its effect on MMP1 upregulation was insignificantly increased by the presence of isoproterenol. Overall, D1R antagonist is a profound stimulator of multiple genes involved in the structure, function, and maintenance of the cardiac extracellular matrix.

Evaluation of Panoramic Acquisition Errors by Pre-doctoral Dental Students

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Objective: Panoramic radiography is one of the most used dental imaging techniques for the diagnosis and treatment planning of dental alveolar pathology. Novice clinicians are prone to various technical errors that diminish the diagnostic quality of the radiographs. The objective of this study is to analyze technical errors during panoramic exposure for third-year (D3) dental students to maximize educational outcomes.

Materials and Methods: Four panoramic exercises (formative assessments) and one final skills assessment (summative assessment) submitted by D3 students were analyzed by radiology instructors. Technical errors, including anterior-posterior, Frankfort plane, and midsagittal plane misalignment, tongue and spinal placement, foreign objects, and exposure errors, were recorded. The percentage of students making various errors was calculated, and error patterns were compared among formative and summative assessments via inferential analysis.

Results: 263 panoramic images were taken during 5 exercises. 39 images were error free (14.83%) and 224 contained at least 1 error (85.17%). Errors committed such as the chin positioned too high (40.38%) or low (25.00%), head rotation (32.69%), tilting (9.62%), tongue placement (17.31%), and presence of a foreign object (11.54%) were the most frequently committed during the summative skills assessment. Most students made one or two errors (37 of 52 students) during the skills assessment, with four being the highest number of errors per exposure (2 of 52 students). The error types and distributions did not demonstrate statistically significant differences between formative and summative assessments, as revealed by the calculated exact 95% confidence interval.

Conclusion: All D3 students passed the panoramic summative assessment by producing diagnostic quality radiographs, reflecting the effectiveness of the clinical teaching. However, Frankfort and midsagittal plane errors persisted throughout the exercises, indicating that more teaching effort needs to be directed toward these areas to optimize imaging performance.

Our Worst Pandemic and We Still Don't Know the Cause

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Background: The number of diabetes cases in the US has risen dramatically in the 21st century, including a dramatic increase from 11,800 adults in 2000 to 20,400 in 2008. As of 2022, there are 24,400 adults with diabetes diagnoses in the US. Cases of obesity, high cholesterol, and hypertension have also increased. These conditions comprise a group of diseases known as the metabolic syndrome.

Objective: The diabetes pandemic is one of unprecedented magnitude, and the condition's cause remains unknown. We present some hints as to what may cause diabetes and related conditions in the metabolic syndrome and propose ideas for future studies that will further investigate shared characteristics of the syndrome.

Methods: PubMed was used to conduct a review of 2,254 publications related to diabetes and pesticides. Of these, 74 met the criteria for review in terms of the diabetogenic effects of chronic pesticide exposure to humans. After realizing that the timeline of pesticide use did not correlate with the dramatic increase in diabetes cases, we pivoted to reviewing current literature related to potential causes of diabetes, including signaling pathways, diet, the intestinal microbiome, and viruses.

Results: The current definition of the metabolic syndrome by the American Heart Association is that it involves having at least 3 out of 5 conditions, i.e., central obesity, hypertension, hyperglycemia, high LDL and low HDL cholesterol. Recent statements by the Centers for Disease Control and Prevention state that many of these conditions result from personal dietary and activity choices. However, bariatric surgery and/or the administration of GLP1-agonist drugs leads to resolution of not only the conditions that make up the metabolic syndrome but also to a reduction in other diseases. The metabolic syndrome affects most if not all organ systems and cells, meaning that it is not a group of separate diseases but rather multiple expressions of a shared defect in the utilization of carbohydrates and lipids.

Mineralizing a Dentin-like Structure for Endodontic Applications with Calcium Phosphate and gelMA.

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Introduction: For years, gutta percha cones have been used in root canal therapy to obturate the endodontic space after removal of the pulp tissue. But it does not provide bioactivity, therefore a fabrication of a bioactive cone augmented with gelMA with collagen Type I mixed with calcium phosphate HAp–PAA can prove to be more suited for endodontic treatment. The goal of this proposal is to test the hardness and modulus of varying ratios of a Ca/Po to gelMA/collagen hydrogel construct.

Objective: Our aim is to assess the hardness and modulus of a construct composed of calcium phosphate to gelMA/collagen solution at the ratios: 3:1, 4:1, 5:1, and 6:1, to determine if increasing the ratio of calcium phosphate to gelMA/collagen mixture will provide a biomaterial with hardness and modulus akin to natural dentin.

Subjects/Materials & Methods: A gelMA and collagen solution, containing 1.5mg/mL collagen, was prepared. This was mixed with a phosphate hydrogel precursor solution to make 1mL samples at varying ratios: 3:1, 4:1, 5:1, and 6:1. Gelation was induced by incubating the solution at 60°C for 2 hours. A 3.34M calcium nitrate tetrahydrate solution was then added in equal volume and left for 72 hours for mineralization. The resulting product was a gelMA/collagen infused HAp–PAA composite.

Results: Three samples were made for each ratio, resulting in 12 total samples. The twelve samples were then embedded in epoxy resin and polished using an EcoMet 30 in decreasing coarseness. Material hardness & modulus was measured using KLA's iNano Nanoindenter with testing parameters set at a 50mN load and 250nm depth. Each sample underwent five indentations at different locations, resulting in fifteen data points across each ratio, and sixty total data points for the study.

Renal Oxidative Stress in Renin-Angiotensin-Aldosterone Model of Hypertension

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Background: Hypertension is a polygenic condition in which high blood pressure leads to cardiovascular complications, cerebral damage, and kidney failure. The Renin-Angiotensin-Aldosterone System (RAAS) model of hypertension, (mREN2)27 transgenic rodent, triggers complex signaling pathways and cellular processes. It is characterized by overexpression of mouse Ren-2^d gene in brain and adrenal gland, with a reduction in kidney renin. The main pressor component of the RAAS is Angiotensin II (AngII) and it exists in many local organs and tissues, including the nephrons. AngII signals the production of reactive oxygen species (ROS) that serves as the epicenter for intracellular signaling pathways and contributes to the hypertensive episode. Despite the research contributions over the years, the role of circulating angiotensin peptides in genetically predisposed hypertensive episodes and their lasting effects on inflammation and immune response remains unclear. We *hypothesized* that in the (mREN2)27 model of hypertension, there will be imbalance in the expression of inflammatory responses and ROS modulators. **Objective:** The present study investigates the intracellular gene expression for reactive oxygen species (ROS) and proinflammatory modulators in renal tissue of the (mREN2)27 transgenic hypertensive rodent.

Methods: Indirect blood pressure and heart rate were recorded via tail-cuff for 7 consecutive days. We isolated RNA from renal tissues using a standard extraction protocol. Quantified RNA concentration using the NanoDrop™ OneC spectrophotometer. The isolated RNA was then reverse transcribed into complementary DNA and Quantitative Real-Time PCR (RT-PCR) was performed to quantify the expression of genes involved in oxidative stress and inflammation.

Results: In hypertensive model, there were significant increases in gene expression for reactive oxygen species (ROS) modulators: Heme Oxygenase-1 (HO-1), Nuclear Erythroid-2-Related Factor 2 (Nrf2), and Receptor for Advanced Glycation End Products (RAGE). Further, gene expression for inflammatory responses to Transforming Growth Factor Beta (TGF-β), and Nuclear Factor Kappa B (NF-κB) were significantly higher in (mREN2)27 compared to normotensive rodents.

Conclusion: The generation of ROS exhibits many inflammatory properties that provoke the ultimate disruption to renal physiology. The upregulation of these modulators and inflammatory responses suggests kidney stress due to prolonged RAAS activation, potentially leading to chronic kidney disease (CKD). These findings underscore the potential to identify therapeutic targets aimed at mitigating CKD.

Geo-Mapping and Epidemiology of Uterine Cancers in Eastern North Carolina

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Background or Problem Statement: Uterine cancer incidence continues to rise annually. Type II uterine cancers are diagnosed at later stages, quicker to metastasize, and have a higher rate of recurrence. Risk factors for developing type II uterine cancers include older age, history of primary tumors, and African American descent. Eastern NC has a higher-than-expected burden of uterine cancers; however, gynecologic oncology providers are limited.

Objective/Hypothesis/Aim Statement: This project aims to assess the geographic distribution of patients diagnosed with type II uterine cancers in eastern NC and identify trends in disease presentation. A geospatial analysis tool will be used to explore location and social determinants of health-based trends in disease incidence and outcomes.

Methods: Using the Eastern North Carolina Cancer Registry, a retrospective chart review of 364 patients diagnosed with type II uterine cancer in eastern NC between 2008 and 2023 was conducted. The data collection includes demographics, surgery date, cancer histology, residential location at time of diagnosis, location of diagnosis, and staging according to FIGO 2018 criteria. Statistical analysis was conducted using Microsoft Excel.

Results: The majority of patients diagnosed with type II uterine cancers were African American (65%) and 60 years of age or older. From 2008 to 2023, the annual incidence rate of uterine cancers increased in eastern NC, with almost a 4-fold increase over the timespan. Pathology reports showed uterine serous carcinoma as the most prevalent (55%) form of type II uterine cancer in this cohort. Most patients were diagnosed at stage 1 (42%) or stage 3 (30%). About 82% of diagnoses in eastern NC were made at ECU Health Medical Center.

Conclusion: Preliminary results have been accepted by the Society of Pelvic Surgeons for oral presentation. A geospatial analysis with Clinical Informatics will be conducted to determine potential hotspots of increased type II uterine cancer prevalence in eastern NC. By analyzing the diagnosis stage and survival rates, the impact of traveling distance and availability of local healthcare resources will be assessed. Social determinants of health that may be associated with these trends will be investigated to identify potential modifiable influences to improve patient and system factors regarding diagnosis and treatment.

Antifungal Activity of Benzophenones Against Oral *Candida* spp

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Background or Problem Statement: Individuals with weakened immune systems or uncontrolled medical conditions may experience *Candida* overgrowth due to microbiome dysbiosis. This condition, called candidiasis, can lead to discomfort, pain, or irritation in the affected mucosal areas. Fluconazole is typically the first option for treating candidiasis; however, some individuals may develop resistance to this azole antifungal, making it less effective. The development of new antifungal drugs is imperative due to the limited availability of effective treatments. Natural small molecules are an important source of new antimicrobial pharmacophores. Our research group has isolated new polyprenylated benzophenones from the fruits and seeds of *Garcinia brasiliensis*, which have shown potential to express both antibacterial and antifungal properties.

Objective/Hypothesis/Aim Statement: To evaluate the *in vitro* antifungal activity of various Benzophenones against *Candida* species and determine the cytotoxicity of select drugs against oral cell line cultures.

Methods: Initial isolation of the polyprenylated benzophenones from *Garcinia brasiliensis* using silica gel column chromatography. The isolated samples were tested against specific *Candida* species (*C. albicans* ATCC 2876, *C. albicans* ATCC 321182, *C. tropicalis* MYA 750, *C. glabrata* ATCC MYA 275, *C. dubliniensis* ATCC MYA 646) at various concentrations. The media was 90 μ L final volume of RPMI/*Candida*, incubated at 37° C, 5% CO₂ for 24 h. MIC/MFC was recorded for each benzophenone sample tested. In addition, cytotoxicity of select drugs against oral cell line cultures (HGF) was tested and results were compared to an HGF control group. The cells remained in media to promote growth (DMEM+10% FBS). 90 μ L of the media with HGF cells was used with 10 μ L of the drug and incubated at 37° C, 5% CO₂ for 24 h. CellTiter-Blue was used to stain the cells for fluorescence measurement.

Results and Conclusion: Of the 30 samples, 7 showed initial MIC/MFC at 10 μ g/mL. Of the 7 samples, Guttiferona-a produced the most MIC/MFC results at 1-10 mM/mL in comparison to the other samples at the same concentrations. Additionally, Guttiferona-a effected the most *Candida* species of all the samples. Finally, Guttiferona-a also did not pose any cytotoxicity between 0.001-10 mM/mL against HGF cells. This shows that polyprenylated benzophenones do express antifungal properties at certain concentrations.

Incidence and Risk Factors for Venous Thromboembolism After Isolated Coronary Artery Bypass Grafting

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Background or Problem Statement: Venous thromboembolism (VTE) incidence, which includes deep vein thrombosis (DVT) and pulmonary embolism (PE), following cardiac surgery is not well described and still carries a 2b/c recommendation. While recent studies place post isolated CABG VTE incidence between 1-2%, the true incidence is still debated.

Objective: We aim to understand the incidence of VTE among patients at ECU Health who have received an isolated CABG procedure. We hypothesize that incidence of VTE at ECU Health will mirror recently reported national rates. With this data, we plan to investigate the characteristics of those that did develop a VTE.

Methods: Incidence was calculated using data obtained from the STS National Database and compared against papers that reported national incidence rates. Patients that received an isolated CABG between 01/01/2014 - 05/31/2024 were included and those within this cohort that were readmitted up to 30 days post procedure for either DVT or PE were used to calculate the incidence rates.

Results: ECU Health performed 4,739 isolated CABGs from 01/01/2014 - 05/31/2024. 4,417 of these were isolated CABGs with full conventional sternotomy and full perfusion strategy. Of this cohort, 41 developed VTEs (6 DVTs and 35 PEs). All 41 patients that were readmitted for VTE had an isolated CABG on-pump with sternotomy and systemic heparin.

	Khoury et al. (2020) Incidence	Du et al. (2020) Incidence	Panhwar et al. (2019) Incidence	ECU Health Incidence
VTE	1.79%	1.75%	1.30%	0.87%
DVT	1.42%	1.28%	0.90%	0.13%
PE	0.37%	0.61%	0.40%	0.74%

Conclusion/Future Directions: We found that the incidence of VTE and DVT after isolated CABG was lower and PE incidence was higher at ECU health than reported national incidence rates. Our findings support the growing body of evidence that the described incidence rate is dependent upon detection techniques and is influenced by incidental findings, contributing to the lack of consensus. Based on these results, we plan for a retrospective chart review looking at characteristics of patients that did develop VTE post isolated CABG. This will help us better understand the risk factors for developing a VTE after isolated CABG, identify which patients should be considered for prophylactic interventions, and encourage more patient-centered care plans.

Neighborhood Cohesion Moderating the Association Between Adverse Childhood Events and Epilepsy in Children

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Background or Problem Statement: Adverse childhood events (ACEs) have been proposed as a risk factor for pediatric seizures and epilepsy. Children who live in less cohesive neighborhoods are more likely to have poorer health outcomes and experience more ACEs than their counterparts. There is limited data on how neighborhood cohesion interacts with ACEs to influence the risk of epilepsy.

Objective/Hypothesis/Aim Statement: The present study aims to examine if neighborhood cohesion moderates the relationship between ACEs and epilepsy.

Methods: Deidentified data from the 2016-2022 National Survey of Children's Health (NSCH) were used in this study. This study included all children age 0-17, excluding children with missing data on study variables. Bivariate tests of study variables were conducted among children with an epilepsy condition and those with no epilepsy diagnosis using Wald tests. Multivariable logistic regression was used to determine if neighborhood cohesion moderates the relationship between the number of ACEs in children and epilepsy diagnosis.

Results: Children who have epilepsy were more likely to live in a neighborhood with low cohesion than those who do not have an epileptic condition, and more likely to experience one or more ACEs. Among children living in highly cohesive neighborhoods, exposure to 1 ACE was associated with higher odds of having epilepsy (odds ratio [OR]: 1.48; 95% CI: 1.10, 1.99), but we found no association between exposure to 2 ACEs and odds of epilepsy among children living in highly cohesive neighborhoods (OR: 0.98; CI: 0.70, 1.36), and no statistically significant interactions between ACE exposure and neighborhood cohesion. Unsafe neighborhood conditions (evaluated separately from neighborhood cohesion) were also not associated with higher odds of epilepsy diagnosis independent of neighborhood cohesion and ACE exposure.

Conclusion: Neighborhood cohesion does not moderate the relationship between ACEs and epilepsy. Among children living in cohesive neighborhoods, there is no evidence that exposure to 2+ ACEs is associated with epilepsy prevalence. Further investigation is needed to determine if other neighborhood characteristics are associated with the odds of epilepsy diagnosis in children.

Poor Man's SPY: A Proof of Concept Using Microscope Near Infrared Laser to Assess Soft Tissue Perfusion

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Background: Indocyanine green angiography (ICG-A) is a gold-standard tool for assessing soft tissue perfusion in high-risk wounds. Despite published benefits of ICG-A, the cost of sophisticated, standalone near infrared lasers imaging systems (NIRLs), such as SPY, is often a barrier to investment.

Objective: This paper demonstrates that ICG-A can be performed on NIRLs within commonly available operating microscopes.

Methods: High-risk wounds were examined using the NIRL within a Zeiss Kinevo microscope (ICG-A Group). Outcomes in this group were compared to matched cases in which microscope ICG-A was not available ("No ICG-A" Group).

Results: There were 12 ICG-A Group cases and 10 "No ICG-A" Group cases. The rate of marginal necrosis was significantly lower in the ICG-A Group: 9% vs 70% (χ^2 p-value = 0.0041*). The rate of unplanned reoperation was nearly equivalent in the two groups: 25% with ICG-A vs 30% without (χ^2 p-value = .79). However, all three re-operations in the "No ICG-A" group were related to abnormal perfusion, while none in the "ICG-A" Group were. ICG-A also helped to avoid unnecessary debridements in three cases. Microscope ICG-A testing cost \$60-\$200 per run as compared to \$550-\$1000 for SPY.

Conclusion: This paper highlights that marginal necrosis and unnecessary debridements can be reduced with microscope NIRL, as one would with SPY. The cost-savings of microscope NIRL can be seen as a benefit to investing in modern microscopes. However, microscope NIRLs lack some of the sophisticated features seen in standalone NIRL devices.

Exploring the Role of HRV and Activity in Thoracic Impedance and Atrial Arrhythmias Amongst Rural Patients

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Abstract: Atrial fibrillation (AF) and congestive heart failure (CHF) are tightly linked comorbidities, with each condition increasing the likelihood of developing the other. To manage and monitor these complex cardiovascular conditions, modern devices, such as internal cardiac defibrillators (ICD), are often employed. These devices track additional and related cardiovascular variables, such as heart rate, activity levels, and fluid volume, offering clinicians valuable insights into the patient's current cardiovascular function. However, the precise relationship between these variables and cardiovascular health outcomes, such as AF and CHF, has yet to be fully understood. In particular, prior research exploring the relationship between thoracic impedance and atrial arrhythmias has shown mixed results. It is clear that additional clinical factors complicate the roles of these variables on cardiovascular health outcomes, suggesting the need for additional research in this domain.

The goal of this study is to investigate the relationship between thoracic impedance and atrial arrhythmias in the context of additional clinical factors, specifically heart rate variability (HRV) and patient activity levels. The temporal dynamics of this relationship will also be investigated, to further understand how these relationships may evolve over time. To do this, I have designed a retroactive study utilizing data from ECU Health's Biotronik ICD Database. This database includes daily counts of cardiovascular variables from 484 ECU Health patients implanted with a Biotronik ICD device between 2019-2023. A multivariate regression model will be used to explore how HRV, activity and TI interact to influence atrial fibrillation burden. This study seeks to deepen the understanding of the development and progression of AF and CHF, while also aiming to enhance the monitoring and management capabilities of ICDs.

Title: Evaluating Salivary Screening Test as a Complimentary Periodontal Risk Assessment Tool

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Background: Periodontitis is a serious gum infection that damages the soft tissue around teeth. Left untreated, periodontitis can lead to bone and tooth loss. Furthermore, studies have shown periodontitis has adverse effects on various systemic health conditions, which makes it both an oral and systemic health concern. The effects of periodontitis are irreversible, providers recognize this and make it a priority to assess patients for periodontal risk. The gold standard for periodontal risk assessment relies primarily on clinical examination. During these examinations providers assess levels of plaque, sites with bleeding on probing (BOP), pocket depth, bone loss, etc. These clinical examinations are very thorough and yield accurate assessments. However, these assessments establish risk after the biologic onset of the disease process and are unable to substantiate disease activity or future risk. Is there a tool that could be used in conjunction with traditional periodontal risk assessment that could remedy this limitation? Several studies are beginning to highlight saliva as a potential screening method for periodontal risk, and some have already identified inflammatory biomarkers within our saliva. The purpose of this study is to evaluate the Sill-Ha Oral Wellness System as a potential complimentary tool to traditional periodontal risk assessment.

Hypothesis: We hypothesize participants with some degree of periodontitis will reflect higher blood, leukocyte, and protein scores. We aim to Find an association between data from Sill-Ha and participants electronic health records (EHR) data.

Methods: We will recruit 30 existing patients from clinics within the ECU School of Dental Medicine. Half (n=15) of these patients will be at low risk for periodontal disease as determined by the data in their electronic health records, while the other half (n=15) will have some degree of existing periodontal disease. We will be using the Sill-Ha Oral Wellness system to collect salivary samples from the patients. The Sill-Ha Oral Wellness system requires a simple “swish and spit” with 3 milliliters of distilled water. The saliva samples are then run through a machine that yields information on the presence of bacteria, acidity, and inflammatory markers. This information will be compared to data within electronic health records to determine if there is an association.

Results: On average, leukocyte and protein scores were higher in the treatment group. Plaque scores, percent of sites bleeding on probing (BOP), and # of sites with 5 mm.

Implementing Depression Screening in Eastern North Carolina Cancer Clinics

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Background: Approximately 20% of individuals with cancer have depression. However, fewer than half of these patients receive behavioral health services, with rural areas especially underserved. Depression screening is essential for comprehensive cancer care; however, there is no standard recommendation regarding program implementation.

Objective: We performed a needs assessment in a rural oncology program to investigate clinical teams' attitudes towards patient depression screening. With this data, we aim to identify strategies and barriers for program implementation.

Methods: This project was IRB-approved. We surveyed patient-facing members at ECU Health Greenville oncology clinics using a modified validated survey regarding attitudes and barriers for patient depression screening. Descriptive analysis was performed. On Likert scales, confidence was interpreted as negative (not at all/slightly confident) or positive (moderately/very/strongly confident.)

Results: We surveyed 99 care team members (response rate= 66%): nurses (38%) and physicians (18%) were the most frequent respondents. Medical, Gynecological, Surgical, and Radiation Oncology were represented. Most respondents had 1-5 years of experience in their role. Approximately 1 in 3 respondents currently perform depression screening, but over half (56%) have performed screening in their career. Most respondents agreed that their team could coordinate tasks (88%) and support team members (86%). Respondents were least confident about their team's ability to handle challenges (20%) and manage the politics of implementing a screening program (25%). Respondents viewed supportive care and referral resources as the most important strategies, and a reminder system in the health record as least important. Time was the most-often identified major barrier (48%), followed by patient financial challenges (40%). Respondents felt most confident eliciting understanding (72%) but least confident providing treatment recommendations (45%) for patients with depression. 79% of respondents were confident in the clinical team's ability to deliver high-quality depression screening. 86% of respondents were confident in their personal ability to participate in the screening program.

Conclusion: Although many ECU oncology care team members do not perform depression screening, most are confident in their ability to deliver this service. Supportive care and referral resources were the most important strategies for program implementation, and time and patient financial challenges were the most concerning barriers. Next steps include comparing responses at ECU Health regional clinics and developing an implementation strategy.

AI-Powered Precision: Revolutionizing CTV Contouring for SAVI® Brachytherapy in Breast Cancer

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Background: Accurate delineation of the Clinical Target Volume (CTV) is crucial for effective radiotherapy planning in breast cancer treatment. Manual contouring is time-consuming and prone to variability.

Objective: To explore the use of a Convolutional Neural Network (CNN)-based segmentation method for automatic CTV contouring in SAVI® brachytherapy, aiming to improve efficiency and consistency in radiotherapy planning.

Methods: CT images from 200 breast cancer patients post-SAVI catheter implantation were collected. CTV was manually contoured by a radiation oncologist (ground truth). U-NET architecture was used for segmentation. Data was split: 70% training, 30% validation. Left breast: 101 training, 10 test; right breast: 74 training, 8 test. A post-processing threshold of 0.70 was applied to reduce false positives. Performance was evaluated using Dice Similarity Coefficient (DSC).

Results: The best agreement between automatic and manual CTV was achieved when the dataset was split by left and right breast. Median DSC: left breast 86.0, right breast 82.2, combined 80.0. Right breast dataset showed more false positives. With 50 epochs, training took <7 hours.

Conclusion: This study demonstrates the promising application of AI in streamlining and enhancing the radiotherapy planning process for SAVI brachytherapy in breast cancer patients. AI shows potential to reduce contouring time, improve consistency and accuracy, and assist physicians by capturing errors and improving workflow. However, limitations include poor interpretability of CNNs and variability in contouring practices among radiation oncologists, presenting challenges for clinical adoption and obtaining ground truth for AI training.

***HLA-DRB1*04:01* has a Neuroprotective Role in a Mouse Model of Parkinson's Disease**

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Background: Parkinson's Disease (PD) is the most common age-related motor neurodegenerative disease in North America. The pathological hallmarks of PD include death of dopaminergic neurons in the substantia nigra, mitochondrial dysfunction, neuroinflammation, and accumulation of abnormal α -synuclein (α -SYN) aggregates termed Lewy bodies. However, the underlying cause of PD remains elusive. A recent study sequencing the human leukocyte antigen (HLA) locus from 1,597 PD patients and 1,606 healthy controls found a strong genetic association between shared epitope (SE) containing *HLA-DRB1*04:01* allele and PD risk. The SE is a five amino-acid sequence (QKRAA) at position 70-74 in the beta chain of the HLA molecule that was previously identified as a risk factor for rheumatoid arthritis (RA). In the central nervous system, *HLA-DRB1* expression is restricted to the resident immune microglial cell population which has been implicated in PD pathology via α -SYN aggregate clearance.

Objective and Aim: The aim of this study was to investigate the genetic association between HLA alleles and PD protection using an *in vivo* animal model.

Methods: To better understand the mechanistic role of SE-HLA alleles in PD, we induced an acute model of PD pathology in transgenic mouse lines expressing *HLA-DRB1*04:01* and *HLA-DRB1*04:02* by injection of mouse α -SYN pre-formed fibrils. Mice were subjected to several tests to evaluate behavior changes, and their brains were later sectioned for immunohistologic analysis.

Results: The 04:01 mice had significantly less spread of α -SYN in the brain. The 04:01 mice had fewer total microglia yet higher levels of deramification leading to increased prevalence of amoeboid microglia, even in PBS injected animals. The behavior of the mice was found to be significantly different between 04:01 and 04:02 mice in a variety of tasks. Interestingly, this trend was still observed among the control PBS mice that had not been exposed to α -SYN.

Conclusion: Our results showed that the 04:01 allele causes increased microglial activation, neurocognitive changes in behavioral tasks, and protection against misfolded α -SYN spread. These findings provide us with an increased understanding of Parkinson's disease pathogenesis and lead us closer to improved options for prevention and treatment of PD.

Pediatrics Oral Health Status and Caregiver Oral Health Literacy

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Introduction/Objective: The objective of this preliminary study is to determine and evaluate whether there is an association between the caregiver's oral health literacy (OHL) and the oral health status (OHS) of their child (children).

Subjects/Materials and Methods: This preliminary cross-sectional study's inclusion criteria includes caregivers seeking treatment for their children (≤ 8 -years old) at a community dental office. The caregivers did not have a cognitive, visual, or hearing impairment. Eligible individuals for this study must have a limited understanding of English and must be able to verbally communicate. Excluded individuals are any children and any adults with a self-reported cognitive, visual, or hearing impairment, or have no understanding of English. A convenience sample of 150 caregiver-child dyads presenting at the office were recruited, where they provided written consent along with a Health Insurance Portability Act Waiver to participate. We then utilized the Research Electronic Data Capture (REDCap) application for OHL instrument data collection; and the patient's electronic health record for (EHR) for OHS. Correlation coefficients were calculated between each pair of continuous variables, such as decayed teeth, missing teeth due to caries, and filled tooth surfaces (dmfs) and the Rapid Estimate of Adult Literacy in Medicine and Dentistry (REALMD-20) score.

Results/Discussion: In this study, we administered the REALMD-20, a screening instrument, to 150 patients and analyzed the results. Based on the results from the preliminary study we have not found an association between the REALMD-20 screening scores and the child's caries experience as measured by dmfs/dmft. The results showed that mean REALMD-20 score is 18.09 and standard deviation of 1.55. We will continue this study by analyzing different data collected, and screening caregiver-child dyads to further determine an association.

A Comparison of Volumetric Differences of the Velopharyngeal Airways in Patients with Cleft Palate: Implications for Palatoplasty Techniques

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Background or Problem Statement: According to the NIH, 1 in 2,000 children worldwide is affected by cleft palate (Kosowski et al., 2012). Many of whom, 20-50%, will additionally develop velopharyngeal insufficiency (VPI), either due to a short soft palate or non-functional levator veli palatini that hinders the soft palate's ability to create a seal between the oral and nasal cavities (Kurnik et al., 2020). This inadequacy allows air to escape through the nose as opposed to the mouth during oralized speech sounds, negatively impacting the ability to communicate (Sainsbury et al., 2019). Currently there is no universal procedure due to anatomical variances in cleft palate. Recently published articles (Chauhan et al., 2020; Haenssler et al., 2023) suggest that palatal lengthening by double opposing buccinator myomucosal flap may be a more effective method to correct cleft palate and produce a normal velopharyngeal system to support speech.

Objective/Hypothesis/Aim Statement: In this study, we evaluated the anatomic and physiologic impact of the buccinator myomucosal flap during primary palatoplasty through MRI volumetric measurements of the velopharyngeal airways. We hypothesize subjects with cleft palate repaired via the buccal flap approach will demonstrate anatomical similarities in airway volume to controls, whereas subjects with cleft palate repaired traditionally with intravelar veloplasty (IVV) or Furlow palatoplasty will exhibit larger airways.

Methods: For each group, subjects with cleft palate (n=15) and controls (n=15), we segmented 4 separate sections within the velopharyngeal airways with Amira 6.0.3 software. Dimensions for analysis were standardized by anatomical landmarks for each section and based upon previously published MRI linear measurements of velopharyngeal airways (Ogawa et al., 2015).

Results: Preliminary data demonstrates similarities in airway volume between the study and control groups from previous studies. The average volume in the nasopharynx, velopharynx, oropharynx, and hypopharynx were 3989.63 mm³ (SD= 1237.26), 4734.24 mm³ (SD= 1396.63), 3626.81 mm³ (SD= 1877.34), 2426.69mm³ (SD= 1303.91), respectively. We anticipate there will be no differences in the 4 airways compared to control patients, following further analysis with an ANOVA.

Conclusion: This similarity in volume indicates a surgical outcome similar to non-cleft anatomy, and thus, the effectiveness of this surgical approach in repairing cleft palate and improving speech outcomes.

Health Equity and Human Papillomavirus Interventions for Adolescents: A Systematic Review

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Background or Problem Statement: Human papillomavirus (HPV) is a known cause of various cancers, yet significant disparities persist in HPV-related cancer rates. Despite the proven efficacy of HPV vaccination in preventing these cancers, the uptake of the vaccine remains low in the U.S. with disparities by race/ethnicity, geographic region, etc. While behavioral interventions have been implemented for nearly two decades, it is essential to incorporate equity considerations to further prevent perpetuating existing health disparities.

Objective/Hypothesis/Aim Statement: The objective of this review was to examine if existing HPV vaccine interventions for adolescents have unequal effects on HPV vaccine uptake based on demographic variables.

Methods: This systematic review was registered with Open Science Framework. By using the HPV Vaccine Round Table's Best Practices Learning Collaborative, we identified a list of relevant interventions to include within our systematic review. In line with the framework outlined in the Cochrane Handbook for Systematic Reviews of Interventions, we developed a search strategy and applied it to the following databases: MEDLINE via PubMed, PsycINFO, the Cumulative Index to Nursing and Allied Health Literature (CINAHL) Complete, Scopus, and Cochrane CENTRAL. Covidence software was also used for this systematic review.

Results: We identified a total of 4858 studies and 4839 studies were screened. Researchers screened all abstracts resulting in 156 articles for full review. After full review, 75 studies were excluded leaving 81 for data abstraction.

Conclusion: Data abstraction is ongoing. This systematic review will ultimately analyze the collected data to assess the significance of differences in HPV vaccination rates when stratified by demographics. By examining the results of the various interventions, we intend to determine whether these differences are significant and to detect any pattern or trends could shape future public health approaches.

Evaluating Access to Oral Healthcare in Pregnant Patients

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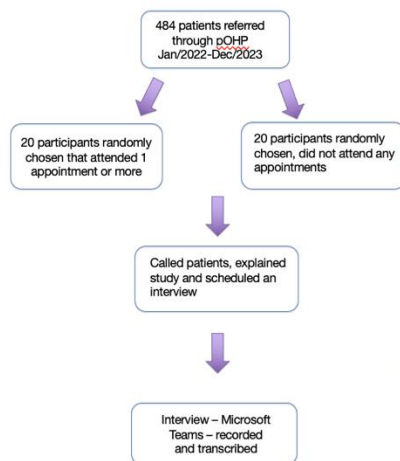
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Abstract: This study will investigate the factors contributing to missed dental appointments among pregnant women referred to the ECU School of Dental Medicine clinic. Key obstacles could include distance, financial constraints, and age-related factors, and will be examined to understand their impact as potential barriers. Interviews with select patients will provide insights into their perceived obstacles and awareness of the importance of oral health during pregnancy. Additionally, we will aim to educate participants on the significance of oral health to underscore the importance of attending appointments. This ongoing research seeks to enhance attendance rates and promote better oral health outcomes for pregnant women.

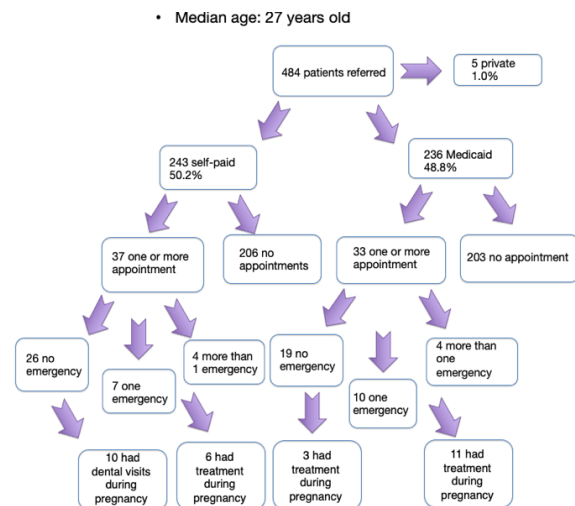
Background: Maintaining oral health during pregnancy is crucial for both maternal well-being and fetal development. According to ADA, hormonal changes, spike of estrogen and progesterone during pregnancy can increase the risk of gum disease, which has been linked to adverse outcomes such as preterm birth and low birth weight. Dental visits play a critical role in early detection and management of oral health issues.

Objective: This study aims to understand the obstacles that pregnant women face in accessing dental care. we aim to understand the obstacles that pregnant or new mothers face in accessing dental care and help them overcome these challenges so they can follow through and complete their treatment plans effectively.

Methods:



Results:



This study is ongoing and requires additional data before conclusions can be drawn.

Characterizing the functions of the novel NME1-NME2 Readthrough Transcript.

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Background: Novel readthrough transcript NME1-NME2 has been identified as being significantly overexpressed in inflamed gingival tissues of children with aggressive form of periodontitis by RNA library sequencing. A readthrough transcript occurs during transcription when the original termination site was not correctly identified, and transcription continues. The eight-fold overexpression of the NME1-NME2 readthrough transcript in inflamed tissues is perplexing and needs further investigation for its role in inflammation.

Objective: This study aims to understand the role(s) of the NME1-NME2 readthrough transcript in inflammation and other pathologic conditions.

Methods: A full-length cDNA representing the novel NME1-NME2 readthrough transcript was cloned into pCMV6 Plasmid vector with a Myc-DDK tag. This plasmid was stably transfected into HEK cells and total RNA from transfected and wild type HEK cells was harvested and sequenced. U2OS cells that express TLR 4 receptors were also stably transfected with the NME1-NME2 readthrough plasmid and challenged with LPS (1µg/ml) for 24h. Total RNA was extracted and analyzed by RT-PCR for effects of NME1-NME2 on the expression of proinflammatory cytokine IL-6 upon LPS stimulation. Immunofluorescence microscopy of transfected cells and immunohistochemistry of inflamed and healthy gingival tissues were also carried out.

Results: A total of 466 genes were differentially expressed (DE) in cells transfected with NME1-NME2 readthrough transcript compared to the wild type controls. Many of the upregulated genes were directly or indirectly involved with inflammation. Some of these dealt with oxidative stress while others were inhibitors of protein phosphatase activity. Finally, there were transcription factors that regulated inflammation (Table I). NME1-NME2 overexpressing cells when challenged by LPS showed some inhibitory effect on IL-6 expression (Fig.3). Immunofluorescence analysis of transfected cells showed NME1-NME2 protein located mostly in the nucleus with trace amounts in the cytoplasm (Fig. 1).

Conclusions: This study is ongoing and preliminary observations indicate NME1-NME2 readthrough transcript is a fully translated protein that shows prominent location in the nucleus and maybe serving important regulator role in inflammation.

Clinical Registry of Rural Oral Health Disparities and Outcomes

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Background. A patient registry is a useful tool for clinical research, and its statistical power is increased through a multi-center approach, as it enables accessibility to data from multiple geographical locations.

Objective. The primary objective of East Carolina University's Clinical Registry of Rural Oral Health Disparities and Outcomes is to collect clinical data along with saliva samples from patients across all the Community Service-Learning Centers for a total of 20,000 participants. Combined, these two forms of data will facilitate a comprehensive analysis of both rural and urban populations. As a secondary objective, this interim study was conducted to compare the current registry's population to ECU's comprehensive patient population and analyze the propensity of different demographics for routine dental care.

Methods. Saliva samples from patients were collected in addition to their consent to participate in the clinical registry. Planned enrollment is 20,000, and current enrollment is 89 patients. Patients who attended appointments annually for 3+ years were categorized as "Routine Care," while patients whose initial appointment was within the last 2 years were considered "New Patients," and any others were categorized as "Emergency Only." To determine the reliability of the data, the registry's current population demographics were compared to those of ECU SoDM's comprehensive patient database from 2011 to 2020³.

Results. Analysis of the current registry population showed that the demographics are representative of the ECU SoDM population from the 2011-2020 database, but not of the Greenville census demographics. A lower rate of routine care visits was found in male (52%) patients compared to female (68%) patients, as well as a lower rate of routine care visits among Black (5%) patients compared to White (47%) patients ($p=0.0004$). Of the rural population in the registry, 32% attended routine care, compared to 37% of the urban population.

Conclusion. This registry's current demographics are representative of SoDM's comprehensive patient demographics. In this study, men were found to be less likely than females to attend routine care. In a comparison by race, Black patients were less likely than White patients to attend routine care. Lastly, patients from rural communities were also less likely to attend routine care compared to patients from urban communities.

Multimodal Pain Management Strategies Mediating Racial and Ethnic Differences in Chronic Pain Outcomes

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Background: Chronic pain affects 1 in 5 US adults, and among adults with chronic pain, 10% suffer from high-impact chronic pain. Non-Hispanic Black and Hispanic adults have lower pain prevalence relative to non-Hispanic White adults, but non-Hispanic Black adults are more likely than White adults to experience severe pain and greater pain interference. Differences in treatment of chronic pain may explain the higher severity of chronic pain in non-Hispanic Black patients, but potential mediation of racial and ethnic differences in pain severity and impact by differences in treatment has not been explored in prior studies.

Aim Statement: We tested the hypothesis that differences in use of multimodal pain treatment strategies mediated racial and ethnic disparities in chronic pain severity and interference with daily activities in a nationally representative sample of US adults.

Methods: The study analyzed deidentified data from the 2019 and 2020 National Health Interview Survey (NHIS), focusing on adults 18 or older who reported experiencing pain and identified as Non-Hispanic White, Non-Hispanic Black, or Hispanic. The primary outcome was chronic pain severity, and the secondary outcome was interference with daily activities. Chronic pain management was assessed through questions about nonpharmacologic (e.g., physical therapy, relaxation techniques) and pharmacologic therapies (e.g., opioid use). Covariates included demographic factors, health status, income level, place of residence, education, and insurance status. Data were summarized using weighted means and proportions, and multivariable analysis employed generalized structural equation modeling to explore direct and indirect associations between race/ethnicity and pain outcomes. Analysis was conducted using Stata/SE 18.0, with statistical significance set at $P < 0.05$.

Results: For the primary outcome of pain severity, Non-Hispanic White participants were most likely to report “a little” and Non-Hispanic Black participants were more likely to report “a lot” of pain. Pain interference was similar among all groups. Multivariable analysis showed minimal differences in pain severity across racial and ethnic groups after adjustments. Non-Hispanic Black participants were less likely to use physical management and talk therapy, while Hispanic participants were more likely to use physical management and less likely to use opioids. All management methods were associated with higher pain severity and interference.

Isolation, Characterization, and Magnetic Field-Induced Cytotoxicity in T11 Cancer Cells Loaded with Magnetic Iron Oxide Nanoparticles

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Background or Problem Statement: Current cancer therapies often suffer from significant side effects due to their lack of specificity. These treatments fail to effectively distinguish between cancerous and healthy cells, leading to widespread damage throughout the body. Research has been underway in engineering cancer exosomes (extracellular vesicles) to carry therapeutic agents directly to cancer cells. Exosomes modified with magnetic nanoparticles enables them to kill cancer cells when exposed to a magnetic field due to the action of magneto-mechanical actuation. These magnetic exosomes have the potential to revolutionize cancer treatment by combining a targeted delivery system with a relatively non-toxic therapeutic agent.

Objective/Hypothesis/Aim Statement: The aim of this study is to isolate exosomes from T11 breast cancer cells. We will create two groups: one of exosomes alone and another of exosomes with internalized magnetic nanoparticles. These exosomes will then be characterized to confirm their exosomal and magnetic properties. We hypothesize that when magnetic exosomes are reintroduced into T11 breast cancer cells and exposed to a magnetic field, they will induce cell death through magneto-mechanical actuation.

Methods: Exosomes were isolated using differential centrifugation and characterized using Bicinchoninic Acid Assay (BCA), Transmission Electron Microscopy (TEM), Vibrating Sample Magnetometry (VSM), Western blotting, Dynamic Light Scattering (DLS), and Confocal Microscopy. The cytotoxic effect of magnetic nanoparticle-loaded exosomes in T11 breast cancer cells was then assessed through in vitro cytotoxicity assays.

Results: Exosomes were successfully isolated and characterized with BCA, TEM, and DLS. Optimized Western Blot confirmed the presence of protein, but not in the correct size range. TEM and VSM also demonstrated that the process of internalization of magnetic nanoparticles by the exosomes still requires further optimization. Cytotoxicity assay confirmed this observation, as there was no significant difference seen between cells with magnetic exosomes and cells without magnetic exosomes.

Conclusion: Exosome isolation protocol yielded exosomes, but Western Blot results suggest that there are other non-exosomal proteins in our sample. Further experimentation must be done to optimize the purity of our sample. Increasing the concentration of magnetic nanoparticles during cell growth may also yield better results in terms of the internalization of magnetic nanoparticles inside exosomes.

Have Some Extra Virgin Olive Oil First

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Background: The Mediterranean diet is well-known for its beneficial effects on cardiovascular and metabolic health. Recent literature has focused on the underlying effects of extra virgin olive oil (EVOO), a major component of the diet. EVOO consumption has been shown to reduce postprandial glucose levels, but the exact physiological mechanism remains unclear.

Objective/Hypothesis/Aim Statement: In this review, we will present our proposed hypothesis on the mechanism behind the glycemic responses observed with EVOO consumption, aiming to deepen our understanding of the underlying mechanism of EVOO.

Methods: In addition to the findings from the ongoing research of the ECU Metabolic Surgical Research Group (NIH # DK120296: Drs. Houmard, Dohm, Broskey, Jones, Pories), we reviewed current literature on the Mediterranean diet, the metabolic effects of extra virgin olive oil, as well as previous studies examining bariatric surgery and type 2 diabetes remission. Articles were identified on PubMed using relevant search terms.

Results: To explore the mechanism of EVOO, we need to examine the current findings from bariatric surgery. It is well-established that bariatric surgery leads to rapid, full and durable remission of metabolic syndrome, decrease in central obesity by 1/3, and a decrease in all-cause mortality by 79%. Patients with metabolic syndrome have high levels of lactate, indicating that their mitochondria do not metabolize glucose efficiently. After bariatric surgery, lactate levels fall not only back to normal levels, but even lower than those who are lean. These findings indicate that metabolic syndrome is caused by a dysmetabolic signaling arising from the foregut that is stimulated by contact with food. As the underlying mechanism of bariatric surgery is to reduce contact either by bypassing the foregut or removing a part of the stomach, it suggests that similar effects could potentially be achieved through other means that also alter food contact with the foregut – such as EVOO. These observations lead us to hypothesize that EVOO may also be exerting these metabolic effects by coating the foregut and reducing contact with food, thereby mimicking the effects of bariatric surgery.

Conclusion: This review provides further insight into the underlying mechanism of EVOO and offers potential management strategies for patients with type 2 diabetes.

Mitochondrial Fatty Acid Oxidation Deficiency Exacerbates Diet-Induced Fatty Liver Disease

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Background: Fatty Liver Disease (FLD) is a significant health issue often induced by high-fat diet. This study investigates the impact of fatty acid oxidative (FAO) metabolism on FLD, focusing on whether flux through mitochondria FAO thwarts the development of FLD.

Hypothesis: We hypothesize that mitochondrial FAO is critical for resistance to FLD. To test this hypothesis, we genetically deleted a critical enzyme in FAO, Carnitine- acylcarnitine translocase (CACT), in the liver of mice and exposed these mice to a FLD-inducing diet anticipating that FLD would be more severe without FAO flux.

Methods: CACT liver KO mice were compared to littermate controls on a C57BL/6J background. Mice were fed either control or FLD diet for 7 days. Liver weight and RNA analysis was determined post-diet.

Results: CACT Liver KO mice fed the FLD diet had increased lipid deposition indicated by white appearance of the liver and significantly increased liver weight compared to other groups, indicating the critical role of CACT in FLD development. To determine if the high degree of FLD impacted gene expression, RT-PCR analysis was performed to reveal that FLD diet in control mice upregulated genes related to mitochondrial fatty acid oxidation, ketogenesis, systemic metabolism, and peroxisomal fatty acid oxidation. CACT LiverKO mice fed the FLD diet had increased Pparg expression suggesting enhanced lipogenesis is regulated at the molecular level. Downregulation of gluconeogenesis and carnitine synthesis genes was observed in CACT KO FLD mice, with a general downregulation of mitochondrial fatty acid oxidation genes, except Cpt1a.

Conclusion: These findings suggest that mitochondrial fatty acid oxidation is crucial in protecting against FLD. CACT knockout impairs the liver's adaptive response to a FLD diet, and alternative fatty acid oxidation pathways may be activated as compensatory mechanisms. Further research is needed to explore potential therapeutic targets based on these findings.