

EAST CAROLINA UNIVERSITY

25th ANNUAL

# MEDICAL STUDENT SCHOLARSHIP FORUM

AUGUST 2022  
ABSTRACT BOOK



# Acknowledgments

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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 2022 Program. Those listed provided financial support for student stipends, research resources, and/or administrative support for the 2022 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**

Mr. and Mrs. Laliotes

## **Brody School of Medicine Distinction Track Programs Fund**

ECU Health Medical Staff

## **Medical Student Scholarship Forum Twitter Master**

Micah Furr

## **Institutional Support**

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***Health System Transformation & Leadership Distinction Track***

*Program Directors: Timothy Reeder, MD, MPH & Suzanne Lazorick, MD,  
MPH*

## **Patient Shadowing in Endoscopy Lab Reveals Potential Areas of Improvement**

**Authors:** Jonathan Bowling, LINC Scholar, ECU Brody School of Medicine

**Care Experience Setting:** Adult male presented to the ECU Health Endoscopy Lab for a bronchoscopy. The patient and his wife drove two hours from Ahoskie.

**Touchpoints:** The nurse began with a medical history review before the physician arrived and discussed the procedure with the patient. The nurse then prepared the patient for the procedure and transported him to the endoscopy lab. Upon return, another nurse cared for the patient before the physician returned for a debriefing. The patient was later prepared for discharge and escorted in a wheelchair to the front door once he felt ready to go.

**Missed Opportunities:** During the medical history review, there was confusion surrounding a liver cirrhosis diagnosis. The patient and wife were upset that they had not previously learned of that diagnosis, insisting it must be an error. The nurse stated she would rereview previous medical notes, however, I am unaware of any staff member following up with the patient on this point of confusion. Additionally, the wheels were left unlocked on the gurney and the patient's wife stumbled while leaning on the gurney to kiss the patient. Also, the physician missed a chance to provide the wife with support and comfort while keeping expectations realistic.

**Ideas for Improvement:** Firstly, the medical staff should ensure the patient's safety before leaving the exam room to avoid preventable accidents. Secondly, physician communication can be improved to show support and compassion for the patient while remaining neutral on an unknown diagnosis. Lastly, following up on any unanswered questions or concerns mentioned throughout the visit would clarify any confusion for the patient and strengthen the patient-provider relationship.

**Positive Actions:** The patient and his wife reported a positive experience in the bronchoscopy lab. Although this was the patient's first interaction with the medical staff, the nurses demonstrated excellent skills in building a rapport with the patient. The patient enjoyed making jokes and the nurses played into it while maintaining a professional relationship with him.

## **Opportunities to Improve Continuity of Care at ECU Health OB/GYN Outpatient Clinic**

**Author:** Elizabeth Davidson, MPH

**Affiliation:** Brody School of Medicine at East Carolina University

### **Patient Navigation Experience**

**Care Experience Setting:** 25-year-old female patient presented at the ECU Health OB/GYN outpatient clinic for removal and reinsertion of Nexplanon contraceptive implant.

#### **Touchpoints:**

- Check-in with staff at the front desk and a brief wait in the waiting room
- Vitals, brief history, and review of medications with the registered nurse in the exam room
- Additional history and review of medications with a medical student
- Further history and medication review, Nexplanon removal and reinsertion procedure, and post-visit care instructions with the resident physician, medical student, and certified nursing assistant
- Check-out with staff at the front desk

**Positive Actions:** The wait time between checking in and being brought to the exam room was very brief (less than 5 minutes). Additionally, each caregiver took the time to appropriately answer patient questions as they came up without seeming rushed. Finally, the procedure was well-explained in accessible terms prior to starting, and the resident physician checked in with the patient several times throughout regarding pain or other unpleasant sensations as well as questions about the process itself and post-visit care.

#### **Missed Opportunities:**

1. The patient was asked three distinct times about whether she currently took a prescribed migraine medication; although she responded “no” each time, it was unclear by the end of the visit whether a) the medication had been removed from the list and b) the patient knew why the medication had been originally prescribed.
2. Although the resident physician stated the patient would be given an opportunity at check out to schedule a routine physical exam, the front desk staff did not initiate any scheduling conversations.

#### **Ideas for Improvement:**

1. Building in a moment to pause, ensure the patient understands their prescribed medications as well as the conditions they are prescribed for, and reviewing the edited medication list across involved providers would limit opportunities for confusion.
2. Emphasizing preventive care by streamlining the process for scheduling a routine physical following the patient’s visit may improve continuity of care.

## Quality/Efficiency Improvement in Pediatric Cardiology Clinic

**Author:** Miles Farlow

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

**Care Setting:** 8-year-old female accompanied by mother presenting with a history of occasional chest pain with exercise, alleviated by rest.

**Background and Rationale:** The objective of this patient shadowing experience was to identify areas for improvement in patient/provider(s) interactions and clinical efficiency at the Pediatric Cardiology clinic.

**Details of the Care Experience:** Patient and mother arrived on time, and care began within 5 minutes of arrival. Height, weight, and vitals were taken, and patient changed into a gown. An EKG was taken. Medical history was taken by a rotating medical student. An ultrasound was taken in a separate room to investigate reported chest pain with exercise. The test results and the suspected cause of chest pain were explained to the patient's mother. The appointment took less than an hour and transition times were minimal.

**Opportunities for Improvement and Possible Solutions:** Sometimes providers failed to address the patient, instead talking only to the mother. Brief explanations of the sights and sounds experienced during the ultrasound exam in real time could alleviate evident curiosity for patients and family members. Explanation of the medical condition to the mother was identified as an area of possible improvement. The explanation included the words "lub" and "dub," with no allusion to these words' colloquial correlation with the "lub-dub" sound of a heartbeat beforehand, which might have led to confusion. It is also noted that, while proficient in English, the patient and her mother were not native speakers, and assumed knowledge of such vernacular could be more problematic for these patients than others. Hand gestures used to demonstrate the "lub-dub" pumping motion of the heart might improve comprehension.

**Recommendations:** Based on these observations, I recommend a clinic wide initiative to address the actual patient first, and often, in every interaction, even if they are too young to have a true understanding of clinical procedures or medical explanations. Explanatory dialogue during various exams and tests is also encouraged, such as during an ultrasound exam. Refined medical explanations and inclusion of easily comprehensible handouts/pamphlets for common conditions could increase patient satisfaction and understanding.

## **Need for Improved Usage of the Patient Portal and Creating a Reminder Checklist at the ECU Pediatric Specialty Clinic**

**Authors:** Annapurna Hanumanthu, MS

**Affiliations:** Health System Transformation and Leadership (LINC) Distinction Track, ECU Pediatric Specialty Clinic, ECU Brody School of Medicine

**Background and Rationale:** This project aimed to identify barriers to quality health care from the perspective of a patient in the health system by observing and critically analyzing a patient visit at the ECU Pediatric Specialty Clinic. Patients in this clinic see 1-5 specialists at each visit, depending on the complexity of their condition and their individual reason for the visit.

**Care Experience Setting:** A 17-year-old male patient presented to the ECU Pediatric Specialty Clinic with his mother for a pediatric nephrology continuity of care visit. The patient had a stroke five years ago, leading to severe deficits in speech and movement. He lives one hour away from this clinic, but it is the closest available pediatric specialist for him.

**Touchpoints and Hospitality:** Each caregiver greeted the patient with familiarity. He checked in easily and had a short wait before getting called back. The nurse took his vitals, collected a urine sample, and walked him to his exam room. Then, the resident examined him while using supporting communication by saying, "I'm listening," and head nodding. Lastly, the physician came in and allowed the patient and his mother to judge how comfortable they felt with the current medication list and with incorporating the changes into his lifestyle. The visit was timely and completed in 40 minutes.

**Ideas for Improvement:** Although the caregivers demonstrated many best practices, there were a few issues. The patient's mother asked some questions about a medication that the physician could not definitively answer since another specialist prescribed it. When asked, the patient couldn't recall the next appointment with that specialist. Based on these gaps in care, it is recommended to implement a virtual form on the patient's online portal that physicians may access before each visit. This form would be used to track major questions and concerns that the patient would like to get addressed at the upcoming appointment. Additionally, it would be beneficial to create a brief reminder checklist to give the patient at check-out so that they don't forget important dates and tasks, which seemed to be a major concern for patients with multiple caregivers.

## **Patient-shadowing Reveals an Opportunity to Screen for Social Determinants of Health**

**Author:** Taha Lodhi

**Affiliations:** Brody School of Medicine

**Care Experience Setting:** The patient was a six-month old infant who arrived at the ECU Physicians Adult and Pediatric Care Clinic due to concern about skin irritation. He arrived with his mother and older brother. During the visit, the patient had a total of 20 minutes of waiting and 10 minutes of non-waiting, defined as time during which the patient or his family were engaged in the clinical encounter. This includes answering questions, physical examination, and discussing a plan.

**Care Givers and Role:** The family first checked in with the front desk staff before being introduced to the patient shadow. They were called to the back by a nurse, although the nurse did not introduce themselves to patient. After measurements were taken by the nurse, the family encountered Physician 1 and Physician 2 before checking out with the front desk staff again.

**Hospitality:** Although the patient cried a few times during the visit, overall, the patient's family reported their visit as a positive experience. All members of the family were addressed and spoken to by both physicians.

**Missed Opportunities:** When providing diapers to the family, the clinic was not able to provide properly sized diapers and gave diapers that were two sizes too large. During the visit, the patient needed a diaper change, but there was no obvious location for the diaper changing area. The mother had to change the patient's diaper in her lap.

**Ideas for Improvement:** Approximately two-thirds of the patient's appointment involved waiting. Within the exam room, the setting with the greatest wait time, there was little to occupy the patient's time. This time could be utilized more effectively by allowing the patient's family to self-administer a screening tool for social determinants of health, paired with contact information within the exam room for the various community resources in Pitt County. Indeed, this would require timely follow-up and referral to community resources by the physicians.

**Positive Actions:** The patient's family reported the short time between check-in and being called back as an especially positive aspect of their experience. Furthermore, physicians interacted with all members in the room.

Checked in (3 minute wait)

Called back to a room to take measurements of baby (lasted 3 minutes)

Told to sit in exam room (11 minute wait)

Physician left for a second opinion (7 minute wait)

Check out (2 minutes)

21 minutes of waiting

10 minutes of non-waiting



## **Identifying Opportunities for Improvement Through Patient Shadowing at ECU Health Children's Emergency Department**

**Authors:** Shantell McLaggan, LINC Scholar

**Affiliations:** LINC Scholars Program at the Brody School of Medicine

**Care Experience Setting:** The patient was an 18-year-old male visiting the Children's Emergency Department (CED) at ECU Health for removal of stitches in his left palm.

**Touchpoints:** The patient presented to the CED where he was checked-in by the front desk staff and sat in the waiting room. A registered nurse (RN) brought him to the triage area to get his vital signs, and then brought him back to the waiting room. Afterwards, a Patient Registration employee stopped him to register him. Another RN brought the patient back to an exam room, where he briefly waited for the doctor. A resident and another RN removed the patient's stitches. Later, the attending came into the room to follow up with the patient. An RN came into the room to give the patient discharge paperwork, and the appointment was over shortly after.

**Care Givers and Role:** The patient first interacted with security, then with several different RN's including at check-in, triage, rooming, and stitches removal. He also interacted with two doctors, one resident who performed the procedure, and one attending. Finally, he interacted with Patient Registration.

**Hospitality:** The entire care team was friendly, conversational, and made the patient feel as comfortable as possible.

**Missed Opportunities:** While this appointment went seamlessly and the patient appeared satisfied, there was a moment after the patient was triaged and instructed to go back to the waiting room. He was supposed to have stopped at the Patient Registration desk, and the one employee behind the counter had to wave him down. It is possible that at a busier time, or if the Patient Registration employee was away from their desk, that the patient would miss this step.

**Ideas for Improvement:** Based on observations, it is recommended to assure that patients are aware of the flow of the ED, and where they need to go after each step. This could be as simple as verbalizing next steps to the patient and confirming that they understand where to go. It is also recommended to possibly have more than one Patient Registration employee at the desk.

**Positive Actions:** Everyone was very respectful to the patient, and his wait time at this visit was virtually zero.

## **Patient Shadowing Experience: Pre-Surgery**

**Authors:** David Oakley, MPH, Timothy Reeder, MD, MPH, Suzanne Lazorick, MD, MPH

**Affiliations:** Brody School of Medicine, East Carolina University

**Care setting:** 50-year-old male for ureter stents surgery

**Background and rationale:** The core building block of our healthcare system is the patient. In order to have a better understand of how to improve the healthcare system as a whole, viewing the system from a patient's lens can provide a crucial perspective.

**Details of the Care Experience:** The patient for undisclosed reasons was late to his appointment. For this surgery (and most surgeries), the patient needs someone else to drive him home, which may have added complications. The patient had two checkpoints through administrative staff. After checking-in, the patient was taken to a pre-operation room. He discussed his PMH and other relevant topics with a nurse, his anesthesiologist, and his surgeon. The visit took about 45 minutes from check-in to pre-operation.

**Opportunities for improvement:** During the initial talk with the nurse, the patient discussed his allergies (he had none). However, after the patient was in the beginning stages of drowsiness, the anesthesiologist came back to clarify about his allergies. The doctor saw something in his chart that may have indicated an allergy. The patient still denied, but he was so drowsy that I'm not sure he could have answered the question properly.

**Recommendations:** My recommendations come with a few uncertainties. I am not sure what the normal process is for double-checking allergies, and I am unsure if the fact that the clinic was running behind due to the patient being late had any impact. However, I would recommend that the allergy double-checking occur before any sleep-inducing medications are provided to the patient.

## **Patient Observation at ECU Health Pain Management Center Evaluation**

**Authors:** Pankti Sheth

**Affiliations:** ECU Brody School of Medicine

**Care Experience Setting:** An 80-year-old woman was accompanied by her husband for her quarterly prescription refill for Norco (hydrocodone/acetaminophen), a narcotic to treat pain, at ECU Health Pain Management Center in Greenville, NC.

**Touchpoints:** The patient's appointment took fifty minutes overall. The patient's husband helped her get in a wheelchair after parking. A volunteer directed the flow of patients near the reception and checked everyone's temperature. Patient checked in at the reception, waited for 5 mins, and was escorted to an exam room by a nurse who took her vitals. A nurse practitioner then conducted a physical exam, inquired about the frequency of intake of Norco and other medications (such as acetaminophen), and recommended physical therapy. The patient waited in the exam room for 15 mins before signing the consent form for the use of opioid analgesic. Patient scheduled her next appointment at the front desk.

**Hospitality:** Everyone greeted the patient and her partner with a smile and willingly answered questions. The staff always held the door open for the patient who was in an electric wheelchair. The patient commented that she has always felt welcomed in the clinic.

**Missed Opportunities and Ideas for Improvement:** The patient shadowing experience led to four suggestions. First, a quicker way to prepare the consent form can be devised to cut the wait time from fifteen minutes. Second, a form that lists time and day can be given to the patient at the beginning of the visit to write down all her medications including quantity. This would avoid having the patient verbally recall them in the exam room. Third, the space near the reception can be expanded to be more wheelchair friendly. Fourth, hearing through the glass window at the front desk is difficult, especially while wearing a mask. This can lead to frustration, miscommunication, and misuse of time. Window intercoms can be used for hearing clarity when talking through the glass window at the front desk.

**Positive Actions:** Everyone worked efficiently. The NP was thorough in her examination. She ensured that the patient understood the effects of overconsuming acetaminophen and created a feasible plan for physical activity based on the patient's social history.

## **Parkinson Patient Navigation at PT/OT Outpatient Clinic Reveals Opportunities for Improvement**

**Authors:** Lance Tiu

**Affiliations:** LINC Scholar, ECU Health Outpatient Rehabilitation Orthopedics, Brody School of Medicine, East Carolina University

**Care Experience Setting:** The visit centered around an elderly woman who was accompanied by her husband, her primary caregiver. The patient was diagnosed with Parkinson's disease and was seeking care from the Physical Therapy/Occupational Therapy (PT/OT) outpatient clinic to help mitigate her symptoms.

**Details of the Care Experience:** She was enrolled in a 4-week intensive program for Parkinson's patients who will receive care from the PT/OT rehabilitation outpatient clinic at ECU Health. Patients enrolled were required to attend rehabilitation appointments three times per week for two hours. Upon her arrival at her two o'clock appointment, the patient checked in and was greeted well by the receptionist and her PT/OT providers. She spent the first hour with a physical therapist who provided strength, balance, and flexibility training. Her PT appointment was followed by an hour session in OT where she engaged in daily lifestyle activities to strengthen her fine and gross motor movements. The patient successfully completed her appointment and was given instructions on how to conduct at home exercises. The PT/OT staff were extremely knowledgeable, patient, and maintained a clean and well-equipped training room that led to the patient's overall satisfaction.

**Opportunities for Improvement/Possible Solutions:** While the shadowing experience was overall satisfactory, there were a couple areas of interest that could be revised to enhance the patient experience. In the PT unit, strength and balance training were conducted in the main hallway where providers, students, and other patients passed through constantly. This shared hallway created a problem that crowded the patients using the obstacle course. One proposed recommendation would be to conduct the strength and balance obstacle course training in a less crowded hallway or to designate a specific area for this form of exercise. Another notable area of improvement would be increasing spacing areas in the OT unit. While both clinics strive to see as many patients as possible, overcrowding patient areas can negatively impact the patient's experience and might hinder the maximum amount of benefit a patient should receive.

**Recommendations:** Striving to improve the quality of care in all facets will contribute to an even more beneficial patient experience and will promote positive patient outcomes.

## **High Quality Care in an Outpatient Geriatric Clinic: Observations from Patient Shadowing Experience**

**Authors:** Uma Gaddamanugu

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

**Care Experience Setting and Details:** A 63-year-old patient presented at ECU Health's Monk Geriatric Center for follow-up regarding his recent centrilobular emphysema diagnosis. The patient wished to discuss the diagnosis with his primary care physician, who has been helping him manage multiple chronic conditions for the past 21 years. The nurse obtained the patient's vitals as soon as he checked in and promptly escorted him to the exam room, where he waited less than five minutes to see his physician. The physician spent about forty minutes explaining the pathophysiology of the emphysema diagnosis to the patient and helping him develop a plan for smoking cessation. During the visit, the patient also completed a six-minute walk test while the nurse recorded his oxygen saturation levels. At the end of the visit, the physician provided the patient with a detailed after-visit summary and made a referral for a pulmonary function test, which the front-desk staff helped him quickly schedule before he checked out.

**Care Givers and Role:** During the experience, the patient interacted with the front-desk staff, two nurses, and a physician. The patient knew every team member he saw on a first-name basis, and I was impressed by the jovial nature of their interactions. He was highly satisfied with his experience and said that the provider showed him a level of care and respect that he had never encountered in any other clinical setting. This experience highlighted the power of the patient-physician relationship, and the value of shared decision-making in achieving patient-centered care.

**Ideas for Improvement:** Although the patient was highly satisfied with his experience, it is important to consider the financial viability of the practice. The follow-up visit lasted an entire hour, and there were no other patients in the waiting room. While it was evident that the patient valued his provider's undivided attention, the practice may benefit from improving its efficiency and increasing patient volume. Shorter follow-up visits would allow the physicians to see more patients per day, thereby increasing revenue while delivering high-quality care to a greater number of aging patients in our community.

***Medical Education & Teaching Distinction Track***

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

## Effects of Orientation on 1<sup>st</sup> Year Medical Students Study Skills

**Authors:** Kodjo Agbowou<sup>1</sup>, Dmitry Tumin PhD <sup>2</sup>, Robert Lust PhD <sup>3</sup>

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**Idea:** This study is set to provide an evaluation piece to the first-year medical student orientation here at the Brody School of Medicine.

**Need/Rationale:** One of the challenges faced by first year medical students is how to study effectively. Studies conducted by Cebeci et al (2013), Choncar et al (2018) and Ward (2011) show that deep and strategic approaches to learning are more effective and yield higher performance than surface approach to learning. In addition, the Brody School of medicine is making adjustment to the student orientation to inform first year medical students on time management and balance, study schedules, self-assessment, general and focus reviews and how to organize notes. This study is looking at what effects orientation has on student's study skills.

**Methods:** To conduct the study, three surveys will be administered to all 86 incoming students of the 2023 class. The first survey will be sent out via student email a week before orientation. Two days after orientation, the second survey will be delivered. The third survey will be sent out at the end of Block 1. Students will have a week to complete each survey and will receive a reminder on the third day from the day each survey is sent. Each survey will consist of 18 questions derived from the short version of Approaches and Study Skills Inventory for Students (ASSIST). It contains questions related to deep, strategic and surface learning approaches. Each of the three learning approaches is divided into sub-scales under which Likert type questions are found. In addition to ASSIST questions, students will be asked to report their thoughts on how orientation affect their study skills. Data will be analyzed using paired T test and repeated measures ANOVA.

**Potential Impact:** From this study, we hope to get meaningful results to help the school improve students study skills through orientation.

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## Cloud-Based Resources for Medical Student Thoracic Surgical Clerkship Preparation

**Authors:** Michael Denning, MBA, MPH<sup>1</sup>, Rob Allman, MD<sup>2</sup>, James Speicher, MD<sup>2</sup>

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**Idea:** Initiating a change in the ECU Thoracic Surgical Education Model by producing, implementing, and analyzing video and cloud-based resources, in order to elevate medical student operative preparation and clinical/ academic experiences.

**Need/Rationale:** Third and Fourth-year Medical Students rotate through various clinical specialty clerkships<sup>1</sup>. Learning curves are different for each clerkship, due to each hosting specific expectations about teaching, clinical acumen, and patient care<sup>2</sup>. The surgery clerkship is notable for being different from most rotations, due to the need for operative skillsets and in-patient/ out-patient clinical knowledge<sup>2</sup>. Due to this notability, students enter the Surgery clerkship with negative mindsets, which negatively impact their performance and grades<sup>3</sup>. Currently, medical students receive objective and subjective feedback throughout and concluding their rotation<sup>1</sup>.

**Methods:** Students will partake in a pre-surgery, post-surgery, and post-clerkship survey, gauging their content knowledge, level of confidence within the operating room, and experience satisfaction. In addition, evaluations and rankings from the Thoracic Surgery Attendings will be garnered. Moreover, quantitatively showing improvements of students' scores on a standardized exam that tests several concepts reviewing within this project will be beneficial.

**Evaluation Plan:** To gauge effectiveness of this educational intervention, the following qualitative and quantitative outcomes will be utilized: increased Student Confidence and Student Participation in the Operating Room, improved Faculty Evaluations and Real Time Feedback, and improvement of student mid-clerkship shelf and clerkship shelf scores. Students will also be asked to provide feedback about the cloud-based intervention, and about the other resources they used for preparation. This data will assist in presenting the actual picture of student preparedness, effectiveness, and, overall, success within the clerkship.

**Potential Impact:** It is imperative that students are prepared and knowledgeable about the various steps to the operation, critical anatomy, and specific-Attending techniques and attitudes. Moreover, learners receive formative evaluations from faculty and a grade that is reported on their transcripts for applying to residency. For students who are interested in entering a surgical specialty or a competitive resident program, it is pertinent that they earn high marks on their clerkships, specifically the General/Thoracic Surgery clerkship.

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## Effects of Supplemental Spaced Based Digital Image Identification on Medical Neuroanatomy Practical Scores

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**Author affiliations:** <sup>1</sup>Brody School of Medicine, <sup>2</sup>Dept. of Emergency Medicine

**Idea:** One of the unique challenges in medical education is the incorporation of practical-based coursework in student anatomical training. These courses often demand many hours within the lab, potentially posing barriers to the completion of targeted degrees. As technology has developed, there is a growing push for the incorporation of digital imaging as a supplemental resource to aid student learning in these courses (Allen, Eagleson, & Ribaupierre, 2016), as well as combat the shortage of professors of the anatomical sciences (Wilson 2020). This study aims to quantify the relationship between student usage of supplemental digital flashcards of gross neuroanatomy structures delivered in a spaced repetition model on student performance within medical neuroanatomy coursework.

**Methods:** In order to assess the effects of spaced digital image identification on practical performance, a supplemental flashcard deck was created. The flashcard deck was created by generating a list of all testable structures for each laboratory session associated with the course. Once a list of structures was obtained, a random sampling was taken, targeting 30-35 structures per unit. Flashcards were then created using the digital software ANKI, taking advantage of the embedded spaced repetition software. Each structure was associated with a minimum of two cards with a maximum of eight, varying with the number of whole brain and cross-sectional views each structure could be seen. The flashcard deck associated with each laboratory session will be released for use at the end of the session. At the completion of each unit, students will complete a 50-question practical exam to assess knowledge of the material; questions will be coded as associated with a flashcard or as no association.

**Evaluation Plan:** Student scores will be split into two groups, those who used ANKI and those who did not. A within-group comparison will be conducted for each group, comparing student performance on flashcard-associated cards and non-associated cards, using the no ANKI group as a measure of control. A between-group comparison will then be conducted to determine if students using the ANKI decks performed differently than non-users on non-flashcard-associated questions, indicating if the utilization of the resource has an appreciable benefit on structure identification as a whole.

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## **Introducing Trauma Informed Care and Child Sexual Abuse Prevention into Medical Education**

**Authors:** Courtney Elliott

**Affiliations:** Brody School of Medicine, East Carolina University

In order to better prepare future physicians to care for patients who are survivors of child sexual abuse and sexual violence, a study to determine the effectiveness of providing trauma informed care training to first year medical students will be conducted. One in nine girls and one in fifty-three boys in the United States are victims of child sexual abuse<sup>3</sup>. This reality paired with the fact that fifty percent of women and twenty-five percent of men experience sexual violence make it evident that physicians will be caring for patients who have survived this form of trauma regardless of the specialty they select<sup>4</sup>. Subsequently, it is imperative that physicians receive proper training in both identifying and preventing abuse as well as how to provide trauma informed care to survivors. To deliver this information to students before they interact with patients in a clinical setting, first year medical students will undergo a one-hour lecture detailing child sexual abuse signs and prevention as well as an introduction to trauma informed care. Then students will participate in a two-hour small group session to work through case-based scenarios with standardized patients. The effectiveness of this training will be analyzed using a student satisfaction survey and a content assessment. The assessment will contain five questions involving identifying and preventing child sexual abuse and five questions relating to steps providers should take to empower and care for survivors of sexual violence through practicing trauma informed care. The survey will have students' rate on a ten-point scale how useful they found the training session to be and how prepared they feel to treat patients in the clinic who are survivors of sexual assault. If the results indicate the training significantly benefitted students and adequately prepared them to care for sexual violence survivors and to identify and prevent sexual abuse, then discussions will be had to attempt to include this training program into the medical education curriculum for all first-year students at the Brody School of Medicine.

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## **Investigating Surgical Dexterity of the Da Vinci Surgical Machine with the usage of Chopsticks**

**Authors:** Johnny Vang, MS2<sup>1</sup>; Michael J. Bates, MD<sup>2</sup>

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**Idea:** This purpose of this study is intended to evaluate the correlation between using chopsticks and using the da Vinci Surgical robotic machine for medical students at the Brody School of Medicine.

**Rationale:** Manual dexterity of the hands is one of the many skills required for surgeons to perform complicated surgeries. However, costs of training surgeons, specifically in hand dexterity, can be very high and the traditional one-to-one apprenticeship model has many limitations. Research studies have shown that using chopsticks can increase fine motor movements in the hand, mimicking those used during surgery.

**Potential Impact:** We hypothesize that students who demonstrate proficiency with chopsticks will also perform well when using the da Vinci surgical robot. This may provide a cost-effective way to help surgeons train in hand dexterity while also increasing their fine motor control of surgical equipment.

**Methods:** The study will enroll twenty students, randomly selected from a survey in which they express their interest in a surgical related field. The study will assess their chopstick using ability by having the students pick up ten kidney beans from one container to another. Each container will be placed 20 centimeters from the other. After completion, the same methodology will be used on the da Vinci surgical robot.

**Evaluation:** The total completion time for each task will be timed. The number of times a kidney bean is dropped will also be documented. Student feedback on each task will be recorded at the end of each session for qualitative feedback. All data will be analyzed using Microsoft Excel and Statistical Package for the Social Sciences (SPSS). Pearson's correlation will be used to assess the relationship between using chopsticks and the da Vinci surgical robot. Three-way ANOVA tests will be used to assess the factors affecting chopstick performance and robotic performance pertaining to age, gender, and prior chopstick proficiency.

***Service-Learning Distinction Track***

*Program Director: Jennifer Crotty, MD*

## **Reducing Musculoskeletal Injury Among Agricultural Workers**

**Authors:** Spencer Cooke<sup>1</sup> and Robin Tutor Marcom<sup>2</sup>, EdD, MPH

**Affiliations:** Brody School of Medicine<sup>1</sup>, North Carolina Agromedicine Institute<sup>2</sup>, Amexcan, Migrant Clinicians Network, and the Northeast Center for Occupational Health and Safety.

**What?** The goal of the North Carolina Agromedicine Institute is to promote safety among farmers, foresters, fishermen, their families, and communities in North Carolina. The institute achieves this through research, proposing prevention and intervention strategies, and providing education to workers and organizations involved in these professions. Amexcan is an organization that seeks to promote the active participation of Mexicans and Latinos in their communities. Through various programs, Amexcan encourages these communities to support one another through culture, education, leadership, health, and advocacy.

**So What?** Agriculture is a dominant force in the economic and social landscape of North Carolina. The individuals who perform this work often face tremendous risks in their daily lives. With long work hours and time constraints, there are many instances where injury can occur due to the physical demands of the work. This form of labor often requires repetitive physical actions that, when combined with poor posture or unstable movements, can lead to musculoskeletal injuries. The CDC reports that 100 farm workers per day receive injuries that cause them to be unable to work for extended periods of time. In 2008-2010, 50% of crop worker injury were due to strain or sprain (2021). Long periods without pay can create financial instability for these workers, which can be detrimental to the livelihood of their families. Additionally, the United States Department of Agriculture reports that a majority of crop-laborers are Hispanic (2022). Thus, the need for accessible and culturally appropriate interventions are required to make a difference in the rates of musculoskeletal injuries in agricultural workers.

**Now What?** In order to reduce the rate of musculoskeletal injury that occurs among farm workers, a training program will be developed through the NC Agromedicine Institute and Amexcan that teaches individuals how to lead group education sessions. These sessions will include various stretching exercises and posturing/lifting techniques that help to relieve tension in muscles or prepare one's body for their daily work. Once trained, these individuals can disperse to various agricultural sites where they can facilitate the training sessions and administer the education materials. ¡Cuidate! is a comic strip sponsored by Migrant Clinicians Network and the Northeast Center for Occupational Health and Safety that depicts a story showing the importance of preparing the musculoskeletal system before undergoing strenuous work. Based on the narrative provided in the comic strip, farm workers can learn stretching or lifting techniques, which would help prepare them for certain work styles or movements. The number of comic strips and training sessions given will be recorded. Through this initiative, agricultural workers will have a greater depth of knowledge on how they can reduce their risk of musculoskeletal injury during work, which will hopefully lead to greater overall physical well-being and financial stability.

## **Rural and Agricultural Health Education: Roots of Knowledge**

**Author:** Micah Furr<sup>1</sup>, Robin Tutor, EdD, MPH<sup>2</sup>, Dr. Thomas Irons, M.D.<sup>3</sup>

**Affiliations:** Brody School of Medicine, East Carolina University<sup>1</sup>; NC Agromedicine Institute<sup>2</sup>, Department of Pediatrics, Brody School of Medicine, East Carolina University<sup>3</sup>

**What?** The NC Agromedicine Institute is an institutional collaboration between NC State, NC A&T and East Carolina University whose main goal includes identifying and addressing the health and safety risks of farmers, foresters, fishermen, their families, and rural communities in North Carolina. Partnering with the NC Cooperative Extension offices in each county across the state, the NC Agromedicine Institute helps foster communication of university led research between the residents of rural North Carolina and health care organizations.

**So What?** With 1 in 6 North Carolinians working in the agriculture industry, physicians practicing in North Carolina will be unable to avoid rural health issues. But do Brody students feel prepared through school curriculum to address specific health issues and risks that are present in rural and agricultural health? While serving rural and agricultural residents all over Eastern North Carolina this summer through AccessEast, I realized that most of my classmates have pledged to serve farmers but have yet to step on a farm themselves. With one of Brody's missions being to "improve the health status of eastern North Carolina's residents", it is crucial that the student body understands the population it plans to serve.

**Now What?** A survey is under way to assess the need for a student led rural health initiative and build data to justify that there is a need for a Rural health/ Agromedicine group within the school to educate and advocate for rural health. The longitudinal purpose of this project will be to establish a supplemental Rural and Agricultural Health Education and Advocacy Group within the Brody School of Medicine. Through farm tours, unique presentations from the community and incorporation of rural health education into student learning this project aims to create a space for students to become more familiar with farmers and their work environments, improve student knowledge of relevant agriculture related health issues, advocate for the improvement of health outcomes in rural residents.



## **Cultivating Medical Careers at Building Hope**

**Authors:** Hoon Kong

**Affiliations:** Brody School of Medicine, East Carolina University

**What?** Building Hope Community Life Center is a faith-based non-profit organization founded in 2001 dedicated to serving children and families of the local Greenville community with a focus on youth and family development, particularly for underrepresented minorities. Building Hope offers various programs throughout the academic year and the summer months designed to provide academic support, spiritual formation, character and leadership development, service opportunities, career exploration, and family engagement. One of these programs is the Summer Camp, which is designed for rising 6<sup>th</sup> graders through high school youth and focused on providing them with the tools and resources to develop leadership skills and creative abilities, as well as offer exposure to college and career opportunities. This offers an academic learning and enrichment opportunity during the period in between school years.

**So What?** This collaborative program has been designed to educate minority youth within the local community about a career in healthcare through engaging hands-on activities. Students have the chance to gain valuable exposure to careers in healthcare to which many students had no prior exposure. It is well-documented that racial and ethnic minorities are significantly underrepresented in healthcare. Increasing the minority representation within the healthcare field could pave the way to addressing and solving critical healthcare disparities, as well as improving the health outcomes of minority populations. Exposing minority youth to healthcare career opportunities and stimulating their interest are critical steps that can be taken to begin addressing this issue. Another goal of this program is to promote good health outcomes and well-being in youth and adolescents of the local community. Specifically, the program was designed to educate students on the importance of mental and spiritual health and to engage them in techniques and activities in improving, promoting, and maintaining positive mental and spiritual health outcomes.

**Now What?** We plan on building upon and cultivating the initial relationships formed with the students and organization staff by engaging in academic programs and creating new ones for the upcoming academic year. We plan on carrying the goals that were set for the summer program into the academic year and collaborating with other community partners, organizations, and student volunteers to maintain these goals. We also want to collaborate with Building Hope and curate programs that will promote and advance the organization's goals of serving the children and families of the local community. As future healthcare professionals training in Greenville, it is our desire to serve and give back to the community that is providing us the opportunity to become physicians and servant leaders within our respective fields.

## **HANDS - On Health Education: PhysioCamp Early STEM Engagement in Pitt County**

**Authors:** Micah Lee

**Affiliations:** PhysioCamp, Brody School of Medicine, East Carolina University

**What?** PhysioCamp is a teaching organization dedicated to providing hands-on exposure of STEM and medical education for youth. This summer, I served as a PhysioCamp summer programming coordinator in Greenville, NC, developed curriculum activities, and taught at our community partnership sites. In addition to completing foundational work for upcoming after-school partnerships with schools in Pitt County, the summer programming sites included Joy Soup Kitchen, Bethel Youth Center, and Operation Sunshine. Operation Sunshine includes our youngest participants, with girls ages 5-13. This location will continue to partner with PhysioCamp through the school year to provide continued mentorship and science programming.

**So What?** Studies have shown that children are positively impacted by beginning STEM education earlier in childhood development. Students are more likely to view scientists in a positive light and are more open to pursuing STEM careers when exposure begins in elementary school.<sup>1</sup> In rural communities, this need is even more prevalent, as students have more difficulty accessing STEM programming and are more likely to view these careers as unattainable. However, with consistent mentorship, students overcome these views to have positive attitudes towards pursuing STEM fields and are more likely to choose STEM majors in college.<sup>2</sup> When these STEM opportunities are presented through hands-on curriculum, students demonstrate increased motivation to continue these activities long-term.<sup>3</sup> PhysioCamp provides these hands-on experiences through consistent mentorship opportunities and health science programming.

**Now What?** My future goal is to provide “HANDS-On Health Education” as part of our PhysioCamp programming for ages 5-13. The acronym “HANDS” represents the combined goals of providing a strong health science foundation for our youngest PhysioCamp members through interactive programming. These goals include to *host* PhysioCamp events in partnership with elementary-based organizations, beginning with scheduled programming at Operation Sunshine. Other goals include *adapting* and expanding existing curriculum for elementary students, *nurturing* long-term relationships with these students, *discovering* new volunteers, and *seeking* opportunities to further engage in the rural and underserved communities of Pitt County.

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## **Improving Anthropometric Data Collection: Head Start Summer Fairs**

**Author:** Dana Shefet

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**What?** Head Start (HS) is a federally funded preschool program for low-income children and their families. In an effort to prevent childhood obesity, HS implemented a Body Mass Index screening program in 2007. BMI screening programs are designed to assess the weight status of individual children to detect those at risk for weight-related health problems. As part of their efforts to prevent and reduce obesity in children participating in their program, the current Performance Standards require HS programs to conduct anthropometric screenings and assessments (or obtain from the required health form) within 45 days of enrollment to identify any concerns around children's nutrition and health needs and submit this information on their annual Program Information Report.

**So What?** Approximately 22.8% of preschool children are classified as overweight or obese. Even worse still, children from low-income families, which is exactly the population that HS serves, are at even greater risk to be overweight and face future health problems as adults, including diabetes, hypertension, and hyperlipidemia. HS Performance Standards requires that programs collaborate and communicate the collected anthropometric data with parents and how it relates to their children's health, including that they ensure children obtain necessary referrals, follow-up appointments, and treatments. Without accurate collection of anthropometric data, Head Start does not receive the accurate data in order to know what resources a child needs to help their health.

**Now What?** This summer, I worked with The Food-based Early Education (FEEd) Lab who collaborate with Head Start centers throughout Eastern NC. The FEEd lab offers services at Head Start Health Fairs, a required event for families enrolling in Head Start for the upcoming year. The Health Fairs provide families a multitude of services including wellness checks, eye exams, and education tools for healthy habits for the upcoming school year. My role in the Health Fair was to take the heights and weights of children who came to the Health Fairs and distribute nutrition education information to families. The importance of having a trained individual doing measurements and having the knowledge about nutrition education for the families is crucial. This ensures parents are receiving accurate information about their child's health and have good tools moving forward to help their child.

## **Medical Respite: Care for People Experiencing Homelessness After Hospital Discharge**

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**What?** The Greenville Community Shelter Clinic (GCSC) is a free primary care clinic located inside the Crossroads Community Center. (CCC). The majority of the patients at GCSC are homeless.

**So What?** VAXXED & BOOSTED was a grassroots COVID-19 vaccine campaign that used community ambassadors to influence community members to get vaccinated. At five events hosted at GCSC and the JOY Soup Kitchen, 52 people received their COVID vaccine: 13 people received their first vaccine, 4 people received their second, and 35 people received their booster.

**Now What?** In 2018-2019, 3600 people in Greenville experienced homelessness<sup>1</sup>. A survey conducted of residents of the CCC found that 40% of them had been hospitalized while homeless. Homeless patients are more likely to have longer hospital stays due to a lack of shelter for safe discharge.

A medical respite, as defined by the National Health Care for the Homeless Council, is “acute and post-acute care for persons experiencing homelessness who are too ill or frail to recover from a physical illness or injury on the streets but are not ill enough to be in a hospital”<sup>2</sup>. A medical respite would allow for more timely hospital discharge. Homeless people spend, on average, 3 nights in the hospital per visit, which can cost upwards of \$9,000<sup>3</sup>. In contrast, a medical respite costs \$125 to \$325 per night<sup>4</sup>. One study found that medical respites reduce medical system charges for its patients by 48.6%<sup>5</sup>.

Providing a safe place for homeless people to recover is essential for full recovery. CCC is currently only open from 6 pm-8 am. A medical respite offers not only shelter, but also connects patients with social workers, has 24/7 on call caregivers, and provides food and transportation to and from medical appointments.

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## **Better Serving the Patient Population of Pitt County Care Clinic**

**Authors:** Arden Vessie<sup>1</sup>; Jessica Barbee, LCSW LCAS-A<sup>2</sup>; Juan Allen, BA CHC<sup>2</sup>; Shantell Cheek, RN MAEd<sup>2</sup>; Thomas Irons, MD<sup>3</sup>

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**What?** Pitt County Care Clinic (PCCC) is a free acute primary care clinic serving uninsured and underinsured patients in Pitt, Beaufort, Greene, Martin, and Edgecombe Counties. The clinic saw 190 patients in fiscal year 2021. PCCC partners with Access East, Inc., a non-profit comprehensive care management organization, for social work services. Some of the patient sub-populations PCCC commonly serves include undocumented immigrants, migrant farmworkers, those awaiting Medicaid or Medicare coverage, those awaiting disability status, persons experiencing financial strain, patients following up after Emergency Department discharge, persons formerly incarcerated, persons formerly or currently homeless, unemployed individuals, individuals with no paid time off from work, persons recovering from addiction, and those new to the area with no established PCP.

**So What?** This project's aim was to better understand the various patient sub-populations seen at PCCC and what social determinants of health (SDOH) they may face through immersive volunteering experiences at other organizations in the community used by these patients. The author participated in migrant farmworker health screening events, volunteered with social workers in the Emergency Department, administered COVID vaccines to individuals from West Greenville, helped teach mental health concepts to underprivileged youth, and volunteered at the JOY Clinic and the Greenville Community Shelter Clinic. The author also directly volunteered with PCCC. It was observed that the SDOH PCCC patients face are highly variable from person to person. Overlying themes included financial strain, food insecurity, transportation issues, employment challenges, limited physical activity, substance use, exposure to violence, mental health challenges, and disability.

**Now What?** To better assess and correct for individual patients' SDOH, a standardized screening tool should be implemented in intake paperwork at PCCC. The clinic will now utilize the Centers for Medicare & Medicaid Services' ACH Health-Related Social Needs Screening Tool (ACH-HRSN), as the tool screens for many of the SDOH challenges currently faced by PCCC patients. ACH-HRSN will initially be used as a guide for providers to start conversations about SDOH with patients. Longitudinally, conglomerate data from ACH-HRSN will also inform the spending plan for grant funding.

***Summer Scholars Research Program***

*Program Director: Kori L. Brewer, PhD*

## **Next Generation Sequencing: an ultra-sensitive diagnostic tool for Lyme borreliosis.**

**Authors:** Vanessa Amabo<sup>1,3</sup>, Nolan Holbrook<sup>2</sup>, Gordon Adams<sup>2</sup>, Eric Rosenberg MD<sup>2</sup> and Jacob Lemieux MD, PhD<sup>2</sup>

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**Background or Problem Statement:** Lyme borreliosis is the most common vector borne disease in the US with about 30,000 confirmed annual cases, though the true number is estimated at approximately 500,000 cases per year. It is caused by the bacteria *Borrelia burgdorferi sensu lato* and transmitted to humans via Ixodid tick bites. The first stage of infection is the erythema migrans, which if untreated, may progress to Lyme carditis, or acute neuroborreliosis (stage 2), or Lyme arthritis (stage 3). Direct detection of *B. burgdorferi* in an infected individual is very challenging and unreliable due to its low abundance in clinical samples. Current diagnostics rely on clinical presentation of signs and symptoms with serological confirmation. However, serological testing is insensitive during the first weeks of infection and cannot distinguish between past and active infection. These limitations can lead to missed diagnosis or delayed treatment. Thus, there is a need for better diagnostic tests.

**Objective/Hypothesis/Aim Statement:** Next generation sequencing (NGS) is a technology used to determine the sequence of DNA or RNA. We hypothesize that NGS with target capture enrichment can be used as an ultra-sensitive diagnostic tool for Lyme disease.

**Methods:** To investigate this, we made mock samples (N=12) using human genome DNA and purified *B. burgdorferi* DNA at varying ratios. We then made DNA libraries, with and without target capture from these samples, and sequenced them. For target capture, the *B. burgdorferi* DNA sequences were enriched using complementary “bait” sequences. The unambiguous assembly length of *B. burgdorferi* genome from the sequenced captured and uncaptured libraries will be compared

**Results:** Using the Illumina NGS platform, we successfully sequenced *B. burgdorferi* genome from a cultured sample, as quality control. We are currently analyzing the sequenced data from the captured and uncaptured libraries made from mock samples.

**Conclusion:** Next generation sequencing (NGS) was successful used in sequencing *B. burgdorferi* DNA. We anticipate that target capture enrichment of the pathogen DNA will enhance the sensitivity of NGS especially for samples in which the pathogen is found in very low abundance.



## **Bradykinin Receptor Serves as a Target for Reducing Lung Fibrosis in COVID Mouse Model**

**Authors:** Kristen Armel, MS<sup>1</sup> and Jeffrey Eells, PhD<sup>1</sup> and Henry Shelton<sup>2</sup>

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**Background or Problem Statement:** Evidence suggests that primary consequences of COVID-19 are pulmonary inflammatory responses, including cytokine and bradykinin storms. Elevated bradykinin, an inflammatory mediator for being a source of bronchoconstriction and physiological pulmonary complications, has been reported in severe COVID-19 cases. Reduced lung function has also been reported in patients recovered from COVID-19, including mild disease. In a mouse model of long COVID-19, we found evidence of elevated fibrosis in the lungs, as well as elevated expression of the bradykinin 1 receptor (B1R) that correlated with fibrosis. While evidence displays the pulmonary complications associated with recovery from COVID-19, no studies have tested potential therapeutic targets to prevent this pulmonary damage.

**Objective/Hypothesis/Aim Statement:** Based on our preliminary data, we hypothesized that antagonizing the B1R during infection with SARS-CoV-2 in susceptible mice would block or attenuate lung fibrosis.

**Methods:** K18-hACE2 mice were implanted with an osmotic minipump to continually deliver the B1R antagonist SSR240612 at 10 mg/kg/day or vehicle (40% DMSO, 60% NaCl) at a rate of 0.11 µl/hr, 5 weeks). We administered a low dose of SARS-CoV-2 (4000 TCID<sub>50</sub>) to elicit mild to moderate disease or sham infection intranasally to K18-hACE2 mice and K18-hACE2 B1R antagonist mice. Mice were sacrificed 30 days post infection and lungs were assessed based on visual assessment, Masson's trichrome (used to label collagen associated lung fibrosis), and B1R immunohistochemistry.

**Results:** Our preliminary data suggests that administering a B1R antagonist could reduce fibrosis of the lungs following COVID-19. Other additional findings indicate a potential reduction in neuro-inflammatory response.

**Conclusion:** These data suggest that B1R could represent an important therapeutic target to reducing the degenerative effects of inflammation from COVID. Future studies will continue to evaluate the neurocognitive effects of B1R antagonism in COVID models.

## **The Metabolic Syndrome Is Associated with Dementia: Is Bariatric Surgery a Possible Cure?**

**Authors:** Lucas W Ashley, MS, William Irish, PhD, Walter J Pories, MD

**Affiliations:** Department of Surgery, Brody School of Medicine, East Carolina University

**Background:** Patients with dementia usually present with concomitant diseases including obesity, hypertension, diabetes mellitus type 2, dyslipidemias, and others. Bariatric surgery was shown to lead to full and durable remission of these associated illnesses, often grouped as the “metabolic syndrome.” Bariatric surgery also led to improved brain function reflected by pre and post-operative fMRI. It is hypothesized that bariatric surgery causes remission of metabolic syndrome (MetS) by correcting an aberrant signal from the gut, leading to improved mitochondrial function.

**Objective:** This systematized review aims to examine the relationship between MetS and dementia and to propose bariatric surgery as a possible solution to the onset of dementia as a manifestation of MetS.

**Methods:** PubMed was used to search for the following terms: dementia, Alzheimer’s, metabolic syndrome, obesity, diabetes, dyslipidemia, hypertriglyceridemia, hypercholesterolemia, and hypertension. Included studies considered patients with obesity and at least one other MetS component at baseline with at least a 2-year follow-up screening for cognitive decline.

**Results:** The studies that met the inclusion criteria support the claim that MetS is associated with cognitive decline and the onset of dementia.

**Conclusion:** These results warrant a prospective trial to evaluate the potential effect of bariatric surgery on improving cognitive function in obese patients with chronic brain disease.

## **Small Cell Lung Cancer with Brain Metastasis Initially Treated with Gamma Knife Confers Comparable Survival to Whole Brain Radiation Treatment**

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**Background:** Whole Brain Radiation Therapy (WBRT) is a long considered standard of care for patients with Small Cell Lung Cancer (SCLC) with brain metastases (BM) but could have significant side effects on cognition. Stereotactic Radiosurgery (SRS) is emerging as a potential alternative to WBRT that has less impact on cognition and quality of life.

**Hypothesis:** Gamma Knife Radiosurgery (GKRS) as an initial treatment for patients with brain metastasis from SCLC does not have a worse survival compared to WBRT.

**Methods:** We performed a single center retrospective review at ECU Heath Medical Center of patients with small cell carcinoma or high-grade, poorly differentiated neuroendocrine carcinoma with BM diagnosed between 2009 and 2020. We compared the overall survival of patients who had initial treatment with GKRS to those who had initial treatment with WBRT. Patients that received prophylactic cranial irradiation (PCI) were excluded from this analysis. The log rank test on Kaplan Meyer curves was used to compare these treatment modalities.

**Results:** 167 of the patients with small cell lung cancer were identified with BM. 96 of these received WBRT while 38 received GKRS. 26 were treated with GKRS as the first radiotherapy modality, 12 received WBRT as their first treatment modality.

The overall survival between the two groups was not significantly different ( $p=0.29$ ). There was a slight trend toward better survival with the GKRS patients at 24 months.

**Discussion:** Limitations of this study include the retrospective nature. The cohort of patients receiving WBRT may be ones treated prior to regular immunotherapy use, may have a greater number of BM or leptomeningeal spread, or who had more medical complications impacting their survival. Further analysis needs to be done on the timing and patterns of recurrence after WBRT and GKRS.

**Conclusion:** Within our institutional cohort of patients with BM from SCLC, there was no difference in overall survival of the patients that had GKRS upfront compared to those who received WBRT upfront. Given the lesser cognitive impact of GKRS as opposed to WBRT, this study supports the recommendation of GKRS being the primary treatment modality for select patients with SCLC and BM.

## **Dopamine Metabolite Profiles Predict Whether Opioids Provide Pain Relief in Rats with Chronic Neuropathic Pain**

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**Background or Problem Statement:** The use of opioids to manage chronic neuropathic pain is not universally effective for the millions of individuals who take them and can often lead to abuse. Although analgesic responsive to morphine can be improved when combined with a dopamine agonist, currently there is no way to predict the effectiveness of opioid treatment in humans before it's administration.

**Objective/Hypothesis/Aim Statement:** The aim of this study is to identify blood-based dopaminergic metabolic profiles in a rodent model of pain that can be used to predict opioid-responders and opioid non-responders. We hypothesize rats that benefit from morphine treatment have different dopamine metabolic profiles than rats that do not benefit from treatment.

**Methods:** Thermal threshold latencies (pain thresholds) were identified in 12 female Long Evans rats over 3 test days. Whole blood was collected for baseline metabolomics. Animals underwent ligation of the left sciatic nerve (SNL). Pain thresholds were reevaluated 2, 3, 4, 8, 10 days post SNL to confirm development of neuropathic pain. Lastly thresholds were measured after administration of saline for control and after injection of 2 mg/kg subcutaneous morphine to divide the rats into two groups, opioid responders and opioid non-responders. At the end of experimentation whole blood and injured sciatic nerve were collected and processed for untargeted mass spectrometry.

**Results:** Following SNL, all animals showed a significant reduction in pain thresholds on the side of injury at all time points ( $p < 0.001$ ). When pain thresholds were assessed in the presence of morphine, over the 3 weeks of behaviors testing there were 4 animals that consistently behaved as non-responders, and 4 that behaved as opioid responders for the majority of trials. Blood will be analyzed using mass spectrometry to determine dopamine profile that predict responsiveness.

**Conclusion:** Pending blood analysis, we hope to identify a metabolic profile that is ultimately predictive of opioid responsiveness.

## **Communicating Genomic Concepts with Virtual Reality: Participants Demonstrate Differential Mastery of Concepts post Targeted Vignette Exposure**

**Authors:** Quashawn Chadwick<sup>1</sup>, Alison Jane Martingano, Ph. D.<sup>2</sup> Sydney Telaak<sup>2</sup>, Siri Ravuri<sup>2</sup>, Christopher Fortney<sup>2</sup>, Alison Susan Persky Ph. D.<sup>2</sup>

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**Background or Problem Statement:** Overweight and Obese status are heavily stigmatized conditions which have strong genetic and environmental influences and the role of genomics in development is complex. There are few studies which evaluate the combined effects of Gene and Environment on eating behaviors and weight; however, existing literature supports the notion that discussing genomic factors in weight can reduced stigma regarding weight.

**Objective/Hypothesis/Aim Statement:** The purpose of this study was to evaluate the degree of efficacy of a video educational application conveying information concerning gene-environment interactions in the context of eating-behaviors. Previous study efforts sought to demonstrate the accessibility of the virtual reality environment to healthy patients. This study focused on evaluating which vignette scenario would lead to improvements in genetics knowledge and knowledge on influences of eating behaviors.

**Methods:** Study participants [n=665] were prompted to take a pre-test online questionnaire which included questions about eating behaviors and their attitudes toward such. Then participants were assigned either educational conditions where they learned about the genetic and environmental components of eating behaviors, or they were shown an equivocally designed control video regarding spicy food. Experimental groups were then led to watch 1 of 4 pairs of video scenarios taking place in a dinner party or office environment. Control groups were shown control vignettes about spicy food. At the end of each video, a health provider explained the impact of the vignette character's behaviors on health. Finally, half of all participants were shown an alternative vignette pair demonstrating opposite behaviors and outcomes for vignette characters. All participants were prompted to complete a questionnaire which required them to demonstrate basic knowledge and applied knowledge concerning a novel scenario.

**Results:** Participants who were shown gene-environment interaction educational material demonstrated significantly greater accuracy on true-false scenario questions than individuals exposed to control alone. No significant differences were found in participants' implicit knowledge of outcomes related to gene-environment interactions in novel scenarios.

**Conclusion:** These results may lay further groundwork for increased educational utility via digital and virtual media to convey genomic information. Future research seeks to explore the effect of education about gene-environment interactions on health behavior motivation.

## **A Randomized, Single Center Pilot Study Comparing Hyaluronic Acid to Vaginal Estrogen for Treatment of Genitourinary Syndrome of Menopause**

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**Background or Problem Statement:** Genitourinary syndrome of menopause (GSM) is a chronic condition resulting from a decrease in estrogen. Symptoms are prevalent amongst menopausal women and 85% of women over the age of 40 suffer from vaginal dryness. Topical estrogen therapy has been the gold standard treatment for GSM, as it replaces depleted estrogen in post-menopausal women. However, due to both medical contraindications and patient preference, non-hormonal alternatives are important to explore for this prevalent condition. Hyaluronic acid (HLA), a non-sulfated glycosaminoglycan, has been recently identified as a potential non-hormonal treatment option for GSM. Its efficacy in treating GSM symptoms needs to be explored.

**Objective/Hypothesis/Aim Statement:** The goal of this study is to compare and assess the acceptance and effectiveness of the non-hormonal alternative, HLA, to the standard of care, vaginal estrogen, for the treatment of GSM using a randomized, controlled, parallel trial.

**Methods:** Forty post-menopausal women will randomly be administered either HLA Vaginal insert (5mg of active medication, 2g vaginal insert) or vaginal estrogen cream, estradiol (100mcg), to use bi-weekly in the 12-week study period. There will be baseline and 12 week follow up visits, at which points patients will undergo a detailed history and physical examination including a pelvic exam, vaginal pH sampling and vaginal cell sample for microscopic analysis. The primary study endpoint is assessed through: Vulvovaginal System Questionnaire (VSQ), Visual Analog Scale (VAS) and Vaginal Maturation Index (VMI). The secondary study endpoint will be assessed through changes in Female Sexual Function Index (FSFI) and Vaginal Symptom Index (VSI) scores from baseline to the 12-week visit, percentage of superficial squamous cells in VMI, vaginal pH, rugal fold appearance, and VAS scoring for dyspareunia, vaginal itching, and dryness. Primary and secondary outcome measures will be summarized overall and by treatment group. Analysis will focus on the quality of life and objective measures of vaginal health improvement obtained in the HLA group, rather than hypothesis testing, to compare outcomes to those receiving estrogen. Compliance and retention will be similarly described overall and by treatment group.

**Results:** Results are not available, as it is still in recruitment phase.

**Conclusion:** Conclusions for this study are pending statistical results.

## **Isolation & Characterization of T11-Derived Exosomes Loaded with Magnetic Iron Oxide Nanoparticles**

**Authors:** Juan Beltran-Huarac<sup>1</sup>, PhD, Homeira Faridnejad<sup>1</sup>, George Edwards<sup>2</sup>

**Affiliations:** <sup>1</sup>Department of Physics, East Carolina University; <sup>2</sup>Brody School of Medicine, East Carolina University

**Background or Problem Statement:** Current breast cancer therapies are plagued by lack of target cell specificity, leading to debilitating side effects. Exosomes can improve drug delivery due to their ability to cross physiological barriers, while adopting properties of their cell of origin and evading the immune response. Furthermore, it has been shown that cancer cell cytoskeletons can be disrupted by mechanotransduction, causing cell-specific apoptosis.

**Objective/Hypothesis/Aim Statement:** We propose loading exosomes derived from breast cancer cells with iron oxide nanoparticles and applying exogenous non-heating magnetic fields to realign magnetic domains of these nanoparticles in order to selectively disrupt cancer cell cytoskeletons. Here, we developed a protocol for isolating and characterizing exosomes derived from T11 breast cancer cells.

**Methods:** Exosomes were isolated using the 101Bio Exosome Isolation Kit, and were characterized using Western blotting, Dynamic Light Scattering (DLS), and Nanoparticle Tracking Analysis (NTA).

**Results:** The 101Bio Exosome Isolation Kit yielded a low concentration of T11-derived exosomes, and did not stain for characteristic exosomal biomarkers. However, the size and dispersity of the exosomes were close to the expected values.

**Conclusion:** Usage of an alternative exosome isolation kit could increase the exosome yields. Additionally, a higher quality staining antibody would allow for better characterization of exosomal biomarkers.

## **Decreasing Opioids in the Emergency Room: Pramipexole Adjuvant Cuts Opioid Dose in Half in Acute Renal Colic Patients**

**Authors:** Cara Girardi<sup>1,2</sup>, Joseph Duronio<sup>1,2</sup>, Ryan Patton<sup>1,2</sup>, MSIII, Allison Mainhart<sup>1,2</sup>, Kori Brewer<sup>1,2</sup>, PhD

**Affiliations:** <sup>1</sup>Brody School of Medicine, <sup>2</sup>ECU Health Department of Emergency Medicine

**Background:** In emergency settings, renal colic is commonly treated with opioids when NSAIDs are contraindicated or ineffective. Due to the nationwide concern about opioid abuse and dependence, physicians are being asked to reduce the use of opioids whenever possible. Preclinical animal studies suggest that adding pramipexole, a dopamine-agonist typically used in Parkinson's disease, to low-dose morphine may provide a greater analgesic effect than higher-dose morphine alone.

**Hypothesis:** We predict that Pramipexole when used as an adjuvant therapy to lower-dosed morphine could provide analgesia comparable to the current standard of care opioid dose in acute renal colic patients.

**Methods:** A randomized double-blind control trial was performed in the Emergency Department of an academic Level I trauma center. Suspected renal colic patients were screened for inclusion/exclusion criteria and consented prior to receiving any pain medication. Eligible patients were randomized to receive either a single dose of pramipexole, 0.25 mg oral tablet in combination with 0.05 mg/kg IV morphine (experimental group), or a single dose of 0.1 mg/kg IV Morphine with a placebo pill (control group). Primary outcomes were change in pain and drug effect ratings at 15-minute intervals (over 2 hours or until discharge from the ED) and the need for rescue medications within 30 minutes of enrollment.

**Results:** A total of 20 patients have been enrolled to date. One patient was withdrawn due to an administrative error. To date, two patients required rescue medication in the control group and two in the experimental group. Preliminary data shows that patients in the experimental and control groups report similar levels of pain relief throughout the study period. Early data from the drug effects questionnaire show that patients in the study arm reported comparable or lower values for all drug effects questions.

**Conclusion:** Should pramipexole enhance the pain relief of morphine alone, this treatment may provide analgesia while minimizing exposure to opioids in the emergency department. Future studies will apply this pain management regimen to other acute pain conditions to determine if pramipexole has a broader scope of use.



## **Determining the Accuracy of Implant Treatment Planning with CBCT**

**Authors:** Hunter Jolicoeur and Wenjian Zhang, DDS, MS, PhD

**Affiliations:** ECU School of Dental Medicine

**Background:** Implants are increasingly utilized to replace teeth and address edentulous regions of the alveolar ridge in dentistry. Cone beam computed tomography (CBCT) is a tool used to aid with planning implants by producing cross-sectional images and providing linear measurements of the regions of interest. It is imperative that the accuracy of CBCT scans and planning is precise and evaluated, as not many studies have been conducted in the area.

**Aim:** This study aims to address if the accuracy of the measurements CBCT produces is sufficient.

**Methods:** A retrospective case-control study was conducted to assess the accuracy of CBCT measurements taken from ECU SoDM locations throughout 2017-2022 in relation to the corresponding implant data. The implant data was obtained from axiUm, ECU SoDM's electronic health record, and focused on 4 sites: Central incisors, Canines, 1st premolars, and 1st molars (Maxillary and Mandibular). Factors of age, race, sex, and implant brand were taken into account as well. One-way analysis of variance was run to determine the average sizes for alveolar ridges and implants. A Pearson correlation analysis was conducted to determine the accuracy of CBCT based implant treatment planning.

**Results:** The results of this analysis determined that implants placed at mandibular first molar, maxillary first premolar, and mandibular canines were locations that demonstrated significant correlations with the sizes of edentulous regions, producing P-values < 0.05.

**Conclusion:** This study indicates that CBCT based alveolar ridge measurements provide a reliable index to predict future implant sizes. However, its accuracy may be limited by anatomic factors, such as angle of edentulous ridges and proximity to vital anatomic landmarks.

## **Developing a 4-D Dynamic Model for GammaTile Dose Distribution**

**Authors:** Sean King BS, Kaida Yang PhD, Sunil Sharma PhD, Andrew Ju MD, M. Sean Peach MD PhD

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**Background:** GammaTile brachytherapy, a novel and promising brain tumor treatment, involves the permanent implantation of radioactive Cesium-131 seeds into the brain immediately following the surgical removal of the tumor. The radiation sources are embedded in a manner to thoroughly dose the surrounding tumor cavity. However, the healing of the surgical cavity can result in the migration of the seeds and consequently the distribution of radiation dose. These are factors that may warrant further consideration during the surgery planning process.

**Hypothesis:** The change in distribution of dose from tumor bed evolution can be modeled through subsequent imaging.

**Methods:** This case report details a patient who received additional imaging after the implantation of their GammaTile radiotherapy sources as she was also receiving additional external beam, radiotherapy to the brain lesion and has cone beam CT imaging available for analysis. Individual radioactive seeds were identified, contoured, and localized in each post-operative. The seed positions were plotted and a model constructed of the 4D evolution of the dose distribution. The contours were generated in Velocity and the seed position model produced in Matlab.

**Results:** Analysis is pending

**Conclusion:** This modeling of the tumor bed/seed position evolution is the first reported proof of concept approach to generate a dynamic model of GammaTile dose distribution over time.

## **SBRT Re-irradiation of Intrathoracic Recurrence of Lung Cancer After Prior Radiation Therapy**

**Authors:** Joseph Maitre<sup>2</sup>; Andrew Ju, MD<sup>1</sup>; Mohit Kasibhatla, MD<sup>1</sup>

**Affiliations:** <sup>1</sup>Department of Radiology Oncology, <sup>2</sup>Brody School of Medicine

**Background or Problem Statement:** Stereotactic body radiosurgery (SBRT) achieves excellent local control with low toxicity for patients with Stage I primary lung cancer in multiple prospective trials. There are limited data regarding efficacy and toxicity of SBRT as re-irradiation for patients with an intrathoracic recurrence of lung cancer after primary conventional radiotherapy (RT) or SBRT.

**Objective/Hypothesis/Aim Statement:** The aim of this study is to examine the outcome of re-irradiated lung cancer patients using SBRT in terms of local control, failures, and toxicities.

**Methods:** We performed a retrospective review of patients treated with SBRT as definitive treatment for intrathoracic recurrence of primary lung cancer after conventional RT or SBRT. Between 2009-2020, we identified 100 patients treated with definitive SBRT at our institution for intrathoracic failure of primary lung cancer after prior conventional RT or SBRT. Patients were evaluated for local control, overall survival and toxicity. Patients were divided into two groups based on the proximity of disease recurrence to the original radiation fields. Those with a recurrence within 2 cm original tumor or in the same lobe were considered local recurrences (group A) and those with tumors outside this area were considered elsewhere recurrences (group B). Patients were grouped as having either a local recurrence of their original cancer (group A) or a second intrathoracic tumor geographically distant from the original tumor (Group B).

**Results:** Data collection has not been completed yet. Thus, results still pending.

- Clinical factors: Median age, sex, prior lung cancer histology, prior stage, prior RT or SBRT, prior chemotherapy or immunotherapy.
- Treatment factors: Median tumor size, SBRT dose, dose per fraction, duration of treatment, use of chemotherapy, immunotherapy, Interval between original treatment and re-irradiation.
- After a median follow-up of \_\_\_ years, the \_\_\_ yr rate of LRC was \_\_\_\_, the \_\_\_ yr OS was \_\_\_ for group A and group B.
- The Pulmonary toxicity for each group was \_\_\_\_. The Cardiac toxicity was \_\_\_\_. The rib injury for each group was \_\_\_.

**Conclusion:** Due to incomplete data collection and pending results, there have been no definite conclusion made. We hope to find that SBRT re-irradiation of intrathoracic recurrence of lung cancer after prior radiation therapy offers high rates of local control and survival with an acceptable toxicity.

## **Investigating the Determinants of Clinical Phenotypes of Peripheral Artery Disease Using Mouse Models of Limb Ischemia**

**Authors:** Joseph M. McClung, PhD<sup>1</sup>, Timothy J. McCord, PhD<sup>2</sup>, Derek T. Peters, MD, PhD<sup>2</sup>, Yueyuan Xu, PhD<sup>2</sup>, Xin Lin, PhD<sup>2</sup>, Xiaolin Wei, PhD<sup>2</sup>, Yarui Diao, PhD<sup>2</sup>, Kevin W. Southerland, MD<sup>2</sup>, Meek Myoung<sup>3</sup>

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**Background or Problem Statement:** Peripheral artery disease (PAD) affects more than 200 million people worldwide and is associated with a 15-20% amputation rate at 1 year and 50% mortality at 5 years despite existing therapies. Anatomic lesions do not always correlate with clinical phenotype; thus, patients with the same vascular lesion and similar limb perfusion on angiography and ankle-brachial index may develop chronic limb-threatening ischemia (CLTI) or intermittent claudication, which is exertional pain without tissue necrosis. This can be observed in mice where different inbred strains of mice (BALB/c and C57BL/6) respond differently to the same ischemic insult. Understanding the influence of genetics on skeletal muscle tissue regeneration and characterizing the cellular heterogeneity and intercellular signaling that occur in the ischemic limb in murine models may provide insights into the development of novel regenerative therapies for PAD.

**Objective/Hypothesis/Aim Statement:** In mouse models of limb ischemia, do certain genetic and cellular and transcriptional dynamics impact skeletal muscle regeneration?

**Methods:** This poster presentation provides an overview of three separate publications:

1. Experiments were conducted on adult C57BL/6 (BL6) (n=51) and BALB/c (n=58) mice. Acute limb ischemia (ALI) was induced by ligation and resection of the femoral artery. Subacute limb ischemia (SLI) was induced by placement of either one or two ameroid constrictors. Muscle samples were stained with hematoxylin and eosin and quantification of blood flow was done with laser Doppler perfusion image (LDPI) scanning.
2. Mice were treated with either adeno-associated viruses encoding a control (green fluorescent protein) or the Met81 or Ile81 variants of BAG3. The mice were then subjected to hind-limb ischemia (HLI) surgery.
3. Single-cell RNA sequencing was applied to samples obtained from BL6 and BALB/c mice after HLI surgery. Cell-cell signaling interactions were obtained via CellChat analysis and macrophage differential gene expression results were analyzed using bulk RNA sequencing of macrophages. Immunostaining of ischemic and non-ischemic lower extremity skeletal muscle was done on patients undergoing amputation for CLTI.

### **Results:**

1. Subacute limb ischemia leads to significant tissue necrosis and limb perfusion deficits in genetically susceptible BALB/c but not BL6 mice independent of vascular density.
2. BAG3 Ile81Met variant in BL6 mice leads to enhanced binding to the small heat shock protein (HspB8) in ischemic skeletal muscle cells and augmented ischemic muscle autophagic flux.
3. Altered macrophage response is associated with impaired muscle regeneration.

**Conclusion:** The sequential findings of these three publications are that (1) a critical determinant of susceptibility to ischemia following ALI or SLI may be the genetically determined muscle cell autonomous response that is at least partly independent of muscle blood flow and vascular density, (2) the BAG3 Ile81 allele in BL6 mice confers protection to ischemic tissue necrosis and (3) there is a correlation between the persistence of pro-inflammatory macrophages and impaired skeletal muscle regeneration in the BALB/c strain. Obtaining an understanding of the genetics and cellular and transcriptional dynamics in skeletal muscle regeneration in the setting of limb ischemia is an exciting area of vascular research and offers potential opportunity for the development of novel treatments.

## **Neo-chord creation versus leaflet resection technique for robotic surgical repair of mitral valve regurgitation**

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**Background:** Compared to standard surgical approaches, the DaVinci robotic surgery system offers improved patient outcomes and intraoperative control (Chitwood, 2018). In the setting of mitral valve regurgitation, the two most common repair techniques are neochord creation and leaflet resection (Pfanmuller, 2020). However, to our knowledge, no study has assessed which technique produces the best patient outcome when approached robotically.

**Objective:** Assess which mitral valve repair technique produces the best patient outcome when approached robotically.

**Methods:** 20 years of adult cardiac surgery data collected at East Carolina Heart Institute was compiled and filtered to meet appropriate inclusion and exclusion criteria as relevant to the above objective. Next, to account for preoperative differences and potential confounding, robotic cases were propensity score matched (1:1) to both neo-chord creation and leaflet resection approaches via logistic regression. Upon propensity matching, paired statistical testing is performed to assess which robotic surgical approach is associated with the best patient outcome.

**Results:** Pending.

**Conclusion:** Recently (Pfanmuller, 2020), neo-chord creation was associated with reduced mitral regurgitation on pre-discharge echocardiography compared to leaflet resection when using a minimally invasive approach. Pending results, our center's data would provide some evidence as to whether this remains true when using a robotic surgical approach.

## **Immune checkpoint inhibitors promote colitis via the upregulation of adhesion molecules in an experimental murine model.**

**Authors:** Aaron T. Phillips, Mona A. Marie, Fatema B. Salem, Ashley J. Williams, Anish H. Alur, Li V. Yang, PhD

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**Abstract:** Immunotherapy for cancer using immune checkpoint inhibitors (ICI) is a common and effective way to treat a plethora of cancers. However, the use of ICIs may lead to multiple types of immune-related adverse events (irAEs) including colitis. Studying various biomarkers including adhesion molecules may allow better management of adverse immune events in patients receiving immunotherapy. The effects of ICI on adhesion molecules were studied using a mouse model. One group of mice was injected with anti-CTLA4 and anti-PDL1 (ICIs) and another was injected with the isotype control (ISO). Following the administration of ICI or Isotype, 2% Dextran Sodium Sulfate (DSS) was administered in the drinking water. Immunohistochemistry (IHC) was then performed on the colon sections to evaluate the expression of adhesion molecules: VCAM-1 and E-Selectin. It was shown that colons from mice who received an ICI + DSS treatment had more severe forms of colitis evident by the presence of more positive signals of VCAM-1 and E-selectin on vascular endothelial cells and increased immune cell infiltration into the lamina propria of the distal colon. Immunocytochemistry (ICC) was also conducted on Phosphorylated-Focal Adhesion Kinase (P-FAK) and Phosphorylated-Paxillin (P-Pax) using Human Umbilical Vascular Endothelial Cells (HUVEC) to study the signaling pathways between adhesion proteins under different microenvironment pH conditions. The cell culture studies showed that at a pH of 6.4 the P-FAK and P-Pax tend to accumulate on the periphery of the cell and actin stress fibers are located in the center of the cell. This is different from physiological pH where the adhesion regulatory proteins accumulate within the cell body and the stress on actin fibers is not as severe when compared to a more acidic environment. These findings may prove that cell adhesion is impacted by changes in the microenvironment. Comparing these findings shows that immune checkpoint inhibitors exacerbate colitis by causing upregulation of adhesion molecules.

**Hypothesis:** Adhesion molecules along with other biochemical markers can predict the occurrence of adverse immune events in patients with cancers that are treated with immune checkpoint blockade treatments.

**Background:** Immunotherapy for cancer using immune checkpoint inhibitors (ICI) is a common and effective way to treat a plethora of cancers. However, the use of ICIs may lead to multiple types of immune-related adverse events (irAEs) including colitis.

**Hypothesis:** Studying various biomarkers including adhesion molecules may allow better management of adverse immune events in patients receiving immunotherapy.

**Methodology:** The effects of ICI on adhesion molecules were studied using a mouse model. One group of mice was injected with anti-CTLA4 and anti-PDL1 (ICIs) and another was injected with the isotype control (ISO). Following the administration of ICI or Isotype, 2% Dextran Sodium Sulfate (DSS) was administered in the drinking water. Immunohistochemistry (IHC) was then performed on the colon sections to evaluate the expression of adhesion molecules: VCAM-1 and E-Selectin.

**Results:** It was shown that colons from mice who received an ICI + DSS treatment had more severe forms of colitis evident by the presence of more positive signals of VCAM-1 and E-selectin on vascular endothelial cells and increased immune cell infiltration into the lamina propria of the distal colon. Immunocytochemistry (ICC) was also conducted on Phosphorylated-Focal Adhesion Kinase (P-FAK) and Phosphorylated-Paxillin (P-Pax) using Human Umbilical Vascular Endothelial Cells (HUVEC) to study the signaling pathways between adhesion proteins under different microenvironment pH conditions. The cell culture studies showed that at a pH of 6.4 the P-FAK and P-Pax tend to accumulate on the periphery of the cell and actin stress fibers are located in the center of the cell. This is different from physiological pH where the adhesion regulatory proteins accumulate within the cell body and the stress on actin fibers is not as severe when compared to a more acidic environment.

**Conclusion:** These findings may prove that cell adhesion is impacted by changes in the microenvironment. Comparing these findings shows that immune checkpoint inhibitors exacerbate colitis by causing upregulation of adhesion molecules.



## **Patient Characteristics and Experiences and Impact on Preference of CVT in Contrast to In-Person Visits at the Veterans Health Administration**

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**Background or Problem Statement:** During COVID-19, there was an unprecedented increase in telehealth services across all available VA platforms. The number of VA clinical video telehealth (CVT) visits increased by more than 300% between Oct-March 2020 and April-June 2020. Without effective delivery of care that is appropriate for the wider VA audience, the utilization of telehealth services could be temporary. There is a need to understand how different patient characteristics and experiences with telehealth visits during the rapid expansion of telehealth services impact preference of clinical video telehealth (CVT) in contrast to in-person visits at the Veterans Health Administration. The goal is to identify barriers and facilitators to the endorsement of CVT preference in comparison to in-person visits to maintain sustainability of VA telehealth services as a modality of care, without furthering healthcare disparities.

**Objective/Hypothesis/Aim Statement:** Evaluate patient characteristics and telehealth experiences of veterans endorsing clinical video telehealth (CVT) preference in contrast to in-person visit preference at the Veterans Health Administration.

**Methods:** To evaluate the impact of patient characteristics and telehealth experiences on visit modality preference, we compared the responses of veterans endorsing CVT to those endorsing in-person visits in a quality improvement self-administered mailed survey Veterans from New York harbor (NYH) and San Diego (SD) VHA sites.

**Findings to date:** The survey used standardized tools to assess barriers to and facilitators of use, satisfaction, and preferences for CVT utilization in comparison to in person visits in different scenarios among N=308 veterans who received at least one CVT from NYH (53%) and SD (47%). The sample was mostly males (83%), with half being non-Hispanic whites (50.6%), with a mean age of 62.5 years (SD = + 13.6, range= 26-88). Satisfaction CVT was high overall (8.4 on a scale from 0-10, SD= + 2.0). The proportion of Veterans reporting positive experiences with CVT was high (Range: 94-98%) overall (e.g., ability to ask all needed questions, provider spending enough time, ability to communicate all health concerns). However, less Veterans (35.4 %) reported CVT preference (i.e., preferred CVT or found no difference in contrast to in person visits) compared to in person visits (64.6%).

**Conclusion:** In Progress.

## **Concurrent Diagnoses: Meningioma and Hodgkin Lymphoma**

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**Background:** Hodgkin's lymphoma (HL) makes up 3% of cancer in children 14 years and younger and 11% of adolescents aged 15-19 years. Lymphoma is currently the second most common cancer in adolescents.<sup>1</sup> Sites of metastasis for HL include liver, spleen, lung, bone, and bone marrow.<sup>2</sup> Rarely, 0.2-0.5% of cases of HL have CNS involvement.<sup>3</sup> Currently, HL has an average 5-year survival rate of 97%.<sup>1</sup> Although there are documented cases of multiple primary malignancies in adults dating back to 1932, there are no current accessible published cases involving pediatric patients.<sup>4</sup>

**Objective:** We present a case report of concurrent diagnoses of Hodgkin's lymphoma and meningioma and a comprehensive review of pediatric literature.

**Methods:** A PubMed literature search was performed using the following keywords: Hodgkin's lymphoma (AND) meningioma, Hodgkin's lymphoma (AND) brain tumor published between 1964-2022. Articles were filtered for human, and English Language.

**Results/Literature Review:** Since 1964, there have been less than 10 published articles regarding Hodgkin's lymphoma with CNS metastasis and 2 articles regarding a concurrent diagnosis of Hodgkin's lymphoma and CNS tumors.<sup>5,6</sup> None of these cases occurred in pediatric patients, defined as 0-19 years of age.

**Case Report:** A 17-year-old adolescent female was diagnosed with classical Hodgkin's Lymphoma, nodular sclerosing subtype. During staging for this malignancy, was found to have a concurrent diagnosis of a meningioma.

**Conclusion:** Our case highlights the rarity of concurrent diagnoses of two distinct malignancies in the pediatric population. Given the rarity of CNS involvement, current staging guidelines for Hodgkin's lymphoma do not involve screening of the head in pediatric patients. Given our unique case, future consideration should be made for baseline imaging of CT head, especially in cases with minor neurological deficits. At the time of her concurrent diagnoses, her treatment team felt it was medically necessary to prioritize the treatment of her Hodgkin's lymphoma over the meningioma. A delay in treatment of lymphoma could result in life-threatening sequelae from worsening lymphadenopathy and ultimately decreasing overall survival for this diagnosis.

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## **Dose Optimization of SDF-1 mRNA for Treating Erectile Dysfunction**

**Authors:** Nethusan Sivanesan, BS/BA, Wrenn Pallas, BS, and Johanna Hannan, PhD

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**Background or Problem Statement:** Erectile dysfunction (ED) affects about 30 million men in the US and is expected to rise in our aging population. Current ED treatments have high discontinuation rates due to ineffectiveness, side effects, and drug-drug interactions. The pathophysiology of ED often involves damage to the nerves and vasculature. Preliminary rodent studies demonstrated stromal cell derived factor 1 (SDF-1) recombinant protein can restore erectile function by inducing an endogenous tissue repair mechanisms in neurons and smooth muscle. However, SDF-1 has a short half-life necessitating expensive, frequent administration to have an effect. With the current advances in synthetic mRNA engineering, multiple SDF-1 proteins can be translated over a longer period providing a larger therapeutic window.

**Objective/Hypothesis/Aim Statement:** The aim of this study is to identify the optimal dose of SDF-1 mRNA to maximize SDF-1 protein expression in the penis and minimize systemic toxicity. We predict SDF-1 mRNA penile injections will have no toxic effects at 10 µg and 25 µg doses; however, predict toxicity at the max dose of 50 µg. We predict SDF-1 mRNA penile injections will increase penile SDF-1 protein expression dose-dependently.

**Methods:** Adult male Sprague-Dawley rats (n=20) were randomized by weight into 5 groups (n=4/grp): 1) Saline, 2) Carrier Control, 3) 10 ug SDF-1 mRNA, 4) 25 ug SDF-1 mRNA, 5) 50 ug SDF-1 mRNA. The SDF-1 mRNA nanoparticle was injected into the penis of the anesthetized rat with a 31-gauge needle. Penis, testes, liver, lung, adrenal gland, spleen, heart, kidney, prostate, MPG, and bladder were collected 24h after penile injection. SDF-1 protein ELISA were performed on penile tissues and serum. Toxicological endpoints measured included serum complete blood counts (CBC), basic metabolic panels (BMP), and organ/body weights were assessed. A one-way ANOVA with a Bonferroni post-hoc test was used to analyze significant differences between groups.

**Results:** There were no differences found in the body or organ weights. The complete blood count and basic metabolic panels had no differences between the groups. ELISA analysis of the serum collected from whole blood had no differences in the expression of SDF-1 protein between groups ( $P \geq 0.05$ ). Penile SDF-1 protein expression is being measured.

**Conclusion:** The three doses of SDF-1 mRNA administered by penile injection did not cause any systemic toxicity. There were no significant findings in the CBC or BMP, thus reducing chances of hematological, metabolic or organ pathologies from SDF-1 mRNA treatment. Protein expression of SDF-1 mRNA in the serum shows that there is reduced risk of systemic toxicity. Our penile SDF-1 ELISA data will determine whether this therapy will provide targeted protein expression to the penis.

## **SAM IO and EZ-IO Comparison Study: Not So Fast SAM!**

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**Background:** Intraosseous (IO) access is a medical procedure primarily used in emergencies when peripheral venous access is unobtainable. The EZ-IO is a battery-operated electric drill. The SAM IO is a newer, hand-actuated device.

**Objective:** This study compares the EZ-IO and SAM IO insertion time in a porcine humeral bone and EMS feedback.

**Methods:** This prospective comparison study with advanced EMS providers began by watching instructional videos demonstrating both device applications. Participants practiced insertions with both drills on plastic bone then swine bone until proficiency was self-reported. The device order of use was randomized, and IO needle size was paired for insertion with each drill and timed. Insertion time was computed from the start of trigger actuation until stopping. Flushing the catheter with 1-3mL saline with visual perfusion out of medullary space assured proper catheter placement. Participants completed a short survey and provided open feedback.

**Results:** For this study, 115 EMS providers participated. The insertion time using the EZ-IO,  $M=1.04s$ , 95% CI [0.45,1.64] was faster than the SAM IO,  $M=4.60s$ , 95% CI [3.99,5.20],  $p<.001$ . A two-way ANOVA was performed, demonstrating a mean difference of 3.56 seconds to insertion,  $F(1,239)=68.22$ ,  $p<.001$ , partial  $\eta^2=.230$ . There was no significant interaction between needle sizes or device order. The majority of participants, 74.8%, preferred the EZ-IO and 19.1% reported no preference. Participants noted that the EZ-IO was easy to use, durable, and familiar. The SAM IO was also easy to use, but concerns were expressed about the ergonomics, durability, decontamination, and the needle hub attachment. Participants noted the lack of battery dependence as a benefit of the SAM IO.

**Conclusion:** The EZ-IO insertion time was faster, but the difference in time would unlikely impact clinical outcomes. Participants preferred the EZ-IO, but would also be comfortable using the comparable SAM IO in a clinical setting. A limitation of the study may result from participant bias due to personal preference on insertion intervals. Future studies should look at clinical trials to study patient outcomes.

## **A Large Retrospective Analysis of Systemic Reactions Associated with Allergen Immunotherapy in the U.S. During the Years 2019 and 2020**

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**Background:** Subcutaneous allergen immunotherapy (SCIT) is an allergy immunotherapy used to treat numerous allergic disorders. Adverse reactions to SCIT range from local effects to systemic reactions (SR), including death. This work analyzes almost 4.2 million SCIT injections given at different Allergy Partners<sup>®</sup> locations during 2019 and 2020, and 2325 SR. Allergy Partners<sup>®</sup> is the largest nationwide group of practicing allergists in the country, with more than 100 locations.

**Objective:** This study aims to evaluate the occurrence, grade, and factors involved with SR to SCIT. Typically, post SCIT monitoring is mandated in clinic. This analysis also intends to guide future clinical practice regarding SCIT such as post SCIT monitoring and others.

**Methods:** Providers at each Allergy Partners<sup>®</sup> were required to fill out a standardized EMR form to report SR. We used chi-square analysis to determine if the distribution of times until reaction, as well as grade, was the same across all groups of BMI, number of years on immunotherapy, phase, and schedule.

**Results:** During the years of 2019 and 2020, there were 4,180,720 injections administered across all Allergy Partners<sup>®</sup> locations with an SR rate of 0.056% (n=2,325). Majority of reactions were grade 1 (n=933, 41.3%) and grade 2 (n=1,226, 54.3%). Only 3.1% of patients were characterized as grade 3 (n=71) and 1.3% as grade 4 (n=29). Almost half of all SR required epinephrine use (n=1,019, 43.8%). Over half of all SR occurred within 30 minutes after SCIT (total n= 1,315, 58.2%). Only 6.7% (n=152) occurred after one hour and only 2.6% (n=59) occurred after two hours. All variables had a significant influence on the time to reaction. Despite this, there was no clear pattern for any except schedule. Patients on a rapid/cluster schedule tended to have delayed reactions. In respect to grade/severity, no variables had a significant influence.

**Conclusion:** Over 50% of SR occurred within the first 30 minutes after SCIT, suggesting that current clinical guidelines for post SCIT monitoring are reasonable. Analyzed variables showed no clear pattern on time to reaction, except for schedule. There was also no significant effect on grade of reaction, suggesting clinicians seek other variables to predict the most severe reactions.

## **Incidence of Suicide in Patients with Young-Onset Colorectal Cancer**

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**Background or Problem Statement:** Over the past 10 years, the incidence of colorectal cancer (CRC) has increased significantly among younger patients. Although it is well-established that patients with cancer experience significant psychosocial distress, few studies have examined mental health and suicide rates among patients with young-onset CRC (< 50 years of age).

**Objective/Hypothesis/Aim Statement:** The primary aim of this study was to determine the incidence of suicide among patients diagnosed with CRC between the ages of 18 and 49. Secondary aims included investigating clinical and demographic factors associated with risk of suicide.

**Methods:** A retrospective study was conducted using data from the population-based SEER cancer registry. The study population included individuals aged 18 to 49 years with CRC diagnosed between 1975 – 2018. Standardized mortality ratios will be calculated to compare the risk of suicide in the study cohort with the general population using US census data.

**Results:** Preliminary data analysis is ongoing. Our hypothesis is that patients with young-onset CRC experience higher rates of suicide than the general population. We further hypothesize that patients aged 20 – 24 years will have the highest level of incidence of suicide. We hypothesize that factors associated with risk of suicide among these patients may include marital status, race, socioeconomic status, and cancer stage.

**Conclusion:** This data aims to define the incidence of suicide in the specific cohort of patients with young-onset CRC compared to the general population and to identify risk factors for suicide. We anticipate that these findings will inform the development of targeted mental health interventions by identifying which patients are at greatest risk.

## **NYU Children’s Health and Environment Study (NYU CHES) and NIH Environmental influences on Child Health Outcomes (NIH ECHO)**

**Authors:** Sydney Thomas, B.S.

**Affiliations:** NYU Langone Health Department of Environmental Pediatrics

**Background or Problem Statement:** Everyday people are exposed to chemicals and other environmental pollutants from their environment, yet little is known about how these exposures impact children in utero and during their development.

**Objective/Hypothesis/Aim Statement:** Are maternal and child exposures to environmental factors associated with childhood health outcomes such as asthma, obesity, type 2 diabetes, autism spectrum disorder, and attention deficit hyperactivity disorder.

**Care Setting:** Three New York Hospital sites—NYU Langone Tisch Hospital, NYU Langone Hospital Brooklyn, and NYC Health and Hospitals/Bellevue.

**Methods:** Samples are collected from pregnant mothers at each trimester. Biospecimens collected include urine, blood, vaginal swab, and anal swab. At the time of delivery, the placenta and umbilical cord are retrieved, measured, weighed, and cored. Samples are stored in -80°C freezers until they are sent to the NIH or additional research labs for further study. If consented into each stage of the study, the child will then be followed from birth to age 7. Samples collected at the 12-month visit include height, weight, head and waist circumference, blood pressure, body composition, saliva (for genetic testing), urine, fecal matter, and a genital measurement. Saliva and urine provide evidence of chemical exposures while the genital measurement can provide details about hormonal balance in utero. In the 24-month visit the same samples are collected, except for the genital measurements and with the addition of hair and toenail specimens as well as sonograms of the child’s heart and kidneys. At this visit, the mother’s health literacy is assessed using a list of pre-set questions about a nutrition label. At the 3-5 year visit the additional tests include a DEXA scan that measures whole body bone mass and soft tissue composition, pulse wave velocity, and an NIH cognitive development iPad application. At this stage, parents are also asked to bring in their child’s tooth that has naturally fallen out, if possible. The 5–7-year stage of this study was recently funded and is still in development.

**Results:** Collection, processing, storage, and shipment of biological samples for various research groups across the county.

**Conclusion:** In progress.



## **Addressing Perinatal Mental Health Equity of Indigenous People in the US**

**Authors:** Krupa Trivedi, Amanda Haberstroh, PhD, Karlene Cunningham, PhD

**Affiliations:** Brody School of Medicine, East Carolina University

**Background or Problem Statement:** Within the U.S., perinatal mental health is a major contributor to maternal mortality and morbidity. It is estimated that having an indigenous identity increases the risk of perinatal mood and anxiety disorders (PMADs) by 62%. Despite these disparities, standing literature has failed to include indigenous populations in mental health treatment and intervention efficacy studies, thereby widening the gap in mental health equity for indigenous birthing individuals. Historical and ongoing trauma has made it even more critical that efforts towards improving mental health for this community be prioritized.

**Objective/Hypothesis/Aim Statement:** The purpose of this scoping review is to synthesize literature that addresses perinatal mental health equity and highlights unique considerations to improve mental health outcomes for indigenous birthing individuals.

**Methods:** The JBI methodology supplemented by the PRISMA extension specifications guided the implementation of this review. A two-step screening process was implemented post extraction of relevant articles from target databases including MEDLINE (PubMed), Embase (Elsevier), PsycINFO (EBSCO), Cochran Library (CENTRAL), Scopus (Elsevier), SocINDEX (EBSCO), Sociological Abstracts (ProQuest), and CINAHL (EBSCO). No limitations on types of articles were imposed. First, two independent reviewers screened 477 titles and abstracts against inclusion criteria. Then, only 51 pertinent full-length articles moved forward for further screening by two independent reviewers.

**Results:** Preliminary data extraction and analysis is underway. Initial findings indicate that Indigenous birthing populations are under-represented in perinatal mental health research. Increased resourcing through the Indian Health Services, increased indigenous presence in mental health research and treatment, cultural congruency in interventions, and cultural reclamation are major themes initially identified to improve perinatal mental health outcomes.

**Conclusion:** These themes indicate that achieving perinatal health equity for indigenous individuals lies in the amplification of indigenous voices and their presence at all levels of perinatal mental healthcare delivery, research, and policy.

## **Retrospective Review of CRRT Filter Lifespan in COVID-19 ICU Patients**

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**Introduction:** Acute kidney injury (AKI) is common with coronavirus disease 2019 (COVID-19) infections. The incidence of AKI is up to ~50%, and ~20% require dialysis. Due to the unprecedented increase in critically ill patients with COVID-19, there will be an increase in patients with AKI. About 20% of patients with COVID-19 will require continuous renal replacement therapy (CRRT). A major limitation of CRRT is premature filter clotting, and studies suggest that COVID-19 patients are hypercoagulable and have increased filter clotting. The purpose of this study is to investigate filter lifespan and average dose delivered of CRRT in patients with COVID-19 in the medical intensive care unit at Vidant Medical Center.

**Methods:** This is a single center retrospective cohort study. Manual electronic chart review will be performed to obtain patient demographics, comorbidities, dates of hospitalization, dates of death, dates of CRRT initiation, time on CRRT, and average lifespan of filters. We will also collect data on causes of filter clotting and average dose of CRRT delivered vs prescribed dose.

**Results:** The primary outcome is CRRT filter lifespan during a 1-month period. We are screening for eligibility and will collect outcome data in the upcoming semester.

**Conclusion:** With this study, we hope to better understand how filter lifespan may relate to mortality of critically ill COVID-19 patients receiving CRRT.

## **Title: Magnetic Iron Oxide Nanoparticles Induce Endothelium Permeability via Magneto-Mechanical Application for Breast Cancer Therapy**

**Authors:** Mohammad Kanber BS, Obum Umerah BA, Isabela Rivera (Undergraduate Student), and Juan Beltran-Huarac PhD

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**Body of Abstract:** Terminal breast cancer treatment is known to involve invasive or aggressive approaches such as chemotherapy — which can result in unbearable side effects (pain, nausea/vomiting, hair loss), radiation — which can be harmful to healthy cells/tissue, and surgery — which can lead to total loss of whole, non-specific breast tissue. Specific tissue/tumor targeting and removal has been difficult to conduct, potentially leading to nerve damage or lymph node loss thus causing paresthesia or edema/lymphatic drainage issues respectively. The goal of this study is to introduce a non-invasive treatment to breast cancer utilizing magnetic poly-ethylene glycol (PEG) iron oxide nanoparticles. For this to be accomplished, an endothelial cell barrier must be established and then disrupted with the intention of passing nanoparticle drugs between cells. Human Umbilical Vein Endothelial Cells (HUVEC) are a subcategory of endothelial cells, which are targets for nanoparticle drug delivery. These cells line blood vessels which creates a barrier preventing the passage of various particles by size and charge. With the internalization of super-paramagnetic PEG iron oxide nanoparticles (SPIONs) as well as application of magneto-mechanical properties, disruption of VE-cadherin junctions allows for permeability or leakiness of endothelial cell monolayer thus offering a potential avenue to specific breast tumor therapy.

**Background or Problem Statement:** With breast cancer diagnoses, treatment is known to involve invasive or aggressive chemotherapy which can result in total loss of whole breast tissue. Specific tissue/tumor targeting has been difficult to conduct potentially leading to nerve or lymph node damage thus causing edema/lymphatic drainage issues.

**Objective/Hypothesis/Aim Statement:** Non-invasive treatment of breast cancer utilizing magnetic iron oxide nanoparticles.

**Methods:** A monolayer of Human Umbilical Vein Endothelial Cells (HUVEC) was grown in a T-75 flask until it reached 90% confluence. HUVEC cells grow on EGM-2 media which includes growth factors, antibiotics, and sugars necessary for cell proliferation and contamination prevention. After cells became confluent, they were transferred over to a Polycarbonate 12-well Transwell Fibronectin coated insert (Corning 3401). Cells were allowed to form a monolayer onto the membrane of these inserts to fulfill the purpose of a barrier. Once HUVEC film/monolayer has been formed, voltohmmeter readings are taken to measure the resistance created by this layer. Iron Oxide Nanoparticles [ $\text{Fe}_3\text{O}_4/\text{IONPs}$ ] (100ug/ml; ~100nm in size) are then introduced and incubated into a subset of inserts to allow for internalization of IONPs. The layout/groups for all the inserts include: HUVEC cells only, HUVEC cells w/ IONPs, IONPs in media, and media. Within this layout, the experimental groups are: inserts with HUVEC cells & IONPs + Magnetic Field (65mT for 30 mins applied in a pulse wave), inserts with HUVEC cells only and the insert with media & NPs. The control groups are: inserts with HUVEC cells & IONPs - MF, inserts with HUVEC cells only, and the insert with only media. Before any application of MF is introduced, FITC-dextran (200ug/ml) is used as a fluorescence tracker and applied to all inserts. After MF is introduced, fluorescence is read via PlateReader. This measurement allows for interpretation of Permeability in

endothelial cell leakiness. Once this parameter has been accomplished, confocal microscopy will be conducted to image/display pores that have been created due to our Magnetic Field induction.

**Results:** Ongoing

**Conclusion:** No conclusions at this time can be made regarding our goal of VE-cadherin disruption via IONPs incorporation in HUVEC cells.

## **The Resounding effect of COVID-19 on Dental Utilization, Payer Type, and Prophylaxis Code Frequency**

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**Background:** The initial diagnosis of COVID-19 emerged within the United States on January 20<sup>th</sup>, 2020. Since this date, the virus has taken hold of the public health stage, with over 85 million cases recorded nationwide. Despite the installation of the SARS-CoV-2 vaccine in December of 2020, repercussions of the pandemic still continue to linger. Some of which include unemployment and loss of Employer-Sponsored Dental Insurance, which in turn, have statistically altered dental care utilization, with differing trends being displayed according to the state level impact of COVID-19.

**Aim Statement:** The goal of this study is to demonstrate the pre-, during, and post COVID-19 patterns of three procedural level variables as they pertain to the underserved populations of North Carolina. These three variables include dental service utilization, payer type and Prophylaxis code frequency.

**Methods:** A retrospective descriptive epidemiologic study design was performed to investigate the characteristics of dental visits in the East Carolina School of Dental Medicine (ECU SoDM) clinics and Community Service Learning Centers during three periods: Pre-COVID-19, during COVID-19 and post COVID-19. The data to be analyzed will be retrieved from the axiUm patient electronic dental records database at the ECU SoDM. This data will be dissected using IBM SPSS statistical software.

**Results:** From this analysis, it was shown that self-payment remained the most common methodology of payment throughout all three periods. In terms of frequency however, self-pay decreased from pre-COVID (32,939) to post-COVID (28,295) by approximately 4,644. Both Grant funding and Medicaid also followed this decreasing trend. Private Insurance was the only form of payment that showed an increase post-pandemic (11,965 to 15,481). With regards to dental utilization, the most common procedure type was diagnostic (64,535), followed by Preventive (32,773) and Restorative (21,320) across all three timeframes. Finally, it was also observed that there was a significant decrease in Prophylaxis code frequency during the 4-month pandemic timeframe. However, this frequency rebounded quickly at the start of the post-COVID period.

**Conclusion:** COVID-19 has had a resounding effect on dental utilization as a whole. Dental visit patterns are showing signs of gradual rebound as the pandemic continues to evolve in its midst.

## **Differences in Motor Learning Between Children with Cerebral Palsy and Typically Developing Peers Using a Dynamic Balance Task**

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**Background or Problem Statement:** Cerebral palsy (CP) is the leading cause of childhood physical disability.<sup>1</sup> Children with CP receive several therapies designed to improve gross motor skills, but further research is needed to understand the impact of these therapies on motor learning and optimal therapeutic dose.<sup>2,3</sup>

**Objective/Hypothesis/Aim Statement:** The aim of this study is to compare motor learning and variability between children with CP and typically developing (TD) children. We hypothesize that (1) children with CP and TD children will have differing patterns of motor learning, and (2) children with CP will show greater variability in motor learning compared to TD peers, but this variability will reduce for both groups with training.<sup>4,5</sup>

**Methods:** The motor task involved a stability platform. Participants were instructed to keep the platform within 5° of its horizontal position. Training consisted of 15, 30 s trials/day for 5 days, pre- and post-testing were 5, 30 s trials/day. Performance was determined by quantifying time the participant maintained the platform within 5° of horizontal and variability by time spent on either side of the 5. Mixed-model ANOVA was performed with time (pre-test vs. post-test) as the within-subject variable and group (CP vs. TD) as the between-subject variable. Dependent variables were mean center time and variability.

**Results:** 22 children participated in this study. 6 are TD (mean age: 11) and 16 have CP (mean age: 12). TD children improved an average of 6.7 seconds (20.8 s to 27.5 s) from pre-test to post-test. Children with CP improved an average of 11.9 seconds (9.85 to 21.7 s). TD children decreased variability an average of 3.35 seconds (4.58 to 1.23). Children with CP decreased variability an average of 6 seconds (10.1 to 4.1). ANOVA showed significant main effects for time on mean center time ( $F(1,40) = 26.0, p < 0.001$ ) and group on mean center time ( $F(1,40) = 20.9, p < 0.001$ ), as well as time on variability ( $F(1,40) = 1, p < 0.001$ ) and group on variability ( $F(1,40) = 1, p < 0.001$ ).

**Conclusion:** Both groups showed motor learning with five days of balance training. Children with CP showed greater variability in their balance performance than TD children. While TD children achieved almost maximum performance with training, children with CP may need more training to achieve this same performance. Alternatively, children with CP may reach maximum motor learning potential after a certain dose, therefore requiring other therapeutic interventions.

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