

EAST CAROLINA UNIVERSITY

26th ANNUAL

MEDICAL STUDENT SCHOLARSHIP FORUM

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ABSTRACT BOOK



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*Program Directors: Weili Chang, MD, David Eldridge, MD,
& David Gilbert, MD*

Patient Shadowing Reveals Potential Opportunities for Quality Improvement in the NICU

Author: Nathan Barefoot

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

Body of Patient Navigation Experience

Care Experience Setting: 2-week-old female baby who was born at 26 weeks gestation with jaundice admitted to the NICU

Touchpoints: The Labor and Delivery team at ECU Health consulted neonatology for possible NICU admittance secondary to significant jaundice. Neonatology determined the baby was a candidate for blue lights therapy and was subsequently admitted. Following initiation of blue light therapy, therapy was incorrectly discontinued for an unidentified reason. The attending physician indicated that this was indeed a mistake and blue light therapy needed to be resumed.

Care Givers and Role: The NICU team during rounds consists of a highly diverse and interprofessional staff. Staff included physicians, fellows, residents, pharmacist, registered dietitian, PT and OT, case managers, NPs, and nurses. Physicians and allied staff all play an integral role in the baby's care to ensure optimal outcomes are obtained.

Missed Opportunities: Failure to document discontinuation of blue light therapy led to confusion amongst the NICU team. It was unclear whose decision this was because it was not documented. As a consequence, this baby had to be restarted on blue light therapy, ultimately resulting in a longer hospital course and more costs to the health system.

Ideas for Improvement: Breakdown of communication due to documentation errors can be improved with timely completion of notes, ideally before the end of the day. This especially applies to any documentation dictating a change in treatment plan. In-patient EMRs are often convoluted and difficult to navigate. Perhaps one area for improvement would be to have a priority ranking for documentation. For example, the decision to discontinue or continue blue light therapy would fall into the "high priority" documentation status that all providers should review before rounds.

Positive Actions and Hospitality: The utilization of interdisciplinary professions during rounds ensures that each patient receives optimal care. The physicians did a great job answering parents' questions about their baby's current condition and the course of action.

Closing the Gap Between Primary and Specialty Care - A Crucial Intervention to Boost Influenza Vaccination Rates for Cystic Fibrosis (CF) Patients at ECU Health

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

Background and Rationale: This aim of this project is to identify, address and reduce the barriers to influenza vaccination rates among cystic fibrosis patients at ECU Pediatric Specialty clinic. With Integrated care being the foundation of CF patient management at this clinic, CF patients see about 1-5 inter-professional specialists such as social workers, physical therapists, pharmacists and nutritionists at each visit, depending on the complexity of their condition and their reason for the visit. However, health insurance restrictions prevents most patients from receiving vaccinations at this clinic, resulting in potential gaps in healthcare delivery. Patients are then required to seek vaccination at their primary care physician's office or other external healthcare facilities at a different time that may be inconvenient for them. Following an interview with the parents of a CF patient to gain valuable insight into their healthcare experience, various areas of improvements were identified. By implementing strategies to improve access to vaccinations and enhance communication between primary and specialty care physicians, CF patients may receive the necessary protection that they need against influenza and mitigate any further respiratory complications.

Care Experience Setting: A 10-year-old CF male patient presented to the ECU Pediatric Specialty Clinic with his family for a continuity of care visit. During this visit, he undergoes routine pulmonary function test and physical therapy evaluations. Additionally, with the consent of his parents, a brief interview was conducted to gain valuable insights into their child's journey with CF, their experiences with the specialty clinic, and to identify areas of improvement. This approach helped better understand the perspectives of the patient and his family in order to foster effective communication and collaboration between healthcare providers, caregivers and the family. While the patient's family resides about 30 minutes away from this clinic, this clinic is the nearest available pediatric specialist for them.

Touch-points and Hospitality: Prior to the patient's arrival, the exam room and medical equipment were thoroughly sanitized. A personal protective equipment (PPE) cart was conveniently positioned just outside the exam room. These simple measures streamlined the process and increased efficiency during the visit. Upon arrival, each caregiver greeted the patient and his family with familiarity and a warm smile, creating a welcoming and friendly atmosphere. The check-in was easy and the patient was called back for vitals assessments after only a two minute wait. The staff displayed enthusiasm, offered support, stayed engaged with the child and used simple language when explaining each step to the him. Lastly, the physician arrived and provided follow-up on the patient's health progress since his last visit. The visit was conducted in timely manner and was completed within hour.

Recommendations for Improvement: During the interview, the family expressed their utmost satisfaction with the best practices and the tremendous level of professionalism that are consistently displayed by the specialty clinic staff. However, they also highlighted specific areas that may be improved secondary to insurance restrictions in-order to enhance quality of care and increase influenza vaccination rates. • *Accessibility:* The patient's family faces a significant barrier due to the distance between their home and both the pediatric specialty clinic and their pediatrician's office. This poses a challenge for them to find a convenient time to schedule an influenza vaccination. To address this, locating a nearby flu shot clinic for the family that accepts their health insurance would be a motivating factor for them getting their flu shots. • *Communication gap:* The patient's family noted a breakdown in

communication from their pediatrician's office. Improving the communication between both clinics would result in better coordination and ensure that both providers are on the same page regarding the needs of the patient, thus enhancing overall care. • *Patient awareness*: The patient's family noted that although their pediatrician's office holds flu shot clinics, they did not seem to know when these clinics take place. Sending clear and effective vaccination reminders that include key information such as dates, locations and times would bring more awareness to them resulting in flu shot clinic attendance. • *Patient education*: While the patient's family understood the importance of vaccinations, it is possible that there may be patients who may have concerns about its safety that may influence their decision to be vaccinated. It is therefore extremely crucial for healthcare providers to thoroughly educate patients on the importance and benefits of vaccinations. This will not only improve vaccination rates but also promote patient safety, health and overall wellness. By implementing these recommendations, the project aims to increase vaccination rates, which stood at 45.5% in the 2022 CF Foundation patient registry, by at least 10%, thereby enhancing the overall health outcomes of CF patients at the ECU Pediatric Specialty Clinic.

Opportunities to Improve Continuity of Care at the ECU Family Medicine Outpatient Clinic

Author: Hannah Rayala, BSPH

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

Patient Navigation Experience

Care Experience Setting: 20 y.o. male patient presented to the ECU Family Medicine Clinic Gold Module for follow-up in the setting of a recent prolonged hospital stay after sustaining a gunshot wound with T10-T12 transection of the spinal cord.

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
- Patient encounter, history, physical exam, assessment, and plan with physician
- Discharged instructions provided by registered nurse
- Check-out and follow-up appointment scheduling with staff at the front desk

Positive Actions: The wait time between checking in and the patient being brought to the exam room and the wait time before being seen by the physician were both relatively short (less than 10 minutes). Additionally, each provider was personable and took the time to appropriately answer all patient questions and concerns as they came up.

Missed Opportunities:

1. The patient had 2 medical charts in the Electronic Hospital Record making it difficult to obtain an accurate history of his recent hospital stay, current medication regimen, and past/future appointments.
2. The discharge instructions the patient received following his prolonged hospital admission were unclear as the patient was not contacted by trauma surgery to schedule a follow-up appointment.

Ideas for Improvement:

1. Increase flagging of duplicate medical charts in the Electronic Hospital Record and increase the speed it takes to merge duplicate medical charts.
2. Improve clarity of discharge instructions for patients and streamline scheduling system for follow-up appointments.

Opportunities for Improvement in Delivery of ECMO Care in the NICU/PICU at ECU Health

Authors: Chance Rector

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

Care Experience Setting: 27-week-old female presents to the NICU following c-section delivery.

Touchpoints: The mother of the patient arrives for delivery. The patient is delivered via c-section and resuscitation occurs in the delivery room. Following resuscitation, the patient is admitted to the NICU where she is treated and monitored for the next 3 months. Following this period, during induction and intubation for a gastrostomy tube placement, a 3-minute cardiorespiratory arrest occurs that requires chest compressions and epinephrine. The following day, the patient has another cardiorespiratory arrest and again chest compressions and epinephrine. The patient continues to have worsening symptoms for the next week at which point it is decided to cannulate on to ECMO in the PICU, where the patient remains for treatment.

Care Givers and Role: The labor and delivery staff handles the delivery of the patient until the patient is admitted to the NICU. Then, nurses, physicians, medical assistants, and case managers are all involved in the patient's care. When the patient is transferred to the PICU for ECMO, the PICU staff are brought into the care team along with an ECMO and respiratory technician.

Missed Opportunities: During the transfer from the NICU to PICU to start ECMO care, there is a large delay in delivery of blood to the patient for the cannulation and treatment procedure. There are also issues with the required daily imaging that often results in poor X-Ray images.

Ideas for Improvement: The issue with blood delivery to the patient appears to be an issue in communication with the blood bank. To alleviate the confusion, it would be helpful to have a single point of contact, such as the charge nurse, that facilitates this process. For improvement in X-Ray quality, it would be more effective to obtain all daily X-Rays in the morning, when the necessary PICU/NICU staff is available to assist with the positioning of the patient.

Positive Actions and Hospitality: The entire staff involved in the treatment of the patient attends ECMO rounding each morning to ensure that the most effective care is being delivered to the baby. The physicians also do an excellent job of updating the parent throughout the process and answering any questions she may have.

The Reduction of Hospital Acquired Infections Within the Intermediate Care Unit

Authors: Jacob Richardson, MS¹, Tilak Kalaria, MD²

Affiliations: ¹LINC Scholar, Brody School of Medicine, East Carolina University, ²East Carolina University Health

AIM Statement: Our aim is to reduce CLABSIs and CAUTIs by 15% within a quarter by implementing a standardized template to be used during progression of care rounds that engages the care team to discuss and act on all external devices for each patient. The study remains highly relevant as cost and patient satisfaction highly correlate with outcome. Our aim is to reduce CLABSIs and CAUTIs by 15% within a quarter by implementing a standardized template to be used during progression of care rounds that engages the care team to discuss and act on all external devices for each patient. The study remains highly relevant as cost and patient satisfaction highly correlate with outcome. Within the Medical ICU at ECU Health, there are approximately, 2 CLABSI and CAUTI infections occurring each month with an average of 6 of each per quarter costing 1.17 Million annually. Our goal is a tangible one, to reduce this quarterly number by 15%, from 6 to 5. This would save \$195,000 annually. Furthermore, it is our goal to create a network wide Epic online notification for all indwelling devices. Once a user logs on and opens a record, a notification will automatically make it known how many days any devices have been present to increase awareness of these devices.

Care Experience Setting: Medical Intensive Care Unit

Touchpoints: The 3 North Tower is an in-patient unit. Shadowing within the in-patient unit means that the patient is there for weeks or days. Impossible to see them from start to finish being admitted and discharged. One patient we saw had an in dwelling catheter which relates to the QI project we are building upon.

Care Givers and Role: On admission they will meet the nursing staff including the CRNA and RN in charge of their unit. Eventually the PA will make rounds to check on them, and finally the Physician visited them. The radiology tech also joined them to image to confirm the placement of the NG-feeding tube.

Hospitality: I believe that the PA made the largest amount of effort to make the patient feel comfortable and checked on them to see if there was anything they needed. However, it was the nursing staff that implemented the efforts to assist them.

Missed Opportunities: The time spent in the hospital waiting for the GI endoscopy team was unfortunate in terms of it increasing the time spent in the hospital.

Ideas for Improvement: I believe that a two Physician agreement would be appropriate for end of life care which would allow for DNR and comfort care for patients at their end of life stage in need of hospice. These patients that are having in dwelling CLABSIs will need to be talked to about possible end of life care.

Positive Actions: This opportunity gave me the idea to pursue creating an EPIC notification within the network for all providers to allow them to see the amount of days that an indwelling line has been within an individual.

Patient Navigation Through ECU Health Pediatric Outpatient Clinic.

Authors: Blaiz Rodman, BS¹, Shaundreal Jamison, MD²

Affiliations: ¹LINC Scholar, Brody School of Medicine, East Carolina University, ²Department of Pediatrics, Brody School of Medicine, East Carolina University

Care Experience Setting: This care experience took place at the ECU Health Pediatric Outpatient Clinic. This is an academic primary care setting and includes medical student education and residency training. I followed a 4-year-old patient and her mother throughout their visit.

Touchpoints: Key moments and places the patient/family encountered during their care experience: The first interaction was checking in with the receptionist and then waiting to be called back. Upon being called back, the patient's vitals were taken by a nurse. Following vitals, the patient and her mother were guided to an exam room to wait until they could be seen by Dr. Jamison. Following the visit with Dr. Jamison, the patient needed bloodwork done, so we were guided to the in-house lab in the clinic. Following bloodwork, the patient and her mother checked out and left.

Care Givers and Role: Every Care Giver with whom the patient and family come into contact with either directly or indirectly. The first caregiver seen was the nurse who took the patient's vitals. The next caregiver was Dr. Jamison who conducted the medical exam. The last caregiver was the laboratory technician who took a sample of blood.

Hospitality: The hospitality shown, how they make the patient and family member feel about their care experience. Overall, every caregiver had a pleasant attitude. The patient and her mother stated that they very much enjoyed coming to this clinic and especially enjoyed being seen by Dr. Jamison. This visit in particular was very long, which visibly annoyed the mother of the patient. She did say that this was out of the ordinary, however. The lab technician was also very gently and good at her job since the patient was not good with needles.

Missed Opportunities: Avoidable negative impressions. The major missed opportunity was the extended length of time of the visit from start to end. There was also no explanations given to the patient and mother for this.

Ideas for Improvement: What could be done differently: There was few elements of the visit that could be done differently to reduce the total time, but these are factors that a hard to plan for. After the medical exam, but prior to lab work, Dr. Jamison had to go get printed papers and asthma supplies for the patient. This is something that took nearly 30 minutes, but it is under my assumption that Dr. Jamison was likely consulted for some urgent matter or emergency in that period of time. The second large wait time occurred when needing to get bloodwork done, which also took around 30 or 40 minutes due to a large family being in line before our patient. This could have been avoided if lab work was done while Dr. Jamison was getting the papers and medical supplies, but it seems as if these wait times weren't necessarily something that could be planned for.

Positive Actions: The patient and mother hold the staff of the clinic in high regards. They also enjoyed the books located in the exam room.

Patient Shadowing in OB/GYN Outpatient Clinic Reveals Areas of Improvement

Authors: Vaishnavi Siripurapu

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

Care Experience Setting: Adult female presents to OB/GYN Outpatient Clinic with concern of an unremoved skin tag. Patient has a prior history of melanoma and was concerned about abnormal skin tags around the pelvis.

Touchpoints: The physician began by asking the patient about her concerns. Patient expressed that during a prior surgery with the same physician, the wrong skin tag was removed. The patient was concerned about a skin tag that was several inches farther away from the tag that was removed. The physician asked the patient which tag she was concerned about and the patient pointed out the specific tag. The physician then performed the removal in the office with local anesthetic. Notably, the patient expressed pain with this procedure.

Missed Opportunities: The physician did not ask the patient for her tag of concern to remove prior to her surgery under anesthesia in the hospital. Additionally, the patient was not followed up with afterwards and was not able to voice her concerns about the wrong tag being removed.

Ideas for Improvement: The physician could have asked the patient for her skin tag of concern before surgery. Perhaps asking the patient to point out her concern could have limited the risk of error. Additionally, it would have resulted in a better utilization of medical resources to complete the procedure accurately. In the future, there should be a procedure in place to correctly check the area of concern with the patient's involvement before surgery.

Positive Actions: The patient reported a very good relationship with her physician and indicated her comfort in expressing that the wrong tag was removed. She was very amenable to receiving her procedure in the clinic. The physician had established a very strong, communicative relationship with the patient prior to her removal.

Quality Improvement in Inpatient Pediatric Medicine Clinic

Author: Michael Wright

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

Care Setting: 10-year-old male patient presented to ECU Health Emergency Department with history of abdominal pain for 8 days, as well as accompanying lack of bowel movement.

Background and Rationale: This patient shadowing experience was aimed to identify potential areas of improvement for patients and providers in the Pediatric Medicine Clinic at ECU Health, with hopes of creating a longitudinal Quality Improvement project in an area identified as needing improvement.

Touchpoints: The patient presented to Family Pediatrician one week prior to experience with a chief complaint of diarrhea after attending summer camp. Pediatrician ordered a KUB X-ray, which was found unremarkable. Patient was sent home from outpatient pediatrician, but then was brought to ED 2 days later with same presentation. Boy had a CT Abdominal scan done but was discharged from ED and told to follow up with PCP. After continued pain for 48 hours, patient returned to ED, where inpatient pediatric medicine consulted him for admission.

Missed Opportunities: During the course of the past 8 days for the patient, they have been admitted to some sort of Physician care a total of 4 times. This continuous cycle in and out of the hospital not only wastes the patients time and money, but also wastes hospital resources they are already tied up. A high priority complaint heard from the patient's family is that they were able to see the results of the patients tests on MyChart up to 6 hours before a Physician interpreted them to the family. There was also a redundancy in treatment, with different providers treating the patient in the same manner, without knowing he had already received that treatment. They described the interaction as feeling they did not truly matter, and they felt forgotten about.

Ideas for Improvement: In order to alleviate the negative feelings the family has experienced, a decrease in average time between patient interactions should be encouraged. By increasing the face time with the patient, they are more likely to feel cared for, and will have better outcomes in the long run, which also allowing prompt interpretation of patient lab results.

Positive Actions: While the patient and his family did have an extended period of time waiting for their treatment, they stated they felt they were getting very high-quality care, and that all the staff they had interacted with so far was nothing but nice. The nursing staff was able to quickly build a level of rapport with the family in order to make them feel cared for, and the Physician care team was consistently working to make the patient have the best outcome.

Medical Education & Teaching Distinction Track

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

Empathy and the Physician: Are Empathetic Providers More Likely to Document Social Determinants of Health?

Authors: Kegan Cox

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

Idea: Inadequate documentation of Social Determinants of Health (SDH) significantly impacts patients by hindering providers' understanding of their complete health context, leading to missed opportunities for personalized care and targeted interventions, thus exacerbating health disparities. While numerous studies have emphasized the vital role of empathy in the patient-physician relationship¹, there is a need to investigate the correlation between empathy demonstrated by healthcare professionals and the recording of SDH in primary care settings as the link between empathy and SDH documentation remains limited.

Need/Rationale: Investigating this relationship is essential to improve patient-centered care, reduce disparities, and enhance overall health outcomes. Analyzing the link between increased physician empathy and SDH reporting in electronic health records can benefit patients, physicians, administrators, educators, and the wider community by improving communication, informed decision-making, resource allocation, and health disparities interventions. These efforts strengthen patient-provider relationships, refine healthcare practices, and enhance community well-being.

Methods: Primary care resident physicians at ECU Health are the target enrollment. Participation in the study is voluntary with no penalties for those who decline. Enrolled residents will complete the Jefferson Scale of Empathy², a certified empathy scale for physicians. Demographic information and specialty details will also be collected. A retrospective chart review will be conducted on patient notes, examining mentions of SDH. Data will be analyzed to explore correlations between empathy scores and the reporting of SDH.

Evaluation Plan: The analysis will investigate the correlation between empathy scores and the occurrence of SDH using statistical methods such as Spearman correlation and Poisson regression with cluster robust standard errors. A positive coefficient in the Poisson regression model will indicate a significant positive association between the explanatory variable (empathy scores) and the outcome variable (occurrence of SDH).

Potential Impact: The findings can improve patient outcomes by promoting targeted interventions and personalized care plans that address underlying social issues. Conclusions can contribute to reducing health disparities through patient-centered care and provide valuable data for resource allocation. The results can also influence medical education by emphasizing the integration of empathy and SDH awareness into curricula thus shaping the practices of future healthcare professionals. The study aims to enhance patient-provider relationships, expand decision-making processes, and improve health outcomes and healthcare equity.

Utilizing ChatGPT to Decrease the Scarcity of Practice Questions and Resources

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Idea: Using ChatGPT to write questions will provide students with discipline-specific question banks that will decrease the lack of availability.

Need/Rationale: Lack of practice questions for students to use to prepare for assessments, and a lack of question banks for faculty to have in preparation for writing exams.

Methods:

Part 1: Pre-work

- Process: Attempting to create as many questions as possible given a certain topic to determine how to consistently ask for the desired question type.
 - This will be done by noting the modifications required to make the question.
 - Once noted, attempts to decrease the modifications to reach the desired result will be made.
 - After determining the consistency of results by verifying with principal investigator (PI), a template will be created to unify the results produced regardless of the question creator.

Part 2: Question-testing

- Goal: to determine whether the AI-generated questions compare to the faculty-written questions with regard to content and quality.
- Process: Divide faculty who volunteered to be a part of the project into two groups. The first group will be faculty who write the faculty-generated questions and the second group will consist of the faculty who determine whether there are issues with the questions generated (content-wise) and whether they can determine whether which questions belong to each category.
 - This will be done by collecting the questions, randomizing their order, and distributing them to the faculty in the second group (by email) who will complete a rubric to assess the quality of the questions. They will also decide which category the questions belong to.
 - A panel/meeting will be organized to allow the faculty to discuss their thoughts about the questions with each other. (This is done later to avoid faculty unintentionally biasing each other's views.)

Evaluation Plan:

Part 3: Question-performance

- Goal: to determine how questions that are AI-generated compared to faculty-written questions with regard to student performance.
- Process: Both will be presented to students, and metrics will be collected to compare the results.

Potential Impact: This should provide students and faculty with additional question banks for practice and renewal of questions on exams.

Investigating the Impact of Psychiatry Clerkship Exposure on Communication-Related EPAs: A Retrospective Study in Medical Education

Authors: Rithik Sudhini

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

Idea: Understanding if and how psychiatric care exposure affects medical students' ability to communicate effectively with patients.

Need/Rationale: Medical education relies on the successful development of Entrustable Professional Activities (EPAs) to ensure that future physicians possess essential skills for effective patient care. Patient communication-related EPAs play a pivotal role in fostering doctor-patient interactions and patient-centered care. However, the extent to which exposure to specific clerkships enhances communication skills, particularly in the context of the psychiatry clerkship, remains a significant research gap. Understanding the influence of psychiatry clerkship exposure on communication-related EPAs can help identify the clerkship's potential to augment students' communication skills beyond the expected linear trajectory of improvement during the third year of medical school.

Methods: The study will access communication-related EPA data, including scores and faculty evaluations, from the medical school's official records for multiple cohorts of 3rd year medical students. Students who completed the psychiatry clerkship will be compared with those who did not. Quantitative analysis will be conducted to assess differences in communication-related EPA scores between the two groups and to explore trends in the data.

Evaluation Plan: The evaluation plan for this research project will include a comparison of potential improvements in communication-related EPAs immediately after a student's psychiatry rotation with the general longitudinal improvement observed over the course of their third year. This comparison will provide insights into the unique impact of the psychiatry clerkship on communication skill development beyond the typical progression during the third year of medical education. Additionally, mean EPA scores for communication-related EPAs will be compared between students who experienced the psychiatry clerkship and those who did not.

Potential Impact: By identifying the role of the psychiatry clerkship in enhancing communication skills beyond the expected trajectory, this study can provide valuable insights for medical educators to optimize training methodologies and prepare future physicians for successful clinical practice. The results may also influence the development of tailored curricular interventions to improve communication skills, positively impacting students' overall performance and preparation for competitive residency programs, especially those considering specialties or other disciplines with high demands for effective communication with patients.

Virtual Reality in Simulation-Based Education: Is It Effective in Teaching Clinical Competency in Point-of-Care Ultrasound Techniques?

Authors: Emily M. Tate, M.S.¹; Walter “Skip” Robey, M.D.²

Affiliations: ¹MET Scholar, Brody School of Medicine, East Carolina University, ²Office of Clinical Simulation, Brody School of Medicine, East Carolina University

Idea: Point-of-care ultrasound (POCUS) is a valuable tool among different medical specialties and the use of POCUS increased significantly in recent years². Prior studies have shown that select virtual learning modules can be effective in medical students’ development of ultrasound skills^{1,3}. With the current struggle to maintain a balance between faculty teaching and clinical responsibilities in many educational settings, there is an increased need to develop innovative methods to educate medical learners that require less faculty-led education.

Rationale: The goal of this project is to introduce learners to the basics of ultrasound using virtual reality (VR) simulation techniques and allow them to develop clinical competency in POCUS in a self-directed manner.

Methods: We have designed a modular curriculum that includes short videos for the didactic portion, followed by hands-on work with a VR ultrasound simulator in the Simulation Center at Brody. Finally, learners will work with real ultrasound machines and task trainers before assessment. At the end of this curriculum, students should have a thorough understanding of basic ultrasound skills, how to operate an ultrasound machine, and how to perform the extended Focused Assessment with Sonography in Trauma (eFAST) and Rapid Ultrasound for Shock and Hypotension (RUSH) protocols.

Evaluation Plan: We will include multiple methods of evaluation of student performance during and after working through the curriculum. Quantitative data collected will include student-reported quality surveys and quality of learner images acquired with Standardized Patients. In addition, participants will be given certain questions in their quality surveys with open answers. These answers will be read and categorized based upon itemized themes developed through qualitative data analysis.

Potential Impact: This standardized curriculum for the VR simulator in the Clinical Simulation Center has a wide variety of applications. We chose to focus our curriculum on techniques often utilized in Emergency Medicine, but this approach can be used by almost any specialty in medicine to educate learners with little to no prior experience in basic POCUS techniques.

Service-Learning Distinction Track

Program Director: Jennifer Crotty, MD

Expansion and Development of Birth Companions at ECU a Volunteer Doula Service

Author: Marriam S. Azam

Affiliations: Service-Learning Scholar, Brody School of Medicine, East Carolina University

What? Birth Companions at ECU is a volunteer doula service available to laboring persons on the labor and delivery unit at ECU Health Medical Center. Birth Companions was established last year as a Schweitzer project and aims to provide continuous emotional, physical and informational support to pregnant persons at no cost, reaching those who would normally not be able to afford a doula. This summer I served as co-director of the program and continued my role as lead doula educator and volunteer doula. I attended meetings with hospital leaders to get feedback about how the program was being received by staff and patients on the unit and to prepare for the new cohort of 20 volunteers who we trained in June. We were connected to state officials from the Division of Public Health, Maternal Health Branch of NCDHHS who asked us to share information about the program as they aim to address disparities in Maternal health in Eastern NC. We also had the opportunity to hold an information session about services that Birth Companions provides as well as practice comfort techniques with expectant families in Greenville.

So What? In 2019 ACOG published a position statement that highlighted how continuous emotional support from a doula can reduce the need for medical interventions, reduce cesarean rates and promote positive birth experiences. With the US ranking the poorest of all developed countries in maternal mortality rates as well as the alarming disparities that exist in maternal and infant mortality, there is an urgent need to create evidence-based interventions to improve birth outcomes. Not only can programs such as Birth Companions support positive birth outcomes, but it can also prepare culturally sensitive future healthcare workers.

Now What? Strengthen the program foundation by ensuring volunteer doula presence on the unit every day. Continue to develop education and training for volunteers and promote culturally sensitive care of birthing persons. Expand and develop Birth Companions to provide prenatal and postpartum support. Recruit more pre-health and health professional students throughout the ECU system. Continue to expand connections in the hospital and outpatient setting as well as increase community awareness of the program.

Addressing Social Determinants of Health for Patients of Pitt County Care Clinic

Author: Alyssa Galleshaw

Affiliations: Service-Learning Scholar, Brody School of Medicine, East Carolina University and Pitt County Care Clinic

What? Pitt County Care Clinic (PCCC) is a free primary care walk-in clinic run by student and physician volunteers. It is hosted at the Pitt County Public Health Department every other Sunday from 12-4 pm and serves patients from Pitt and surrounding counties.

So What? PCCC was fortunate to receive a \$25,000 grant from the NC Healing Communities Fund and had until July 15th, 2023, to deploy the funds. Our goal with this grant was to address social determinants of health and other barriers that affect our patients' health outcomes. One of the prominent barriers is financial hardship, which significantly hinders our patients' ability to access essential healthcare resources like medications, at-home monitoring tools, transportation, and nutritious food options. To address these needs, we made strategic investments in the following areas:

1. **Patient Education:** We purchased patient education brochures from Krames to enhance patients' understanding of their health and their medical conditions. Additionally, we purchased Healthy Heart recipe books to promote nutritious eating habits. These are available in both English and Spanish since many of our patients are Spanish speakers.
2. **Onsite Testing:** Understanding the transportation challenges many of our patients face, we expanded our onsite testing capabilities by investing in a lipid panel machine, eliminating the need to refer patients off-site to LabCorp.
3. **Healthcare Kits and At-Home Monitoring Supplies:** We created general health care kits, feminine hygiene kits, and diabetic care kits and replenished our supply of insulin and blood pressure cuffs to distribute among our patients.
4. **Fresh Produce:** We partnered with a local organization, Farm-To-Clinic, which will provide over 100 pounds of fresh produce sourced from nearby farms and offer nutritional education to our patients during each clinic.

Now What? We are working to find a location at Brody School of Medicine to store our refrigerated produce from Farm-To-Clinic. To begin using the lipid machine, we will need to attend a training session with McKesson and then train our coordinators on how to properly use the machine and interpret its results. Although PCCC is eager to implement screening tools that will enhance our understanding of the social determinants affecting the health of our patients, we must use caution to ensure we have community resources available to address the determinants we identify. Finally, one of our main limitations lies in physician availability. The recent absence of our lead physician has highlighted the need for innovative approaches to recruit new physicians.

Increasing Availability to Harm Reduction Supplies

Authors: Emily Garner

Affiliations: Service-Learning Scholar, Brody School of Medicine, East Carolina University

Acknowledgments: Thank you to, eKim for Change, Dianne Carden-Glenn, Grey Silverman, Joshua Parke, and Brody School of Medicine Service-Learning Distinction Track.

What? eKim for Change is a harm reduction site whose goals are to provide clean supplies to people who inject drugs for free. Some supplies that are given are sterile syringes, naloxone, sharps containers, alcohol wipes, fentanyl and xylazine test strips, etc. Along with the harm reduction supplies, eKim for Change also provides a free lunch to the public, hygiene supplies, gas gift cards, Hepatitis C and HIV testing, and referrals to treatment centers in Pitt County.

So What? Substance abuse does not discriminate and impacts the lives of the person who injects drugs and all of their family and friends around them. In North Carolina alone in 2020, there was more than a 40% increase in the total number of overdoses recorded than in 2019.¹ It is an epidemic that is continuing to rise and so many people, especially in Eastern North Carolina, lack the availability to get supplies such as naloxone to treat overdoses. Some people drive 30 minutes to an hour to get supplies from eKim for Change for a whole community if they have the means to afford gas. Overdoses are impacting historically marginalized communities at much higher rates due to lack of availability to harm reduction supplies, naloxone, and access to healthcare.²

Now What? Our project is to put naloxone in boxes in high overdose areas to make them more available for communities that need them. The sheriff department is working on getting us a map of the hot spots in our community where overdoses are the most frequent so we can strategically place the boxes. Instructions will be posted on the inside of the box for how to use the naloxone along with easy-to-read handouts for people to take. We are still researching the best kind of boxes to put the naloxone in to sustain against weather elements.

Mentorship Opportunity for Minority Youth with Building Hope Community Life Center

Authors: Noah Green, Sophie Villani

Affiliation: Service-Learning Scholars, Brody School of Medicine, East Carolina University

What? Building Hope Community Life Center is a faith-based non-profit organization founded in 2001 for youth and family development. They created a mentorship summer program based on evidence that youths with mentors are 55% more likely to enroll in college, 78% more likely to volunteer in communities, and 130% more likely to be in leadership roles on teams and clubs. The ECU Brody School of Medicine is incorporated in its summer programming series to expose minority youth in the community to mentors and career opportunities in the healthcare field. Medical students also mentor adolescents and teach them the importance of physical and mental health related to health outcomes. This is the third year the ECU Brody School of Medicine has been involved in its annual summer camp.

So What? Our summer program goals were to increase youth exposure to healthcare careers and professions in STEM as well as to improve minority physical health and mental health through interactive programs and projects. We worked with 18 students ages 11 to 16 utilizing open discussions and hands-on learning activities to teach the adolescents about the various focus topics. We worked with the Office of Clinical Simulation to expose children to the high-fidelity manikin, SAM heart and lung sounds, and Stop the Bleed simulation. We partnered with The Country Museum to provide NC healthcare history and the importance of rural medicine. We conducted nutrition, mental health, and career exploration workshops at the Building Hope Community Life Center. Participants were able to connect with students in professional programs for educational advising now and in the future.

Now What? Through our efforts to create a sustainable presence, we will continue to curate lesson plans for next summer that maintain the project's mission. This will involve integrating more healthcare professions into our programming, including dental, physical therapy, and health science education. This is in hopes of increasing the likelihood for participants to advance their education, become leaders in their communities, and pay it forward.

Closing the Gap of Establishing Health Care for Refugees in Greenville

Authors: Hannah Herrick

Affiliations: Service-Learning Scholar, Brody School of Medicine, East Carolina University

What? The interfaith Refugee Ministry (IRM) is located in New Bern, North Carolina and is dedicated to helping refugees rebuild their lives in eastern North Carolina. Their goal is to help refugees become self-reliant, emotionally secure and culturally adjusted in their new home. They achieve this goal by helping with housing, food, clothing, employment, social security and Medicaid, learning English, and cultural orientation. Importantly, they help establish refugees with health care in their new communities. Unfortunately, establishing health care in Greenville has proved more difficult than anticipated.

So What? Vaccinations and initial physical examination are due 30 days after refugee arrival. Unfortunately, it can take up to 45 days for Medicaid to be processed and completed. Thus, a gap in care exists in that Medicaid is often not completed until 15 days after initial care is required. As many providers are unable to see patients without insurance coverage, these individuals are often unable to receive necessary care within the time allotted. While the IRM has established connections with the Health Department and certain providers in New Bern to bridge this gap, it has been difficult for them to do so as they expand to Greenville and learn the area.

Now What? This summer, I have helped establish connections between the IRM, Pitt County Health Department, ECU Family Medicine, and Pitt County Cares Clinic (PCCC). The hope is that moving forward, Pitt County Health Department will help with required vaccinations, PCCC will help with initial physical examinations, and ECU Family Medicine will provide primary care once patients are established with Medicaid. Hopefully, with new connections made, refugees can access required care in a more efficient manner after arrival.

Utilizing Retinal Scanners for Early Detection of Organ Failure in H-2A Visa Farmworkers

Authors: Jeffrey Matthew¹, Emily Moore², Paul Shackelford, MD³

Affiliations: ¹Service-Learning Scholar, Brody School of Medicine, East Carolina University, ²Brody School of Medicine, East Carolina University, ³Department of Obstetrics and Gynecology, Brody School of Medicine, East Carolina University

What? Farmworkers often face significant barriers to healthcare access, including limited transportation options and language barriers, preventing them from seeking timely medical attention. By utilizing the mobile clinic, we aim to bridge this gap and bring healthcare services directly to the fields where they work. This project aims to address the healthcare disparities faced by farmworkers in Eastern North Carolina through a comprehensive and accessible screening initiative. Leveraging the mobile clinic at Brody, we seek to provide vital healthcare services directly to farms in the region, targeting the underserved H-2A visa farmworker population. Our primary objective is to introduce retinal scanning as an innovative and non-invasive tool for early detection and diagnostics of organ failure and systemic diseases.

So What? The proposed project will involve deploying the mobile clinic to Tull Hill Farm in Kinston, North Carolina, offering on-site screening services to farmworkers. The retinal scanner can capture high-resolution images of the eye's inner layers and will be a central component of our screening process. Through retinal scanning, we aim to detect potential signs of organ failure, enabling timely interventions and improving health outcomes for this vulnerable population. This project's significance lies in the direct impact it can have on farmworkers' health by eliminating the barriers that hinder their access to healthcare. By offering screening services at their worksites, we aim to overcome the challenges posed by transportation limitations and language barriers, thereby promoting better health-seeking behaviors, and encouraging early detection and treatment.

Now What? Our future endeavors involve expanding our mobile clinic services to reach more farms around Eastern North Carolina, thus extending the benefits of our screening initiative to a wider population of farmworkers. As we progress, we will explore opportunities to integrate retinal scanning into routine healthcare practices specifically tailored to farmworkers, ensuring its long-term sustainability and effectiveness. Additionally, we recognize the importance of ongoing evaluation and monitoring to assess the impact of early detection on health outcomes, healthcare utilization, and the overall well-being of the farmworker population. Through continuous assessment, we aim to demonstrate the advantages of our approach in improving farmworkers' health and advocate for its adoption within healthcare systems.

Transition to Mobile Clinic Space at Greenville Community Shelter Clinic

Authors: Zachary Miller¹; Mentor: Ryan Moore, MD²

Affiliations: ¹Service-Learning Scholar, Brody School of Medicine, East Carolina University, ²Division of Neonatology and Newborn Medicine, Department of Pediatrics, Brody School of Medicine, East Carolina University

What? The Greenville Community Shelter Clinic (GCSC) is a student-run, physician-supported free medical clinic that operates out of the Community Crossroads Center (CCC), a shelter for those experiencing homelessness in Greenville, NC. Two evenings per month, GCSC provides medical care to guests of the CCC, as well as other members of the community, regardless of insurance status. GCSC takes an interdisciplinary approach to care for vulnerable patients. Medical students and physicians work with behavioral health consultants, a social worker from Access East, and a pharmacist at each clinic. By partnering with CCC, GCSC is able to operate on shelter grounds, making clinic services more accessible for guests of CCC.

So What? Until June 2023, GCSC was using four “Family Rooms” at CCC as exam rooms during the clinic’s operating hours. These Family Rooms were not occupied during the COVID-19 pandemic, but, as the rooms open back up to families staying at CCC, they are no longer a viable clinic space. GCSC and CCC both recognize the importance of operating the clinic in a space that is accessible to shelter guests, so together we are working with ECU Health to continue providing care on the shelter grounds. ECU Health is making this possible by providing a mobile clinic that will give GCSC access to two exam rooms. Additionally, GCSC and CCC are working with Railcare Health, another mobile healthcare clinic, who is also providing their single-room mobile clinic space.

Now What? This summer, GCSC has worked with CCC, ECU Health, and Railcare Health to arrange for two mobile clinics to be available during GCSC’s operating hours. These mobile clinics sit outside CCC every other Monday evening, and all four organizations are working together to ensure that GCSC remains accessible, regardless of weather conditions or patients’ mobility limitations. Though GCSC currently welcomes any community members who wish to be evaluated, the ECU Health mobile clinic raises the possibility of future clinic dates that are specifically advertised to the community. As an example, one idea is for GCSC to assist with a “back-to-school” clinic night. So far, GCSC has operated two successful clinics with this new arrangement, and we are working to ensure that it is a sustainable solution.

Improving Rapid Fentanyl Test-Strip Reliability and Usability through Simplification of Instructions

Author: Grey Silverman

Affiliation: Service-Learning Scholar, Brody School of Medicine, East Carolina University

What? ekiM for Change is a Volunteer-run non-profit in Pitt County that provides support to the local homeless population and to people who inject drugs (PWID). ekiM for Change helps PWID find treatment options and also provides them with supplies to decrease risks associated with drug-using (naloxone, sterile syringes, fentanyl test strips, etc.).

So What? Overdose deaths are up 72% in NC since 2019, with over 77% of overdose deaths in 2021 involving fentanyl¹. ekiM for Change purchases fentanyl test strips in bulk, with 1 set of long, confusing instructions provided for the whole box. 1 set of instructions is not enough for everyone. Furthermore, confusing instructions could invalidate test results. To address this, the manufacturer's instructions were rewritten in simpler terms, hundreds of copies were printed, and a copy was taped to each fentanyl test packet.

Now What? Next steps for the project include the following: (1) Investigating the impact of the simplified instructions on the validity of test results; (2) Investigating the impact of the simplified instructions on PWID's willingness to use the fentanyl test strips, and (3) Updating the instructions with images for people who have different literacy levels.

Mentorship Opportunity for Minority Youth with Building Hope Community Life Center

Authors: Sophie Villani, Noah Green

Affiliations: Service-Learning Scholars, Brody School of Medicine, East Carolina University

What? Building Hope Community Life Center is a faith-based non-profit organization founded in 2001 for youth and family development. They created a mentorship summer program based on evidence that youths with mentors are 55% more likely to enroll in college, 78% more likely to volunteer in communities, and 130% more likely to be in leadership roles on teams and clubs. The ECU Brody School of Medicine is incorporated in its summer programming series to expose minority youth in the community to mentors and career opportunities in the healthcare field. Medical students also mentor adolescents and teach them the importance of physical and mental health related to health outcomes. This is the third year the ECU Brody School of Medicine has been involved in its annual summer camp.

So What? Our summer program goals were to increase youth exposure to healthcare careers and professions in STEM as well as to improve minority physical health and mental health through interactive programs and projects. We worked with 18 students ages 11 to 16 utilizing open discussions and hands-on learning activities to teach the adolescents about the various focus topics. We worked with the Office of Clinical Simulation to expose children to the high-fidelity manikin, SAM heart and lung sounds, and Stop the Bleed simulation. We partnered with The Country Museum to provide NC healthcare history and the importance of rural medicine. We conducted nutrition, mental health, and career exploration workshops at the Building Hope Community Life Center. Participants were able to connect with students in professional programs for educational advising now and in the future.

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Summer Scholars Research Program

Program Director: Kori L. Brewer, PhD

Length of Initial Hospitalization Is Associated with Poorer Childhood Neurodevelopmental Outcomes in Premature Neonates with Surgically Managed Necrotizing Enterocolitis.

Authors: Brooke Allen, BS¹, Shannon Longshore, MD², Jan Wong, MD³, William Irish, PhD³

Affiliations: ¹Brody School of Medicine, East Carolina University, ²Division of Pediatric Surgery, Department of Surgery, Brody School of Medicine, East Carolina University, ³Division of Surgical Research, Department of Surgery, Brody School of Medicine, East Carolina University

Background: Necrotizing enterocolitis (NEC) is a gastrointestinal disease that is marked by severe inflammation. It is a common cause of mortality for premature neonates.^{1,2} NEC is variable in presentation and may present with necrosis and perforation.³ Management of NEC ranges from antibiotics and bowel rest to surgical debridement/resection.³⁻⁵ A NEC diagnosis increases the child's risk of neurodevelopmental delay.⁶ The association between the length of hospital stay (LOS) and surgically managed NEC patients' neurodevelopmental outcomes is unclear.

Objective: The objective of this study is to determine if a surgically managed NEC patient's LOS predicts neurodevelopmental outcomes as measured by the Bayley-III Scales of Infant and Toddler Development.

Methods: A retrospective chart review was performed of 30 premature neonates born at <34 weeks gestational age at a very low birth weight (<1500 grams). All subjects had surgically managed necrotizing enterocolitis between January 2010-June 2021 at ECU Health Medical Center in Greenville, NC. Neurodevelopmental outcomes between 12-24 months were assessed by utilizing scores from the Bayley-III Scales of Infant and Toddler Development, with lower scores predicting poorer outcomes.

Results: The demographics of this cohort were the following: 20 Black (66.7%), 8 White (26.7%), 2 "Other" (6.7%), and 19 male (63.3%). The cohort's mean birthweight was 810 grams (range: 380 g-1415g). The mean gestational age was 26 weeks (range: 23-34 weeks). The mean LOS was 103 days (range: 8 days-238 days). Bayley-III scores were obtained from 12 infants (40%) with an average score of 79.4 (range: 46-107). 13 infants (43.3%) pre-deceased Bayley-III testing, and 5 infants (16.6%) were lost to follow-up. Bayley-III scores were correlated with the following variables: gestational age, 1-minute and 5-minute APGAR scores, LOS, weight/age at diagnosis, and length of small bowel resection. The only significant correlation was between Bayley-III composite scores and LOS. These variables were negatively correlated as evidenced by Pearson Correlation and Spearman Rho values of $-.808$ ($p=0.01$) and $-.756$ ($p=0.01$), respectively.

Conclusion: Greater neurodevelopmental impairment as measured by the Bayley-III Scales of Infant and Toddler Development was associated with longer hospitalizations in surgically managed NEC patients at ECU Medical Center from 2010-2021.

Acknowledgements: Thank you to Reba Bullard and Trisha Aponte from the Department of Surgical Research at BSOM for their support and guidance throughout the summer.

Exploring Maternal Oral Health Literacy and Access to Dental Care in Relation to the Mother's Oral Health Care Behaviors

Authors: Abdullah Amer, MS, Vanessa Pardi, DDS, MS, PhD

Affiliations: School of Dental Medicine, East Carolina University

Background: Effective oral health literacy plays an integral role in promoting the well-being of both the mother and their children. Understanding pregnant women's knowledge, beliefs, and access to dental care is crucial for optimizing their overall oral health and that of their children. Identifying and addressing oral health risks, such as caries and other potential complications, can also lead to improved oral health outcomes.

Objective: This study aims to explore the relationship between oral health literacy of pregnant women and its implications for the oral health of the mother and child. The goal is to learn more about current exposure to oral health literacy tools from prenatal to postnatal phase and to use these valuable insights to figure out where we can work on implementing more exposure for mothers to increase their oral health literacy.

Methods: The survey was conducted as a one-on-one interview among low-risk pregnant individuals. The questionnaire, which was composed of demographics, dental healthcare, Health Literacy in Dentistry scale (HeLD) by Jones et al, and lastly maternal oral health knowledge and beliefs. The participants were from East Carolina University's Women's Physician Clinic and ECU Health Brody outpatient center.

Results: The data provided insights into oral health-related behaviors and perceptions. The findings revealed a strong understanding of oral health during pregnancy. Most participants demonstrated a good understanding of the importance of oral hygiene and its impact on overall health, with only a small percentage falling for common misconceptions. Access to dental care also emerged as a significant factor influencing oral health outcomes during pregnancy.

Conclusion: The finding suggests a potential link between maternal oral health literacy and good oral health care practices, highlighting the importance of incorporating oral health education into prenatal care to promote positive oral health behaviors. It also underscores the need for educational interventions to improve oral health literacy among pregnant individuals. These challenges highlight the importance of addressing disparities in access to dental services to ensure optimal oral health during pregnancy. Efforts should focus on improving oral health literacy among pregnant individuals, addressing barriers to dental care access, and promoting the integration of oral health education into routine prenatal care.

Reducing Neurocognitive Impairment in Treating Limited Stage Small Cell Lung Cancer with Gamma Knife Radiosurgery.

Authors: Andrew Cunningham¹, Hayley Behm², Andrew Ju³, Matthew Peach³

Affiliations: ¹Brody School of Medicine, East Carolina University, ²RDT Scholar, M3, Brody School of Medicine, East Carolina University, ³Department of Radiation Oncology, Brody School of Medicine, East Carolina University

Background: Small Cell Lung Cancer (SCLC) represents 20-30% of lung cancer and is characterized by rapid growth with metastasis resulting in poor survival rates. SCLC with a limited stage defined as disease limited to the hemithorax with no evidence of current metastasis. The current gold standard includes chemoradiation and prophylactic cranial irradiation (PCI) which can result in acute adverse effects that do not improve over time. These include long-term toxicity with neurocognitive impairment, decrease short term memory and change in personality. An alternative treatment is the implementation of a watchful waiting strategy utilizing Gamma Knife Radiosurgery on a single or a few metastatic lesions as they appear. With Gamma Knife Radiosurgery, treating small lesions to a high dose with little irradiation to the rest of the brain does not result in cognitive side effects. Patients are subjected to close image surveillance of serial MRIs monthly to determine if Gamma Knife is necessary.

Objective: The purpose of this report is to compare the current gold-standard PCI to surveillance and treatment with Gamma Knife Radiosurgery in limited-stage SCLC. We hypothesize Gamma Knife to have significantly reduced neurocognitive effects with better quality of life outcomes with equivalent or improved survival rates.

Methods: A database of patients with SCLC will be constructed and patients' charts will be systematically reviewed to determine the stage of lung cancer, the treatment offered, cognitive status, brain metastasis, and overall survival. The two cohorts (PCI vs Gamma Knife) will be compared on several outcomes including brain metastasis, cognitive function and overall survival.

Results: We identified 320 patients with limited stage SCLC with 53 receiving PCI and 39 receiving Gamma Knife. Another 228 underwent watchful waiting but had not developed brain metastasis requiring further treatment.

Conclusion: We estimate that upon completion of our analysis, we will be able to demonstrate comparative survival between the two cohorts but there will be significant improvements in both the quality of life and cognitive function of the patients undergoing watchful waiting with Gamma Knife.

Immunotherapy for Metastatic Basal Cell Carcinoma: A Case Report and Literature Review of Rare Osseous Metastasis

Authors: Andrew Cunningham¹, Amanda Goetz², Andrew Ju², Matthew Peach²

Affiliations: ¹Brody School of Medicine, East Carolina University, ²Department of Radiation Oncology, Brody School of Medicine, East Carolina University

Background: Cutaneous basal cell carcinoma (BCC) is one of the most common malignancies with a rising incidence. Fortunately, this neoplasm typically does not lead to lymphatic or hematogenous metastasis. This case report focuses on a patient who initially presented with a basal cell carcinoma on his left shoulder and upon work up was found to have a metachronous metastasis to his spine. The vertebral metastasis presented as lower back pain and bilateral lower extremity weakness. Surgery was performed, followed by adjuvant radiotherapy given the aggressive nature of the patient's disease. The patient developed a subsequent recurrence in the spine. A second surgical resection was performed, which was followed by a change to sonidegib. The application of second line hedgehog inhibition was followed by immunotherapy and has kept the patient's metastasis stable.

Objective: The purpose of this report is to focus on both the unique presentation of basal cell carcinoma metastasizing to bone and discuss the most recent treatment options that has extended life expectancy for these patients by using hedgehog pathway inhibitors such as vismodegib or sonidegib and immunotherapies like pembrolizumab and cemiplimab.

Methods: A systematic review of the literature was performed to determine the significance of metastatic basal cell carcinoma (mBCC) to the bone and uniqueness of its treatment with the combination of hedgehog inhibitors followed by immunotherapy.

Results: We identified 26 case reports of patients with osseous mBCC. Most patients were treated with surgery, radiation, chemotherapy and seldomly hedgehog inhibitors. This report is noteworthy as it is the first to discuss immunotherapy as a treatment option for mBCC.

Conclusion: This report highlights the rarity of osseous BCC with only 26 articles identified after an extensive review but also presents a novel treatment strategy with the use of immunotherapy that has yielded positive results upon radiographic imaging of the lesions.

The Dopamine D3 Agonist Pramipexole Decreases Withdrawal Potential of Morphine in Opioid-Tolerant Animals

Authors: Alissa L. Davis¹, Dylan Marshall², Martina De Cristofaro², Stefan Clemens, PhD², Kori L. Brewer, PhD³

Affiliations: ¹Brody School of Medicine, East Carolina University, ²Department of Physiology, Brody School of Medicine, East Carolina University, ³Department of Emergency Medicine, Brody School of Medicine, East Carolina University

Background: Despite dangerous labeled side effects that include physical dependence on the drugs, opioids remain the standard of care for moderate to severe pain because they are highly effective analgesics with few alternatives. The use of an adjuvant may decrease opioid doses needed to achieve analgesia which in turn may decrease their adverse effects of tolerance, dependence, and withdrawal.

Objective: The objective of this study was to determine if using the dopamine receptor agonist pramipexole (PPX) as an adjuvant can attenuate opioid withdrawal in animals that are opioid tolerant.

Methods: We induced morphine tolerance in 18 male Long-Evans rats over seven days with a twice daily 10 mg/kg subcutaneous injection. At 7 days, drug administration was either stopped (control group, n=6), or animals were assigned one of two drug conditions for the seven following days: a 5 mg/kg dose of morphine (n=6) or a 5 mg/kg dose of morphine with the addition of 0.5 mg/kg pramipexole (n=6). Withdrawal symptoms were measured and compared across groups at the start of treatment and after all drug administration was stopped.

Results: There was no significant difference in total withdrawal scores across groups during the treatment period or after removal of drug. However, the behavioral profile of withdrawal symptoms during the treatment period was different, with the pramipexole group displaying significantly more rearing than the control or morphine reduction groups. When controlling for rearing behaviors (known to be associated with the use of dopaminergic drugs), there was a significant reduction in withdrawal symptoms in the PPX-treatment group when compared to control at both 48 (p=0.014) and 72 hours (p=0.004).

Conclusion: We were able to reduce the dose of morphine given to a tolerant animal without inducing withdrawal which serves as preclinical evidence for developing pramipexole as a potential opioid replacement therapy. Future research should investigate if a stepwise decrease in doses of the morphine/pramipexole combination over time can also reduce withdrawal after complete removal of drug in morphine tolerant animals.

Transcriptional States of B cells Producing Broadly Neutralizing Antibodies that target HIV-1 Envelope

Authors: Tyler Evangelous¹, Madison Berry², Todd Bradley, PhD³, Isabela Pedroza-Pacheco, PhD⁴, Ipsita Mohanty², Bhavna Hora, PhD², Yousef Abuahmad², Anthony M. Moody, MD², Derek W. Cain, PhD², Persephone Borrow, PhD⁴, Kevin Wiehe, PhD², Barton F. Haynes, MD², and Wilton B. Williams, PhD²

Affiliations: ¹Brody School of Medicine, East Carolina University, ²Duke University, Durham, NC, USA, ³Children's Mercy Hospital, Kansas City, MO, USA, ⁴University of Oxford, Oxford, UK.

Background: Previous studies have isolated HIV-1 envelope (env)-reactive broadly neutralizing antibodies (bnAbs) from chronic human HIV-infection. However, the nature and properties of bnAb B cells are not fully defined.

Objective: The transcriptional programs of HIV-1 Env bnAb B cells may provide insights into the nature of these B cells and inform future vaccine strategies to harness them.

Methods: We studied negatively-enriched B cells from blood of four HIV-1 infected individuals from whom we previously isolated and characterized five bnAbs that targeted different regions on HIV-1 Env. B cell receptor (BCR) or paired heavy and light chain genes per antibody, and transcriptome sequencing of single B cells were performed using a single cell immune profiling assay that generated paired BCR genes as well as transcriptomes of single B cells. We computationally inferred BCR immunogenetics, including clonality, and performed gene expression (GEX) profiling using robust statistical softwares.

Results: From 78,399 BCRs in four HIV-1 infected individuals (Avg. = ~19,600 cells/ individual), we found 21 HIV-1 Env bnAbs that were clonally-related to five previously isolated bnAbs studied. From the transcriptomes of 308,187 B cells across the four HIV-1 infected and three seronegative controls, we identified 16 distinct transcriptional clusters. In three clusters where bnAb B cells predominated and were also underpopulated by B cells from seronegative individuals, the common differentially expressed genes included CD22, CD72 and SHP-1, which play key roles in B cell receptor signaling. All 3 genes were downregulated in these clusters suggestive of a hyper-responsive B cell state, thus making them prone to constitutive signaling that may lead to anergy, and possibly loss of responsiveness to HIV-1 Env stimulation. To determine if this transcriptional signature of bnAb B cells was unique to HIV infection, future studies will interrogate 251,377 B cells from COVID-19 infected patients.

Conclusion: The transcriptional profile of B cell clusters with the highest number of bnAb B cells implicated loss of regulation of B cells expanded following HIV-1 infection. Thus, effective HIV-1 vaccine immunogens may need to rescue anergic B cells capable of maturing to bnAb status.

Clinical Outcomes in Patients Presenting to the Emergency Department for Opioid Overdose and Concurrent Covid-19 Infection

Authors: Benjamin Gerstein¹, Kori L. Brewer, PhD², Dmitry Tumin, PhD³, Jason Hack, MD²

Affiliations: ¹ Brody School of Medicine, East Carolina University, ² Department of Emergency Medicine, Brody School of Medicine, East Carolina University, ³ Department of Pediatrics, Brody School of Medicine at East Carolina University

Background: To date, research on opioid overdose during the COVID-19 pandemic has focused on the increase in rates of Emergency Department (ED) visits related to opioids, opioid overdose, and death but has not considered how concurrent COVID-19 infection influenced clinical outcomes.

Hypothesis: We tested the hypothesis that COVID-19 infection increased the need for respiratory support, prolonged hospital stays, and increased mortality among patients admitted to the hospital after presenting to the ED due to opioid overdose.

Methods: The 2020 National Emergency Department Sample (NEDS), a nationally representative sample of ED visits, was used to identify patients admitted to the hospital after presenting to the ED with a primary diagnosis of opioid abuse, and whose COVID-19 infection status could be determined. The primary outcome of interest was the need for any respiratory support, and secondary outcomes were hospital length of stay (LOS) and death before discharge from the hospital. Multivariable analysis included logistic regression models for dichotomous variables, and a Poisson regression model for LOS.

Results: Among the 6,094 eligible ED visits, we estimated that 3% of patients had a COVID-19 diagnosis. The estimated need for respiratory support was 27%, the estimated in-hospital mortality was 4%, and the mean hospital length of stay was 3.9 days. After multivariable adjustment of study outcomes, COVID-19 was not associated with the requirement for respiratory support (odds ratio [OR]: 0.92; 95% CI: 0.63, 1.35; p=0.669). COVID-19 was associated with a higher odd of in-hospital mortality ([OR]: 2.11; 95% CI: 1.14, 3.91; p=0.018) and a longer hospital stay (incidence rate ratio [IRR]: 1.57, 95% CI: 1.24, 1.98; p= <0.001).

Conclusion: Among patients admitted to the hospital with a primary diagnosis of opioid abuse, concurrent COVID-19 diagnosis was associated with a higher risk of in-hospital mortality and a longer hospital stay, but not the requirement for respiratory support. This data suggests that COVID-19 may exacerbate some of the physiological consequences of opioid overdose, including organ damage. COVID testing may continue to be important in hospitalized patients after an opioid overdose to identify patients at risk for worse clinical outcomes.

Alpha-synuclein: A Non-Lethal Interaction with Gram-Positive Bacteria

Authors: Martin Green¹, Whitney G. Bond², Tonya N. Zeczycki²

Affiliations: ¹Brody School of Medicine, East Carolina University, ²Department of Biochemistry and Molecular Biology, Brody School of Medicine, East Carolina University

With approximately 1 million people in the US alone currently living with Parkinson's disease (PD) and 90,000 new cases diagnosed each year, there is an imperative need to develop therapeutics targeting both the initiation and progression of this devastating neurodegenerative disease. A major impediment to the development of effective therapeutics against PD is our lack of understanding the mechanisms which cause α -synuclein to go from a physiologically important protein to the major protein associated with PD disease pathologies. Considering α -synuclein's newly defined functional role in gastrointestinal immunity and emerging evidence correlating gut and oral microbiome health and PD, we sought to examine the impact α -synuclein has on gram positive bacteria found both in the gut and oral microbiome. In contrast to previous reports with gram negative bacteria, we found α -synuclein did not exhibit anti-microbial effects towards the gram-positive bacteria, *Enterococcus faecalis* (*E. faecalis*). α -Synuclein had no apparent lethal impact on planktonic *E. faecalis* growth; *E. faecalis* planktonic growth rates, lag time, or overall maximal growth numbers did not change in the presence of α -synuclein. In fact, we show that α -synuclein may be enhancing *E. faecalis* membrane's integrity, potentially leading to enhanced bacterial viability. In contrast to planktonic growth, we observed increased biofilm formation for *E. faecalis* biofilms grown in the presence of increasing concentrations of α -synuclein. Finally, to extend these findings to other gram-positive bacteria, we began preliminary studies with *Streptococcus mutans* (*S. mutans*); as we observe in these early studies, α -synuclein has a similar impact on planktonic *S. mutans* growth as it does in *E. faecalis*. Collectively, these studies show: α -synuclein's reported anti-microbial activity is bacterial species dependent and may promote bacterial viability in both the planktonic and biofilm states. Not only do these studies begin to lay the groundwork for advancing our understanding of the imperative role α -synuclein plays in gastrointestinal immunity, but also its central role in linking gut health and inflammation and PD disease pathologies.

ECU Family Medicine Summer Medical Nutrition Fellowship via the Kolasa-Kelly Endowed Scholarship

Authors: Jenna Carter Hamed, BS

Affiliations: ECU Brody School of Medicine, Nutrition Department

Background: I learned about Nutrition over the course of eight weeks during the summer between M1 and M2 years with ECU Family Medicine in the Nutrition department. I spent time in several departments and worked with various patient populations including Internal Medicine, Med-Peds, High Risk Obstetrics, Lifestyle Medicine, Diabetes Clinic, Tube Feeding Clinic, and Pediatric Healthy Weight Clinic. I participated in several trainings including Food as Medicine, Lifestyle Medicine, and Diabetes Prevention Program Lifestyle Coach. I gained skills such as plain language writing and public speaking to participate in several presentations and publications. From this experience, I gained 320 clinical hours.

Objective: My goal was to learn how to educate patients on their nutrition and its importance in managing their chronic illnesses.

Results: As a future physician, to be able to see firsthand the implications and benefits of nutrition and lifestyle education and modifications can have on the overall health of my patients, is impactful. I was able to observe how MNT can impact patients with chronic diseases such as Diabetes Mellitus, Chronic Kidney Disease, Hypertension, Hyperlipidemia, Obesity, Malnutrition, etc. From this, I learned that nutrition and medicine can work together for the benefit of the patient. Sometimes, a patient can make adequate diet and exercise changes to control their diseases. I was able to see the direct effects of a patient's diet and exercise changes, including decreased A1C, decreased Blood Glucose Levels, decreased lipid levels, decreased blood pressure, and weight loss. However, sometimes, no matter how many changes a patient makes their DNA will catch up to them and medicine can step in to provide their body with the support to manage their disease. Through this I learned the importance of nutrition within medicine and how interdisciplinary care can benefit the patient both medically and nutritionally.

Conclusion: This summer, I not only learned how to implement nutrition education into my academic career, but my own personal life. I can see the direct impacts that diet and exercise can have on one's health. Understanding this from a first-person point of view has made an immeasurable impact on how I view these impacts from a preventative care perspective.

CBCT Analysis of Anterior Maxillary Anatomy Shows Age- and Gender-Related Variance in Morphology

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Background: Implants have been widely used to restore missing teeth. The morphologies of the nasal cavity and nasopalatine canal (NPC) must be considered when immediate implant placement of maxillary incisors is planned.

Materials & Methods: CBCT scans were screened, and 140 scans met the set criteria. Measurements were taken at sagittal and axial views of each maxillary central incisor. Anteroposterior dimension of the NPC was measured at the middle root level. Closest distance from anterior wall of the NPC to each maxillary central incisor was measured at crestal, mid-root, and apical levels. The crestal level was measured from the edge of the buccal plate in order to avoid factors of periodontitis. The distances from the apex of the root of each maxillary incisor to the floor of the nasal fossa were also measured. These measurements were analyzed between genders (55 men, 85 women) as well as between age brackets. Out of the patient scans, ten were randomly selected and measured again two weeks later. This data was analyzed to determine an intraclass correlation coefficient (ICC) for intrarater reliability analysis.

Results: Distance from the apex of the incisal root to the floor of the nasal fossa averaged to 7.23 ± 2.80 mm. This measurement did not show statistically significant differences between genders ($p=0.96$), but did across age groups ($p<0.01$). This measurement showed a general trend of increasing distance with increased age. Distance from the edge of the incisor to the NPC averaged to 1.72 ± 0.76 mm at crestal level, 1.97 ± 0.85 mm at mid-root level, and 4.27 ± 1.55 mm at the apical level. The incisor-NPC distance at the crestal level varied significantly between genders ($p=0.02$) but not between age groups ($p=0.37$). The incisor-NPC distance at the mid-root level also varied significantly between genders ($p=0.01$) but not age groups ($p=0.53$). Although the incisor-NPC distance at the apical level did not show significant differences between genders ($p=0.38$) or age ($p=0.60$), there was an interesting clinical finding with respect to this measurement. NPCs in men showed asymmetry at the apical level, where the distance to the NPC from tooth #8 was significantly longer than from tooth #9 ($p<0.01$). However, there was no significant skew either direction at the apical level in women ($p=0.87$). The lateral width of the NPC at mid-root level averaged to 4.45 ± 0.98 mm, with no significant differences across gender ($p=0.15$) or age ($p=0.84$) groups. The ICC coefficient was 0.94, demonstrating strong reliability of the single measurer.

Conclusions: In the anterior maxilla, care should be taken when placing dental implants in order to avoid perforating the nasal fossa and nasopalatine canal. The distance between the edge of the central maxillary incisor and the NPC show significant gendered differences at the crestal and mid-root levels. Additionally, the distance from the apex of the central incisors to the floor of the nasal fossa show significant age-related differences. This may be due to continued eruption of the central incisors or age-related changes of the bone. Further research is needed to investigate this, as well as the impact of incisal angle and overjet on these measurements.

Analysis of Racial Differences in Multi-Arterial Coronary Artery Bypass Grafting

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Background: Coronary Artery Bypass Grafting (CABG) is employed when coronary arteries are critically blocked to treat or prevent acute myocardial infarctions and heart failure. CABG procedures can utilize arterial or venous grafts, most commonly the left internal mammary artery and the greater saphenous vein.

Objective: To assess racial differences in utilization of multiple arterial grafts for patients undergoing primary CABG between African Americans (AA) and Whites (W).

Methods: AA and W patients who underwent CABG at our institution from 2017-2022 were included in a retrospective analysis of our Society of Thoracic Surgeons Adult Cardiac Surgery Database. Chi-Square and Fisher's exact tests were performed with a *p* value less than .05 considered statistically significant.

Results: There were 1,934 AA and W patients who underwent CABG from August 2017-July 2022; 442 AA and 1,492 W. The majority of cases utilized single arterial grafting with the left internal mammary artery and greater saphenous vein grafts (79.9% AA and 74% W). Overall, 20.1% of AAs and 26% of Ws received multiple arterial grafts with RIMA and/or radial artery (*p*=0.013). Of the patients undergoing urgent inpatient CABG, more W patients (24.4%) received multiple arterial grafts than AA patients (14.9%) (*p*=0.001). However, of the patients undergoing elective CABG, there was no difference in the proportion of W patients (28.8%) who received multiple arterial grafts in comparison to AA patients (30.8%) (*p*=0.642). There were no statistically significant differences within the patient population between race and the following: BMI (*p*=0.144), age \geq 65 (*p*=0.068), MACE (*p*=0.742), operative mortality (*p*=0.53), readmission (*p*=0.407), and case status (*p*=0.375).

Conclusions: There is increasing evidence that multi-arterial CABG has improved graft patency and better long-term survival than traditional single arterial CABG. However, in this study population, the utilization of multiple arterial grafts during first-time CABG procedures was less in AAs compared to Ws overall. Additionally, there was decreased multi-arterial graft utilization during urgent CABG for AAs compared to Ws. These trends suggest that further analysis of a national database would be beneficial in better characterizing racial disparities in multi-arterial coronary artery bypass grafting.

Physician Training: Too Long to Learn?

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Background: While medical education across the United States and other countries shares common objectives, such as producing competent and compassionate physicians, the differences in admission process, duration and cost of training reflect the diverse educational systems and cultural contexts.

Objective: This comparative analysis of medical education in the United States, Europe and East Asia sheds light on the key similarities and differences in their respective systems and examines how the current U.S. medical education model can be improved.

Methods: PubMed and Laupus Library search engine were used to search for the following terms: models of medical education, medical education in the United States or Europe or East Asia, CAMPP, health care outcomes in different countries. Matriculating Student Questionnaire (MSQ) from AAMC used to look at the age of matriculation, debt, and cost of application.

Results: Analysis of health care outcome data showed U.S. and Canada ranking 11th and 10th, respectively, among eleven nations on health system performance measures, which included access to care, care process, administrative efficiency, equity, and health care outcomes. These two North American countries share the same model of medical education system: Graduate Entry Model (8 years). The U.S. had one of the longest durations and the highest costs of physician training and was also an outlier among developed countries when its healthcare system performance was compared to its spending as a share of GDP.

Conclusion: Medical education plays a pivotal role in shaping competent healthcare professionals capable of addressing the evolving healthcare needs of societies. The health system performance measures data shows that the countries with shorter duration of physician training are performing better than the countries that use GEM. In 2023, 31 U.S. medical schools are participating in 3 year accelerated medical education system (CAMPP) that shortens overall training duration by 1 year in the hopes of making medical education more efficient and more affordable. Understanding the similarities and differences in medical education between the United States and Europe contributes to a broader global perspective on training healthcare professionals. By identifying successful aspects of each system and fostering collaboration, medical educators can explore opportunities for enhancing educational practices, ultimately improving healthcare outcomes worldwide.

Exploring Factors Associated with Disparities in Accessing the Kidney Transplant Waitlist within the Southeastern United States.

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Background: Disparities impacting post-waitlist access to kidney transplantation (KTx) are well documented. However, barriers affecting the initial steps to the KTx waitlist (i.e., referral, and waitlist evaluation) have not been well characterized, particularly in the Southeastern, United States (U.S.), which has the lowest rates of kidney transplantation in the nation. Identifying these barriers is needed to promote awareness and improve health outcomes and equitable access to the KTx waitlist.

Objective/Hypothesis/Aim Statement: To determine the scope of literature on KTx waitlist access, identify disparities impacting access to the KTx waitlist within the Southeastern, U.S., and to examine knowledge gaps to guide future research.

Methods: A comprehensive scoping literature review encompassing relevant literature examining disparities to accessing the KTx waitlist, published between 2013 and 2023, was conducted. We included literature within PubMed, which targeted adult populations with end-stage renal disease (ESRD) to examine established systemic, provider, and patient-related factors contributing to barriers impacting KTx waitlist access. A hierarchical cluster analysis is being performed, and factors associated with disparities in access to the KTx waitlist within the Southeastern, U.S. are being assessed using the Surgical Equity Index (SEI), a quantitative measure of surgical disparity.

Results: Our initial search generated 134 peer-reviewed studies. Of these, 51% (n=68) met our review criteria of adults with ESRD on dialysis within the U.S. Of the selected studies, 28% (n=19) focused on systemic barriers related to geospatial disparities, for-profit vs. non-profit dialysis facility performance, community risk, and social deprivation; 18% (n=12) established provider-level barriers including implicit bias, perceived discrimination, and awareness to disparities in KTx access; and 54% (n=37) examined patient-level barriers including social factors (SES, gender, race, ethnicity, age), health literacy, education, medical mistrust, and social support. Preliminary data analysis outlining disparities within the Southeastern, U.S. is ongoing. We hypothesize that these barriers negatively impact access to the KTx waitlist within the Southeastern, U.S.

Conclusion: This review provides important background data that guides our analysis moving forward as women, racial and ethnic minorities, reduced health literacy, rural locations, dialysis center variability, and provider implicit bias and awareness of disparities were strongly predictive of reduced likelihood in accessing the KTx waitlist.

Effects of physical therapy and medical nutrition therapy on patients' frailty scores and self-reported fear of falls.

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Background: Medical frailty is a state of decreased functional reserve and resilience, and increased risk of adverse outcomes (e.g., falls, delirium, hospitalization, disability, death) affecting 10-15% of community dwelling Americans over 65 years of age. Due to insidious onset, and confusion between frailty and aging, many patients are not diagnosed with frailty until they are functionally disabled. Outpatient frailty screening is now a standard patient care procedure in Canada and UK, leading to early intervention. At ECU Family Medicine Center (FMC) 15201 patients were seen from 1/1/2019 to 7/31/2021. Frailty was documented in only 49 patients' charts. This diagnostic prevalence of 0.32%, is markedly lower than the national average. Given the risks frailty imposes against healthy aging, a frailty screening quality improvement protocol was implemented for patients over age 65 seen at FMC Geriatrics Clinic from August 1, 2021. Screening was initially performed using gait speed, with a positive screen (0.8 m/s or inability to complete the test) followed by assessment via the FRAIL scale. Patients with a positive screen were referred to physical therapy (home based, outpatient or self-directed as prescribed by a clinician) and medical nutrition therapy, and frailty was reevaluated every 3 months.

Objective: We will analyze the effects of physical therapy and medical nutrition therapy on patients' frailty scores and self-reported fear of falls from the baseline visit at which frailty was identified until the 6-month and 12-month follow-up visits. We hypothesize that frailty score and fear of falls improve more in patients who completed the intervention (physical therapy and medical nutrition therapy) than those who did not.

Methods: The study includes a retrospective electronic chart review of up to 500 patients over age 65 seen at the FMC Geriatrics clinic from August 1, 2021. In addition to patients' frailty scores, we will analyze changes in patient fear of fall following targeted therapies.

Results: Retrospective chart review and data collection is ongoing. We expect to find significantly improved frailty scores and self-reported fear of falls in patients who completed recommended physical therapy and medical nutrition therapy sessions. We will also identify demographic, socio-economic, and clinical factors that are associated with change in patients' frailty score and self reported fear of falls.

Conclusion: We are hoping that our results would inform incorporation of screening and treatment of frailty as a standard of care in patients over age 65.

Postpartum Supports for Black Women in Eastern North Carolina

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Background: Postpartum depression is a condition that affects many women and their families. PPD can negatively impact a woman's ability to function and complete their normal daily activities. According to the CDC, 1 in 8 women experience symptoms of postpartum depression. Left untreated, postpartum depression can contribute to poor outcomes on the health and well-being of the affected woman and even the development of the child. Research suggests that postpartum depression disproportionately affects women of color. A longitudinal study conducting ethnographic interviews found that while Black women and White women had similar depressive symptoms, there were differences in how the symptoms were managed. We aim to determine if symptoms of postpartum depression and anxiety affect the quality of life of Black, native, US born women in Eastern North Carolina. Additionally, we seek to explore how Black women are being supported throughout the perinatal period and if there is any difference in social capital among Black women that impacts their receipt of support.

Objective: The purpose of this study is to determine how Black women in Eastern North Carolina receive support during the postpartum period.

Methods: Data surrounding the postpartum experiences of Black women in Eastern North Carolina will be collected via online surveys.

Results: We expect to find that Black women seek support during the postpartum period through community resources, rather than through physicians or pharmacological treatments or therapy. We also expect to find that the quality of life of Black mothers in Eastern North Carolina who experience postpartum depression do not have a worse quality of life, despite similarities in reported depressive symptoms.

Conclusion: We expect to find that Black women do not have a worse quality of life because they seek support through family, friends or other community support organizations, rather than pharmacological treatments or psychotherapy.

Perinatal mental health provisions for birthing people impacted by the carceral state: a scoping review

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Background or Problem Statement: Criminal-legal system impacted (CLSI) birthing persons face unique health barriers exacerbated by racial disparities. People inside prisons and jails face higher rates of mental health conditions and limited access to evidence-based treatment. A growing body of research finds that incarceration negatively impacts mental and physical health. However, research on perinatal mental health disparities among birthing people who have been incarcerated is limited.

Objective/Hypothesis/Aim Statement: This scoping review evaluates the current literature on perinatal mental health provisions for CLSI birthing persons.

Methods: As a part of a large-scale scoping review of perinatal mental health, we will review literature inclusive of people impacted by the criminal-legal system, either through direct incarceration or incarceration of a loved one, that includes health equity considerations in the screening, assessment, and treatment of marginalized birthing persons in the U.S. We used the updated Joanna Briggs Institute methodology and the Preferred Reporting Item PRISMA extension guidelines for scoping reviews. Seven databases were searched initially and will be updated to include additional search terms specific to incarceration status. Quantitative, qualitative, mixed methods, case studies, systemic reviews and commentaries published within the last 41 years (1980-2023) will be considered for inclusion. Data will be extracted, aggregated, and narrative themes will be identified. Results will be presented in tables and narrative formats.

Results: Of 2185 articles retrieved, 21 articles have been identified that meet inclusion criteria. Of these articles, only three recognized race and incarceration as structural determinants of health. Most studies were cross-sectional studies or commentaries and measured either polysubstance use or depression in CLSI perinatal populations. Preliminary results indicate that most studies do not stratify results based on type of CLSI, including current incarceration, former incarceration, or parole/probation experiences.

Conclusion: The carceral status of birthing people is an important health equity consideration that should be more adequately addressed in the literature.

Treating and Preventing Cancer Using a Genetic Screening Tool as Part of Risk Assessment: A Model of Academic-Community Collaboration to Address Rural Disparities in Breast Cancer

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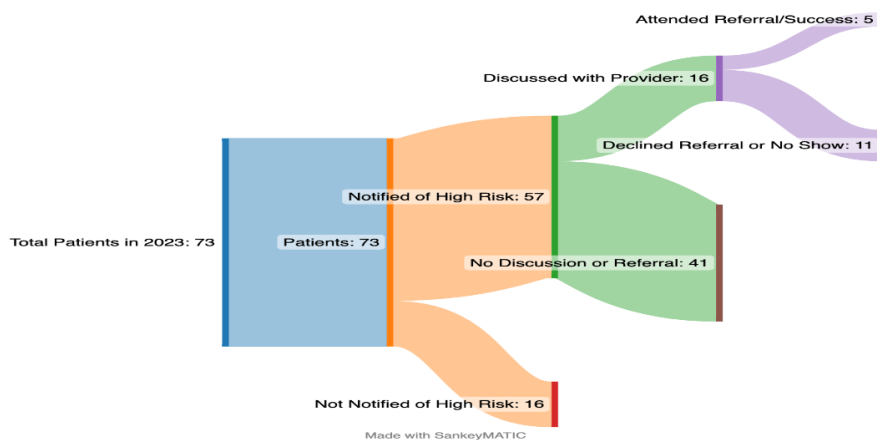
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Background: The Outer Banks Hospital is leveraging collaboration between Academic Cancer Programs and Community Hospitals to improve rural disparity in cancer outcomes. A recent program focus includes analyzing cancer patients tested for genetic susceptibility to cancer to discover how common inheritable cancer related genes occur rurally, and then determine how results influenced the care and treatment plan based on a well-informed physician/patient relationship. This is a collaborative model that emphasizes not only treatment of affected patients with cancer, but also one that potentially promotes larger scale prevention in an at-risk population by using genetic screening tools within a population before patients develop cancer. A major project focus is for our small critical access rural community hospital (TOBH) to integrate an automated risk-assessment model that includes genetic testing into the electronic medical records of EPIC for patients locally, and then expand availability of this risk assessment model to the rest of a network that shares the same electronic medical record (EMR) platform with ECU Health.

Objective: We plan to develop a population screening tool for patients unaffected by cancer, but who are at risk by virtue of family histories of cancers. We now want to develop resources to 1) offer genetic counseling and testing to more of these women annually as they trigger alerts at time of screening, and 2) make this an automated tool within our electronic record to allow adoption elsewhere.

Methods: We pulled over 2100 patient charts from Epic records of all screening mammograms within a six-month period in 2023 for the OBH geographic area. After grouping patients based on risk profile, we tracked those in the “high risk” category for their outcomes to see if they were properly informed of their risk, had a discussion with their provider, and ultimately referred to a proper high-risk facility.

Results:



Conclusion: Most patients who are identified as being high risk are not receiving the proper screening and preventative care. Due to the process relying on a delayed manual entry, pitfalls can occur at multiple stages in the process. By using an automatic tool that instantly screens the risk profile, we can ultimately inform more of these patients of their risk profile and develop proper specialized care for them.

PED vs Night clinic

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Abstract: Many caretakers take their children to the pediatric emergency department (PED) despite open hours at pediatric night care clinics meant to decrease the burden on local PED. The goal of this study is to identify the determining factors taken into consideration by caretakers when choosing PED over pediatric acute care night clinics for low acuity conditions. Over a course of 4 weeks a two-section survey was provided to eligible patients that presented to the PED at an academic tertiary care center during night clinic hours. Patient eligibility consisted of a participating night clinic pediatrician, presentation to the ED during night clinic hours, and a triage ESI level of 4 or 5. Of the 70 completed surveys that were received 67.1 % of care givers were aware of the night clinic. Of that 70, 41.4% of caregivers believed that the PED wait times would be shorter and 21.4% were under the impression that the child's illness required the PED. We concluded that a majority of caregivers knew of the clinic but pursued the PED regardless. This illuminates a bright light on the potential of caregiver education as an avenue for PED reductions in the Greenville area.

Psychiatric Boarding in a Rural Southeastern Pediatric Emergency Department: A Clinical Crisis

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Background or Problem Statement: The increasing prevalence of childhood mental health disorders in the United States has highlighted the growing concern for clinical burden within pediatric emergency departments (PEDs) and the lack of psychiatric resources available for these patients. Over the past decade, pediatric mental health-related visits in PEDs increased significantly as did length of stay (LOS) and admission rates for those in the PED visits.¹⁻⁶ It is estimated that between 5-10% of all PED visits are for mental health, behavioral and substance abuse related concerns.⁷⁻¹⁰

Objective/Hypothesis/Aim Statement: The goal of this study was to describe the characteristics, frequency, and LOS of PED psychiatric evaluations in a rural hospital in Eastern North Carolina and identify factors associated with increased boarding times in the ED.

Methods: We performed a retrospective chart review of children presenting for a psychiatric evaluation at a rural Southeastern PED from January 2018-May 2018. LOS, demographic data, diagnosis, and disposition decisions were reported using descriptive statistics. Spearman correlations were used to identify associations between LOS and requests for involuntary commitment (IVC) or DSS involvement as well as historical factors such as previous psychiatric admission, adverse childhood events, history of violence by the patient and previous PED visits.

Results: Charts for 235 children were reviewed (13.61 years +/-3.05). Average LOS for all children presenting for psychiatric evaluations was 30.21 hours (1.82-354.02). LOS was significantly longer for patients who were IVC'd in comparison to those who were discharged. ($M_{IVC}=56.09, M_{home}=11.00, p<0.001$), and these two things were strongly correlated ($r=0.74; p<0.0001$). 74.4% of patients had a previous psychiatric diagnosis and 35.7% had a previous psychiatric inpatient admission. 28.8% visits involved DSS. 39.2% of children had a history of adverse childhood events and 45.6% had a history of violence. Correlations between each of these factors and LOS were weak ($r<0.3$).

Conclusion: Children presenting to the PED for mental health disorders, particularly those meeting inpatient admission criteria, are boarding for significant periods of time. The IVC process significantly impacts this boarding time. These results suggest that systemic changes may be needed to ensure sufficient and adequate mental health care for children in our region.

Renin-Angiotensin-Aldosterone System on Cardiomyocyte and the Impact of Anti-Hypertensive Drug on Myocardial Excitability

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Hypertension is a polygenic condition that characterizes one of the most common and relevant cardiovascular complications that contributes to approximately 690,000 deaths per year in the United States. Renin-angiotensin-aldosterone system (RAAS) plays a significant role in systemic and neurogenic hypertension [1, 2]. Angiotensin II (Ang II), an octapeptide, is a key hormonal peptide that interacts with AT₁ and AT₂ G-protein-coupled receptors (GPCR). The effects of AT₁ receptors mediate excitatory responses, and AT₂ serves as the protective arm of RAAS at the level of cardiomyocytes. Angiotensin-converting enzyme-2 (ACE2) converts AngII into Ang-(1-7) mediated by MAS receptor, a GPCR for Ang-(1-7), to mitigate myocardial excitation and regulate blood pressure. Angiotensin 1-7 (Ang 1-7) has been shown to reduce blood pressure [3], cardiac contractility [4, 5], and reactive oxygen species (ROS) [6], mediated via MAS1 proto-oncogene protein (MAS).

The *objective* is to study the expression of RAAS receptors on ventricular myocytes isolated from hypertensive rodents to assess the implication of the AngII in the presence or absence of antihypertensive drugs. There was a correlation in the circulating plasma AngII with blood pressure in hypertensive rodents. The blood pressure was reversed with angiotensin receptor blocker (ARB) suggesting the impact of RAAS. Cardiac expression for AT₁R showed a significant increase compared to the control group ($p < 0.001$) but was abolished in the treated group with angiotensin receptor blocker (16mg/kg candesartan) and a vasodilator (10mg/kg di-hydralazine). Conversely, AT₂R expression in hypertensive group was significantly lowered compared to control group ($p < 0.001$). However, the antihypertensive drug treatments did not reverse AT₂ response to control level suggesting a non-reversal of AT₂ receptor expression when blood pressure is returned to normal. Furthermore, there was a significant decrease in the protein expression of MAS receptors for angiotensin 1-7 (Ang1-7) peptides but was returned to control levels in the treatment group. These *results* suggest that while AT₁R mediates excitability and enhancement of cardiac contraction in hypertensive condition, MAS receptor mediates the metabolite of AngII, through Ang1-7 and, along with AT₂ receptors to serve as the protective arm of angiotensin peptides. This work implies that changes in the expression of the receptors on the surface of the cells are a key mechanism involved in the signaling pathways that lead to the manifestation of hypertension. It also suggests that treatments for hypertension works by restoring receptor expression to basal level.

Evaluating the Use of Retinal Imaging as a Means to Detect Vascular Damage Secondary to Hypertension and/or Diabetes in Eastern North Carolina Farmworkers: A Case Series

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Background: In North Carolina alone, thousands of farmworkers are contracted each growing season via H-2A visas to contribute to the nation's food production. Migrant farmworkers in North Carolina face a multitude of barriers in accessing and receiving regular, reliable healthcare. Mobile clinic programs partly address problems in accessing care, but are often limited in resources, providers, and the amount of clinical information that can be gleaned in such an unconventional setting.

Hypothesis: We hypothesize that retinal imaging can serve as a non-invasive and easily accessible method to detect early indicators of organ failure in H-2A farmworkers. By analyzing the retinal blood vessels and the optic nerve, among other structures, potential signs of organ dysfunction or chronic disease could be identified, allowing for timely intervention and improved health outcomes.

Methods: The research team will include two medical students, two native Spanish speaking outreach workers from the Kinston Community Health Center, and a physician, and will be transported to the fields in a mobile clinic. All participants will be migrant farmworkers over the age of 18 years. Each participant will receive two screening tests performed: a blood pressure reading, and an HbA1c obtained via fingerstick. Any farmworker who screens positively for either hypertension (defined according to the AHA/ACC as greater than or equal to 130 mmHg), or diabetes (defined here as HbA1c greater than 6.5%), will have an image of their retina taken via the RetinaVue 100 camera. Results will be interpreted by the physician in the field and shared and discussed with participants. Any participants with concerning findings will then be transferred/referred to the Kinston Community Health Clinic for follow-up management as needed.

Results: Not yet available.

Conclusion: Not yet available.

Ongoing medication Use Could Inhibit Weight Loss Amongst Participants of the Diabetes Prevention Program

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Background or Problem Statement: Almost half of the United States population took at least one prescription drug in the past 30 days in 2015-2018.¹ Certain classes of medications, such as antipsychotics, antidepressants, antihypertensives, and corticosteroids are associated with significant weight gain.^{2,3} This weight gain can increase the risk of metabolic disorders, including prediabetes and type 2 diabetes (T2D), affecting 38% of US adults. The National Diabetes Prevention Program (DPP) was created by the CDC in 2010 to address the increasing burden of prediabetes and T2D. One key feature of the DPP is the lifestyle change program, focusing on 7% weight loss through healthy eating and physical activity.⁵ ECU's Family Medicine Center started its DPP in 2017 and obtained full CDC recognition in 2023. So far more than 200 patients have completed this year-long program and two cohorts are currently ongoing.

Objective/Hypothesis/Aim Statement: This study will investigate whether ongoing medication use among DPP participants is associated with their weight change during participation in the program. The primary hypothesis states that DPP participants who continue daily medication use do not lose the expected 7% weight from baseline to completion of the program.

Methods: A retrospective electronic chart review study is being performed for more than 200 adult patients who complete the DPP at ECU Family Medicine Center from 2017- 2024. Data is collected on patient's demographic characteristics, health conditions, medications, weight, blood pressure, laboratory values, and their DPP participation.

Results: Preliminary data analysis is ongoing. In addition to the baseline demographic, socio-economic and clinical characteristics (baseline A1c, weight, BMI), we will present how these factors differ in patients who did not achieve expected 7% weight loss from patients who lost 7% weight from the baseline to the DPP completion. We will also present a representative case of how certain medications affected their ability to lose weight despite completion of the yearlong DPP.

Conclusion: This is the first study to evaluate the effect of medications on weight among patients with prediabetes enrolled in DPP. The findings will contribute to our understanding of the relationship between specific medications and weight changes, potentially informing clinical decision-making and patient management strategies.

Identifying women with an undiagnosed bleeding disorder in Eastern North Carolina

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Background: Approximately 1% of women living in the US have an undiagnosed bleeding disorder despite ongoing symptoms. Lack of knowledge and lack of screening tools for these disorders contributes to diagnostic delay, further impairing their quality of life and increasing their risk for adverse complications. In rural areas, this disparity is further heightened due to lack of access to medical care. Currently, the form of questioning utilized in OB/GYN practice is largely limited to a few questions focused on a pharmacological or malignant cause of bleeding with few questions regarding bleeding disorders specifically. Unfortunately, patients presenting with abnormal uterine bleeding are typically placed on medical management without further diagnostics conducted.

Objective: The objective of this study was to establish an effective bleeding risk assessment tool to screen all women presenting to the ECU OB/GYN outpatient clinic who would subsequently establish care with the Bleeding Disorders clinic, if certain criteria were met.

Methods: This is an observation, quality improvement study which uses the International Society on Thrombosis and Hemostasis bleeding assessment tool to screen patients ≥ 18 presenting to the ECU OB/GYN outpatient clinic. If patients score ≥ 6 , they are referred to the Bleeding Disorders clinic where they undergo further diagnostic workup. We collected data on the number of patients referred, their ultimate diagnosis, their zip code and lowest hemoglobin value to date. Results: This study is being conducted over a year and we are still waiting on initial results but anticipate there will be a significant number of patients that are positive in screening.

Conclusions: This is an ongoing QI study through which multiple PDSA cycles will be utilized to improve our screening tool with the goal of enhancing patient care by incorporating the bleeding risk assessment tool into current clinical practice to allow physicians across specialties to be able to effectively screen patients for bleeding disorders. We hope to raise awareness about bleeding disorders through an enhanced collaborative effort between Hematology and OB/GYN.

The pH-Sensing GPCR GPR68 Signals In cAMP/PKA/EPAC1-Independent Manner

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Background: G protein-coupled receptor 68 (GPR68) is a recently described cell membrane receptor that is activated by extracellular acidification whose role in vascular pathophysiology including abnormal vascular smooth muscle (VSM) cell growth is unclear. Ischemia, a major component of cardiovascular disease (CVD), forces affected tissues to switch to anaerobic metabolism, which results in lactic acid buildup, a drop in pH, and activation of GPR68. Preliminary observations indicate that GPR68 inhibits VSM cell growth, a central facet of CVD; however, the signaling pathways used by GPR68 to regulate VSM cell proliferation in the setting of CVD and ischemia remain unknown. GPR68 and members of its intracellular signaling cascade could be potential pharmacologic targets to help combat pathological VSM growth after ischemic injury.

Hypothesis: The purpose of this project is to elucidate the downstream signaling cascades responsible for GPR68-mediated regulation of VSM cell proliferation under acidic conditions. We hypothesize that GPR68 signals through a $G\alpha_s$ signaling pathway consisting of cAMP-activated EPAC1 and/or PKA.

Methods: Mouse primary VSM cell cultures from wild type (WT) C57BL/6J (Jackson Labs) and global knockout (KO) GPR68 mice were used as in vitro models of acidosis when cultured under normal (pH ~7.5) or acidic conditions (pH ~6.5) for 5 hours post-quiescence. Cell lysates from the four cohorts (WT normal, WT acidic, KO normal, and KO acidic) were used to measure target protein levels and activation via Western Blot analysis. A one-way ANOVA with multiple replicate Bonferroni tests were used for statistical analysis with an $\alpha < .05$.

Results: Activation of GPR68 in acidic conditions showed no significant changes in protein levels of EPAC1, PKA_{Total}, PKA_{Thr197}, or PKA_{Thr197}: PKA_{Total} ratio, compared to normal biological pH after 5 hours of exposure. These data indicate that GPR68 signals through mechanisms independent of cAMP, PKA, and EPAC1, the major targets of the $G\alpha_s$ signaling pathway.

Conclusion: GPR68 signaling in response to extracellular acidification is cAMP/PKA/EPAC1-independent. These results, however, leave open the possibility that GPR68 signals through $G\alpha_s$ in other specific contexts. Future studies will focus on alternate downstream signaling pathways for GPR68 in VSM including G_q and/or $G_{12/13}$ in response to ischemic injury.

Morphological Characterization of Female Rat Genitourinary Tissues Following Pelvic Radiation

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Background: Sexual and reproductive toxicities commonly affect patients who have undergone pelvic radiation for treatment of gynecological cancers. Development of animal models for pelvic radiation is necessary to evaluate preventative interventions to improve outcomes for cancer survivors.

Hypothesis: We compared vaginal and cervical tissue between irradiated versus non-irradiated female rats to evaluate morphological changes induced by pelvic radiation. Additionally, we sought to characterize the clitoral tissue of female rats. We predicted that pelvic radiation will significantly increase vaginal epithelial atrophy and tissue fibrosis and decrease innervation in the clitoris and cervix.

Methods: Female Sprague-Dawley rats will be randomly divided into 3 groups (n=8/group): Sham, 4-week radiation therapy (RT), and 9-week RT. Animals will be anesthetized with ketamine/xylazine (90/10mg/mL) for pelvic radiation. The XRAD 320 Irradiator will deliver a single dose of 25 Gy to the pelvis within a 2 cm x 2 cm field. Vaginal, cervical, and clitoral tissues will be collected, fixed in 10% formalin, and embedded in paraffin. Tissue will be sectioned (6 µm) and stained with Masson's Trichrome to assess fibrosis. We will additionally stain the tissue with PGP 9.5 primary antibodies to assess overall innervation. The stained tissue will be analyzed using the Zeiss Axio imager to determine nerve density, epithelial changes, and smooth muscle and collagen content of the tissues.

Results: We have previously demonstrated that pelvic RT decreases nerve-mediated vaginal blood flow at 4 weeks. Additionally, vaginal neurogenic and adrenergic-mediated contractions increased 9 weeks following pelvic RT. The vaginal tissue becomes more fibrotic and the epithelial layers are significantly thinner following RT. We are currently processing the clitoral and cervical tissues from these RT rats.

Conclusion: We have confirmed that pelvic RT in female rats causes fibrosis and atrophy of the vaginal tissues, diminishing vaginal blood flow and leading to greater vaginal contractility. These pelvic RT-induced pathological changes mimic what is seen in cancer patients undergoing RT. There is a demonstrated need for clinical interventions to prevent these adverse effects in patients undergoing pelvic RT, thus the preclinical model we have established will allow for evaluation of potential new therapies for pelvic cancer survivors.

Novel Advancements in Cardiac Care: Using Mobile Health Technology and Analytics to Support Clinical Decision Making in Post-Surgical Aortic Dissection Care

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Background: Mobile health (mHealth) technology has been used to better understand patient needs in health care. It has been used to report symptoms in asthma⁴, diabetes¹, and childhood obesity³. Information collected in this way has the potential to improve patient experiences and support clinical decision making. mHealth tools are useful for communicating symptoms to providers and people are more consistent with these tools than with paper diaries in an outpatient setting². Currently, little is known about patient experience after type A aortic dissection open surgical repair⁵. Due to the limited knowledge of patient experience after aortic repair, patients return to the hospital with complications^{8,9}. These complications range from a recurrence of an aortic dissection, pulmonary embolisms, and death. Hypertension, lumen volume variance, and infections have been associated with these complications^{6,9}. Through interacting with post-surgical repair aortic dissection patients in a clinical context, our team has uncovered a gap in the current research. Patients are having psychological and physiological symptoms not related to their post-operative recovery process for upwards of a year post-repair. It is for this reason that we seek to use mHealth technology to better understand the experience of aortic dissection patients post-surgical repair and use the data collected to better support clinical decision making.

Objective: Through the use of mHealth technology, we will be able to collect self-reported symptoms and biometric information from wearable devices in order to better support clinical decision making.

Methods: Participants between the ages of 18 and 85 receiving care at the ECU Heart Institute will be identified by clinical study personnel. Participants with access to an iOS Apple iPhone will be enrolled on a rolling basis and consented. Participants will download the Nanbar Health app to their smartphone, and patients who have a wearable device will sync with the app to allow collection of biometric data (heart rate, step count, etc.), or will be provided an Apple watch by the study team. Participants will be instructed to report symptoms through the app on a daily basis. Information from electronic health records will be integrated into a dashboard for clinicians to visualize a snapshot of each patient. Outcomes related to symptom burden and quality of life will be measured monthly. Additionally, quality improvement metrics including patient satisfaction, adverse events, and readmission rates will be assessed. Study participation will last for one year and the total number of participants included will be a minimum of 15. The Nanbar Health App was customized to include relevant symptomatology, education, and features for those living with type A aortic dissection.

Results: Our team has identified a need to better understand symptomatology and patient experience after type A aortic dissection open surgical repair. We have developed a study protocol as well as submitted it to the ECU UMCIRB for approval. Currently we are being reviewed by an IRB administrator and hope to be able to move forward with the next steps of the study soon.

Conclusion: Studies have shown that mHealth tools are useful for improving quality of patient care as well as improving clinical decision-making. Study methodology like the one described above has been proven to be useful in supporting clinical decisions in sickle-cell disease as well as other chronic diseases⁷. Future research should be conducted into the application of mHealth symptom monitoring for acute medical conditions such as aortic dissections and other cardiac diseases.

How do Trends in Thyroid Cancer Incidence Rates in Women and Men across Races/Ethnicities differ in the United States? A US SEER Study 2000 - 2019

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Background: Thyroid cancer incidence rates in the US have increased significantly compared to other types of cancer due to advancements in detection imaging. The screening process has been modified to account for this innovation. However, factors such as access to preventive care, socioeconomic status, insurance coverage, poor environmental conditions, and more may impact the incidence rates in specific patient populations.

Objectives: This research project aims to compare the trends in female and male thyroid cancer incidence rates in the United States by race/ethnicity and describe potential disparities over time.

Methods: We conducted a retrospective analysis utilizing population-based data from the National Cancer Institute's (NCI's) Surveillance, Epidemiology, and End Results (SEER) Program. We described age-adjusted incidence rates and recent trends for thyroid cancer using data from 22 SEER registries for cases diagnosed from 2000 to 2019. We included both men and women to have a more holistic comparison. Then, we utilized JoinPoint Trend Analysis Software version 4.9 to evaluate the annual percent change (APC) and to explore the trends in incidence rates by race/ethnicity [Hispanic (any race), Non-Hispanic White (NHW), Non-Hispanic Asian/Pacific Islander (NHAPI), Non-Hispanic American Indian/Alaska Native (NHAIAN), and Non-Hispanic Black (NHB)].

Results: Incidence rates of thyroid cancer among NHAIAN women have increased by 5.5% annually, 95% CI [4.3, 7.1] since 2000. Conversely, the incidence rates of thyroid cancer in NHAPI women have been steadily flat by 0.2% annually, 95% CI [0.2, -0.9] beginning in 2011. On the other hand, NHW and NHB women experienced decreasing thyroid cancer incidence (-3.3%, 95% CI [3.3, -4.5] and -5.6%, 95% CI [-8.4, -3.3], respectively) beginning in 2014. The trend in Hispanic women has been steadily flat since 2014; the APC is 0.4%, 95% CI [-1.9%, 1.5%]. Trends in the incidence of thyroid cancer in men mirror those seen in women of the same racial and ethnic groups, except for Hispanic men, which remains upward but is not statistically significant compared to the NHAIAN population. From 2000 to 2019, NHB men and women had the lowest incidence rates, while NHW men had the highest. NHW women have the highest incidence rates only until 2016. In 2017, the incidence rates in NHAPI and NHAIAN women surpassed the incidence rates in NHW women. The annual percent change (APC) is higher in women across races/ethnicities than in men. The trend initially rises in both sexes, then the rates drop or plateau. Even though the APC in Non-Hispanic American Indian/Alaska Native is not the highest, it is the only patient population whose incidence rates continue to increase significantly (2000 to 2019).

Conclusions: The trend is very similar in both sexes; thus, aside from biological factors, other variables may be at play. Based on SEER data and previous studies, the reason for the upward linear trend for Non-Hispanic Alaskan Native/American Indian remains unclear. However, it may be due to diet, tumor characteristics, geographic location, and socioeconomic inequities.

“You Can’t See Me” - Developing an Optical Measurement Tracking System for Minimally Invasive Spinal Surgical Drills.

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Background: Minimally invasive spinal surgeries are growing in usage due to less complications, reduced chance of infection, and shorter recovery times, but have a “steep” learning curve and frequently leave less experienced surgeons struggling with the necessary tools¹. In addition, older methods of minimally invasive surgery lead to increased exposure to radiation due to repeat CT scans to ensure screws, spacers, and other components are correctly placed¹. Recently, an uptake in the usage of digital tracking via optical measurement technology (OMT) has been employed to track the movement of surgical tools and estimate placement of surgical components with high levels of accuracy, which can reduce the exposure to radiation and help to reduce complications due to limited sight lines². While most OMT tools are used for screw and spacer placement, spinal drills and beveling tools have not undergone the same innovation. Spinal drills and beveling tools are used for spacer placement between vertebral discs, laminectomies, disk removal, fusion surgeries, and more³. The process of shaving the vertebral disc occurs within millimeters of the spinal cord and requires surgical experience to conduct properly, since experience and estimation make up the majority of the movement decisions⁴. In addition to the complications that can arise from this point in the surgery, inexperienced surgeons may also find it difficult to identify the differences between nerves, tissue types, vertebral bodies, discs, and arteries/vessels in the working space provided⁵.

Objective: Develop an optical tracking drill device, that also helps surgeons identify the anatomical components during the surgery to lower the learning curve experienced by less experienced surgeons and ensure fewer complications during minimally invasive spinal surgeries.

Methods: Our team utilized the Northern Digital Inc. (NDI) Polaris camera, alongside their optical trackers as the OMT system for the drill. Optical tracking branches were designed in SolidWorks 2021 and 3D printed via melted extrusion modeling to mount the optical trackers to the drill. The drill tracking software was created using Python (Version 3.10) which develops a matrix, providing highly accurate position data of the drill. A multi-thread Python system was enabled to streamline all sensors into one communication point, which then utilized Robot Operation System (ROS), creating “nodes”. This combination of multi-thread Python and ROS enabled one-way communication for position data between the tracking system and computer. Next, our team developed the visual feedback system by creating a program that would overlay computed tomography (CT) scans by using trackers placed on the individual during surgery. This system was created using Python (Version 3.10), and allowed the physician to “see” where they are currently drilling or shaving.

Results: Our team successfully developed an OMT system for surgical drills during spinal surgeries. Currently, our research continues to develop our visual feedback system for the surgeons while using the tracking device and will soon implement haptic feedback to give surgeons correct placement of the drill, as well as warnings when near the spinal column. Our team is also working on utilizing augmented

reality tools, such as the HoloLens from Microsoft or similar to provide microscopic imaging and tracking of the tool.

Conclusions: OMT devices for drills and other surgical tools are feasible for development and clinical implementation. OMT devices with haptic feedback and identification tools are also useful in training young surgeons before and during surgical procedures. Further research should be conducted in creating a way for physicians to have microscopic views required for minimally invasive surgery. OMT drill tracking must be pushed towards commercialization, while haptic feedback devices and image identification softwares should be further researched.

Cardiovascular Consequences of Radiation Therapy for Left-Sided Breast Cancer

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Background or Problem Statement: Breast cancer is the second most common cancer in women in the United States. With advances in radiation therapy and other treatments during the past decades, the mortality rate has declined significantly. However, in treatment of left-sided breast cancer, the heart is at risk of exposure to harmful radiation, which can cause damage and lead to conditions like heart disease and heart attacks. Using a technique called “deep inspiratory breath hold” (DIBH) helps to move the heart away from the breast to reduce the radiation exposure during treatment. However, some women are not able to use this technique due to physical or anatomical limitations, or due to the radiation method that is used in certain cases. Although radiation therapy has decreased mortality rates and allowed survivors to have a longer life expectancy, it is important to investigate cardiac side effects that may threaten the quality of life of survivors.

Objective: This study aims to determine whether left-sided breast cancer patients who received radiation treatment without the use of the deep inspiratory breath hold technique have a higher incidence of cardiovascular events in the years following their radiation treatment.

Methods: Retrospective data was collected concerning the therapeutic techniques used on left-sided breast cancer patients who received radiation treatment at ECU Health Cancer Tower between the years 2014 to 2022. Then, each patient was chart-reviewed to screen for cardiac conditions and events that arose since the radiation treatment. Information about specific cardiac risk factors was also collected.

Results: The primary outcome was the collection of cardiovascular related diseases and events that occurred after radiation treatment for left-sided breast cancer patients. We will be continuing the project and analyzing the outcome data in the upcoming semester. Results are still in progress.

2-aminoimidazole incorporated into acrylamide-based adhesive – Degree of Conversion and Biofilm Inhibition

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Objective: Cariogenic biofilms and esterase originated from bacteria or saliva are relevant factors linked with failure of tooth-colored, resin composite fillings. The former, releases lactic acid that demineralize tooth structures, and the latter breakdown the ester bond present in polymerized methacrylate-based resin composites. Collectively, they create new cavities at the margins of the filling, i.e., secondary caries (SC). The aims of this study were to 1) determine the degree of conversion, and 2) *S. mutans* biofilm inhibition of an experimental acrylamide-based universal dental adhesive containing 2-aminoimidazole compound (2-AI-H10) and a commercial dental adhesive containing chlorhexidine.

Method: Experimental Design: the acrylamide-based universal dental *adhesive system* was comprised of HEAA, 10-MDP, BisGMA, UDMA, CQ, Ethanol and water. Monomers were added to separated amber flasks in order of most viscous to least viscous and stirred overnight. CQ was added followed by photo inhibitor, BHT, 4-methoxyphenol and stored into separated black plastic bottles at 4 °C. Such formulation was used to prepare the acrylamide-based universal containing no 2-AI/H10 (control group) and the experimental groups containing 2-AI-H10 at 2%wt and 6%wt. The degree of conversion was performed on unpolymerized (UN) and polymerized (P) materials using an ATR-FTIR instrument. For UN, 10µL were placed on a diamond ATR-crystal and absorbance spectra collected at 16 scans/1 cm⁻¹ resolution. For P, the same amount was placed on a glass slide, light cured (14 J/cm²) and spectra proceeded as with UN. The peak areas of methacrylamide and methacrylate C=C stretching at 1637 cm⁻¹ and aromatic reference peak area of Bis-GMA at 1608 cm⁻¹ of uncured and cured adhesives were used to calculate the DC% (n=5) using the adjacent formula. *S. mutans* cell biofilm test was used to evaluate bacteria inhibition. Resin disks (N=3) of each material were prepared (1 mm height and 9 mm diameter), polymerized, and sterilized under UV light (8h) under a hood. Next, 1x10⁵ bacterial *S. mutans* U159 were used with Tryptic Soy Broth for 24 h to grow early biofilm for 24h and 5 days. The disks were gently washed with PBS and a Live/Dead backlight kit was used to assess the biofilm viability using a Fluorescence microscope (Keyence Z1000, 20x). Live/Dead cell were counted using image cytometer and hybrid cell count.

Results: The degree of conversion were as follow: Peak SE (commercial) 87%, H10-acrylamide control 47%, H10-acrylamide 2% 51%, and H10-acrylamide 6% 54%. The *S. mutans* Live/Dead demonstrated that the universal adhesive containing 2-AI-H-10 compound, regardless of the concentration, diminished live cell count.

Conclusion: It can be concluded that adding 2-AI/H-10 compound to acrylamide-based universal dental adhesive slightly increased the DC regardless of the concentration used, and that more live *S. mutans* cells present in the control acrylamide-based material.