



August 2021

24TH ANNUAL
MEDICAL STUDENT
SCHOLARSHIP FORUM
Abstract Book

Acknowledgments

The Brody School of Medicine Summer Scholars Research and Distinction Track Programs would like to express sincere gratitude to the following individuals and participating faculty of the following departments for their support of the 2021 Program. Those listed provided financial support for student stipends, research resources, and/or administrative support for the 2021 Summer Immersion and Medical Student Scholarship Forum. These generous contributions make it possible for BSOM students to learn and make their own contributions to the field of medicine through scholarly pursuits.

Rosemary B. Allen Summer Scholars Research Fund

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Nitin Gupta Research Endowment

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Health System Transformation & Leadership Distinction Track

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

Analyzing the Implementation of Routine Opt-Out HIV Testing in VMC ED

Authors: Titilola Babatunde, LINC Scholar; Dr. Timothy Reeder, MD

Affiliations: Vidant Medical Center - Department of Emergency Medicine

Care Setting: Vidant Medical Center, Emergency Department

Aim Statement: To improve routine, opt-out HIV Screening in all three of the Vidant Medical Center Emergency Departments (Adult, Children's (CED), Minor (MED)) for people age 18-64 who will have blood work done in the ED and have not had an HIV test documented in the electronic medical record (EMR) in the past year by 20% within 4 months. To successfully link all HIV-positive patients to HIV care at the ECU-HIV Program and other HIV clinics in the region.

Details and Interventions: Currently, in the US almost half of all new HIV infections are found in the Southern United States. Specifically, Pitt County has some of the highest rates in North Carolina, but in 2015 VMC had only performed 121 HIV tests in their ED. In light of this data, a quality improvement project began to create an opt-out routine HIV screening for those receiving bloodwork in the Emergency Department. This was especially important since the ED may be many uninsured patients' only point of contact. The project included an EMR algorithm created to alert the care team when bloodwork was ordered and a full-time linkage coordinator to refer and follow up with positive HIV patients.

Strengths: The project was able to successfully diagnose 22 HIV cases and were further able to link 21 of the new patients to care in the HIV Specialty Clinic. Hiring of a linkage coordinator helped to ensure follow up of positive patients. Though rates fell over the course of the intervention, even at the lowest, testing rates were still above 20% of the original testing rate.

Opportunities: There was a lack of shared mental model from all members of the health care teams and the language surrounding "opt-out" testing was not fully explained to patients, leading to a decrease in the number of eligible patients being screened for HIV. EMR changes should be implemented that lead to a "hard stop" which would decrease "defer" rates.

Recommendations: Investing in a nurse champion and notifying nurses of the percentage of eligible patients they were screening could overall help change the atmosphere around testing. Along with that, posting the overall trend of number of tests performed may bring awareness to the dipping rates, and incentivize more tests being done.

Evaluation and Recommendation of “Optimization of Glycemic Control in ECU APHC Clinic Patients with HBA1C >9.0%”

Authors: Nolan Davis

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

Body of QI Project Critique: The purpose of this Quality Improvement project was to improve glycemic control in patients with diabetes at ECU APHC. Improved glycemic control in these patients can help to reduce the likelihood of diabetes-related complications. Patients at this clinic often have Social Determinants of Health (SDOH) that can negatively impact their ability to achieve a HgBA1C under 9.0%. If physicians are more acutely aware of social factors that influence patient health, they are more likely to provide resources to assist patients in overcoming these obstacles. This project involved a multidisciplinary team (physicians, nurses, and clinic administration). This diversity in team membership was positive as it provided perspectives from various aspects of patient care. The utilization of a Diabetes Nurse Specialist was a strong example of utilizing resources already present to improve quality care. This is also an indicator that this project can be a sustainable project in the future. In a clinic where resident physicians are joining and leaving, this specialist can serve as a stable contact point for improving glycemic control efforts among patients.

Care Setting: The Adult and Pediatric Healthcare Clinic at ECU serves a large number of patients including those from underserved areas. Many patients face barriers (affording medications, transportation issues, etc.) to care that negatively impact their glycemic control.

Aim Statement: This project’s Aim Statement was “By April 30th, 2021, 60% of the study cohort population of 25 adult APHC patients with HgBA1C >9.0% on or before September 01, 2020 will have an HgBA1C <9.0%”

Details and Interventions: Patients with uncontrolled diabetes (HgBA1C > 9.0%) were identified by APHC team. An elevated HgBA1C is associated with poor health outcomes and increased diabetes-related complications. A survey was sent to all providers that had upcoming appointments with these identified patients. This survey was administered to these patients and provided a more detailed account of social factors that could be preventing adequate glycemic control. The scheduling team at APHC was then tasked with contacting and scheduling follow-up appointments for patients with concerning qualifications. Patients with known exceptional circumstances were specifically targeted by APHC’s Diabetes Nurse Specialist. With increased knowledge of Social Determinants of Health that patients at APHC face, physicians and other health professionals can work to adequately address patient needs.

Strengths: This project involved a collaborative team of resident physicians, interns, an attending physician, nurses, and a medical assistant. This project emphasized using QI to address Social Determinants of Health that are negatively impacting glycemic control. 57.7% of patients involved had a reduction in HgBA1C to below 9.0%. This project had a clear aim statement with specific goals and a clear timeframe for implementation.

Opportunities: An opportunity for the future could be the inclusion of other health metrics that are important in the care of diabetic patients. Blood pressure control in patients with hypertension and foot screening in patients with possible neuropathy could be incorporated in this project. The team could decide to track patient health experience over multiple years to examine how reduction in HgBA1C leads to a decrease in diabetes related complications.

Recommendations: The team could incorporate behavioral health professionals into this project to improve outcomes. The team could expand the project to include patients with HgBA1C below 9.0% but have co-morbidities. ECU APHC could help address barriers to exercise by incorporating increased physical exercise counseling into patient appointments.

Quality Improvement Review: Individualized fluid management in extremely preterm neonates to ensure adequate diuresis without increasing complications

Authors: Nupur Jain, Medical Student Class of 2024

Affiliations: Division of Neonatology and Newborn Medicine, LINC Scholars Program, Brody School of Medicine

Care Setting: Fifty-bed NICU at Vidant Medical Center (East Carolina University) in Greenville, NC

Aim Statement: To decrease incidence of inadequate postnatal diuresis (loss of <6% birth weight) during first week of life in infants less than 28 weeks' gestation by 50% over 1 year. The incidence of inadequate postnatal diuresis was 43%, compared to 3-8% in other units.

Details and Interventions: Multimember team (nurse, medical student, fellow, nurse practitioner, attending, resident) was formed to amend the protocol in place to manage inadequate diuresis in neonates. A fluid management sheet was created for easy access and decision making. Provider education, closer monitoring of hydration status, and delaying the addition of sodium to fluids were also parts of the intervention.

Strengths: Inadequate diuresis decreased to 29% over 1 year, and a major strength noted was generalizability to all neonates. Starting neonatal fluid volume and maximum daily fluid volume decreased by statistically significant margins. The intervention underwent six PDSA cycles which continually improved the tool.

Opportunities: While inadequate diuresis decreased, the team did not achieve their goal of 50% reduction. There may be opportunities to better integrate the fluid management tool into the EMR. Nightly nurse lead rounds were started following the publication of the paper to manage and monitor fluids and measuring the progress of this intervention is important. There is also a further potential to reduce sodium content in IV medication and blood products. Lastly, the fluid management sheet can be used as a teaching tool for members of the care team.

Recommendations:

1. Collect and present qualitative survey data from care providers using the new fluid management sheet
2. Perform and present root cause analyses to determine if there are more areas for intervention
3. Continue to implement educational trainings for care providers and measure inadequate diuresis rates over the course of 2 years, as 1 year may not have been enough time to change "unit" culture in the neonatology department.
4. Evaluate the impact of nightly nurse lead rounds for impact on inadequate diuresis levels

QI Critique of the Mental Health Screening Program for Adolescents with Chronic Medical Conditions at the ECU Physicians Pediatric Specialty Clinic

Author: Ananya Koripella

Affiliations: LINC Scholars Program, Brody School of Medicine

Care Setting: This project was implemented in the endocrinology, gastroenterology, pulmonary, nephrology and infectious disease sections of the Pediatric Specialty Care Clinic (PSC). The Clinical Informatics Team and Crystal Garman, one of Vidant's licensed clinical social workers also played a vital role in this project.

Aim Statement: Through a critique of the quality improvement project, we aim to identify strengths and areas of opportunities to remove barriers to standardizing an efficient screening protocol for depression and anxiety in all sections of multispecialty clinics and ensure its adaptability to both in-person and virtual settings

Details and Interventions: Research indicates that patients with chronic medical conditions are predisposed to depression and anxiety, which result in poorer health outcomes. Through the implementation of the screening program, patients with depression and anxiety at PSC can be properly identified and referred for mental health support. Steps included:

1. Protocol developed to administer and document PHQ-9 and GAD-7 screening tests.
2. Reports generated by the Clinical Informatics Team to gather data regarding screenings in 2019.
3. Protocol and 2019 baseline data presented to the sections in the clinic that care for adolescents aged 12-21 with diabetes, inflammatory bowel disease, cystic fibrosis, kidney transplants or HIV/AIDS.
4. Roll-out of the screening protocol.

Strengths: The standardized protocol led to an increase in the annual screening rate from 2% to 47%. With the implementation of PDSA cycles, the team was able to re-evaluate the protocol and its measures after every quarter. Process changes that were then made, included simplifying the number of steps and personnel involved, allowing for a more sustainable protocol with a closed circle of communication.

Opportunities: While this project improved the screening rate for the entire clinic, each section of the clinic was met with different barriers. This led to difficulty in following one standardized protocol for the whole clinic and resulted in miscommunications. With the shift to telehealth, screenings also decreased in number.

Recommendations: Focus on one section of the clinic at a time, allowing for more accurate process measures. Modify screening tests to be administered in different clinical settings. Include an outcome measure to evaluate how screenings are improving the health of patients.

Quality Improvement Project Analysis: Individualized fluid management in extremely preterm neonates to ensure adequate diuresis without increasing complications

Authors: Serena Mooney,¹ Uduak Akpan, MD²

Affiliations: ¹Brody School of Medicine, East Carolina University; ²Division of Neonatology, Department of Pediatrics, Brody School of Medicine, East Carolina University

Care Setting: The Vidant Medical Center Neonatal Intensive Care Unit (VMC NICU), a level IV, 50-bed unit that admits ~850 neonates yearly, including 100 extremely low birth weight infants.

Aim Statement: Decrease the incidence of inadequate diuresis (weight loss of <6% of birth weight) in extremely preterm neonates (EPT, <28 weeks of gestation at birth) during the first week of life by 50% in 1 year.

Details and Interventions: The VMC NICU had a 43% incidence of inadequate postnatal diuresis in EPT infants compared to 3–8% reported in other units. A multidisciplinary team comprised of a medical student, neonatology fellow, nurse practitioner, nurse, resident, and an attending neonatologist was formed to decrease this percentage and decrease the associated morbidities. The intervention focused on individualizing a lower starting fluid volume, educating providers about the new practices, and having the providers complete a fluid guide sheet to monitor fluid and weight changes. When adjusting fluid volumes, dehydration and hyponatremia could be unintended consequences, thus these were the balancing measures. Six PDSA cycles were completed to improve the intervention.

Strengths: One of the major strengths is the individualization of fluid management. The previous Golden Hour protocol required all fluid to be started at 120ml and fluid adjustments were in 20ml/kg increments. This QI project directed providers to start at a lower volume and adjust fluid volume by different increments (5ml/kg, 10ml/kg vs. 20ml/kg). It also encouraged providers to decrease fluids if needed, whereas previously, fluid volume was only adjusted upwards.

Opportunities: Although the project did not achieve the goal of reduction by 50%, a decreased of 32% was noted (29% from 43%) over 12 months. One of the anticipated barriers was buy-in by providers in the NICU unit. A longer timeline may be necessary to change the unit culture. Moreover, providers were not diligent in completing the fluid guide sheet; however, data was discussed on morning rounds. Having this sheet integrated into the EHR may make recording data easier. Another barrier was controlling all sources of fluid and sodium, especially in critically ill infants requiring a central line. Being more cognizant of extra fluids such as flushes and antibiotics as well as strictly controlling or eliminating extra sources of sodium could reduce fluid retention.

Recommendations:

1. Continue provider education as 12 months may not have been long enough to shift unit culture.
2. Conduct root cause analysis to determine why fluid guide sheets were not being completed.
3. Create a method using Lean/Six Sigma to track extra sources of fluids, especially for infants requiring a central line.

Decrease in appropriate IV antihypertensive use for severe asymptomatic hypertension in hospitalized non-ICU patients

Authors: Pranaya Pakala; Greeshma Sheri, MD,¹ Stephen Jurko MD, Felix Afriye MD

Affiliations: General Internal Medicine Department, Vidant Medical Center; Brody School of Medicine

Care Setting: Asymptomatic severe hypertension is a highly prevalent problem (up to 70%) in inpatient setting and these readings might not be a true reflection of ambulatory blood pressures. Generally, there is no indication for immediate intervention with IV antihypertensives (IV labetalol, IV hydrazine, IV enalapril) to bring down BP rapidly and this practice could cause harm however it is not uncommon to see IV antihypertensives ordered without indication. Sequential Interventions are being proposed with an aim to understand why providers do this and to educate providers regarding appropriate and inappropriate use of IV antihypertensives. Current interventions are planned for patients treated on 2 south internal medicine department in Vidant Medical Center.

Aim Statement: “Reduce inappropriate IV antihypertensive use (IV labetalol, IV hydrazine, IV enalapril) by 30% in 3 months in patients admitted to 2 south internal medicine teams.”

Details and Interventions: Therefore, the team took to minimize inappropriate IV antihypertensive use and educated hospital staff through four different steps. First, a survey was conducted amongst residents to understand why they believe this type of intervention is necessary. Supervisor expectation, nursing expectation and gap in medical knowledge were identified as key actors according to survey. Next, a series of lectures on appropriate assessment and management HTN urgency, adverse effects of rapid reduction of BP were conducted for two consecutive years. Finally, posters with Flowchart guiding management inpatient HTN was placed in rounding areas and email communication was sent to all faculty regarding the flow chart. The future step is to also educate nursing staff through posters.

Strengths: This project not only identified the unnecessary interventions that can take place in the hospital setting, but also hoped to avoid complications that arise. The interventions are detailed in how to approach hypertension and set to prepare the staff.

Opportunities: There are opportunities to avoid complications that arise from unnecessary IV antihypertensive intervention such as CVA, hypotension, falls, or increased LOS.

Recommendations: The only recommendations to give are to continue the preventative measures education, address medical professionals in training, and to develop and mandatory course that forces the staff to prove they understand these measures.

Novel Bed Allocation Protocols Decrease ED to ICU Transfer Times

Authors: Ryan Patton,² Jennifer Stahl, MD¹, and Christel Molnar²

Affiliations: ¹Department of Emergency Medicine and ²Leaders in Innovative Care, Brody School of Medicine

Care Setting: Patient throughput in the Emergency Department (ED) is made difficult by unavailable inpatient beds, causing delayed patient transfers in an often-chaotic environment. Delayed transfers of critically ill patients from the ED to Intensive Care Unit (ICU) are associated with increased hospital length of stay, morbidity, and mortality. ICU bed availability is unpredictable, but institutional, systemic, and structural factors present opportunities for improvement.

Aim Statement: The aim of this project was to decrease the time from admission orders to patient occupancy of an ICU bed to ≤ 30 minutes for patients admitted from the ED over a 4-month period of time.

Details and Interventions: A bed allocation protocol was developed that would allow more efficient assignment to the Medical Intensive Care Unit (MICU). Previously, the ED team was responsible for placing a “Bed Request” order upon acceptance of a critically ill patient to the ICU. This responsibility of placing the “Admission to Inpatient Order” was given to the MICU team to allow immediate initiation of bed allocation.

A secondary protocol was implemented to allocate the first two available step-down unit beds to stable MICU patients with transfer orders. These beds were assigned at 7 AM and 7 PM to ensure their availability for day shift and night shift admissions.

Strengths: Recording times at each step in the transfer process allowed the team to identify time lost to cleaning beds as a potential source of waste. The project was also completed by a diverse team from multiple disciplines, offering ample opportunity to defer to expertise.

Opportunities: Since the team noted waste during the transfer process, the project could benefit from use of Lean and Six Sigma principles, such as a cause-and-effect (fishbone) diagram and direct observation studies to both identify instances of waste and observe the greatest contributors to transfer delays.

Recommendations: To further decrease transfer times, the team should conduct a process flow map and fishbone diagram to identify all opportunities for waste. Then, observe moments of suspected waste and record delay times to begin focusing on the next intervention. The study should also be continued to increase population size for a more robust data set.

Improving Care of Patients Through Use of a Diabetes Registry

Author: Dan Ta

Affiliation: Brody School of Medicine

Care Setting: Despite advancements in the treatment and prevention of diabetes, care gaps have been identified at various levels of health systems. At the ECU Family Medicine Center (FMC), a disease registry was created using electronic health record (EHR) data to organize patients and then track metrics in order to identify deficiencies in care and schedule appropriate follow-up treatment.

Aim Statement: Improve the number of Accountable Care Organization (ACO) patients with diabetes at ECU FMC who have not had A1c done in the measurement year 2016 by 85% by August 31st, 2017 using a diabetes registry.

Details and Interventions: A Plan-Do-Study-Act (PDSA) cycle was implemented which included 14 clinic patients only on Purple module of FMC who had not had A1c measured the previous year. Patients were contacted to schedule an appointment, during which A1c measurements were taken. An additional PDSA cycle was conducted involving the remaining 67 patients on the rest of the modules of FMC. At the end of this cycle, the number of ACO diabetes patients at ECU FMC who had not had A1c measured in the previous year was reduced by 88%.

Strengths: A fishbone diagram was created in order to identify possible causes of gaps in diabetes management. This allowed providers to pinpoint areas for improvement and led to the creation of a diabetes registry. A process map was developed to outline how potential patients could schedule an appointment and complete A1c measurements. This was particularly useful in addressing possible barriers for patient follow-up.

Opportunities: The success of using a diabetes registry illustrates the potential benefit for creation of registries pertaining to other chronic conditions in order to identify potential gaps in care. By periodically updating information in EHR, health systems can better identify potential patients who are not receiving adequate care or lacking in management of disease.

Recommendations: In order to ensure that patient data remains accurate, registry data should be checked and updated on a regular basis such as monthly or annually. In addition, a protocol may be implemented when adding new patients to the EHR so that the registry is updated every time a potential patient is added to the electronic health record system.

Sea of Safety Program Critique

Authors: Kevin Travia, MS2 and John Kohler, MD, MBA, FAAP

Affiliations: Brody School of Medicine and Division of Neonatology and Newborn Medicine

Care Setting: Maynard Children's Hospital at Vidant Medical Center

Aim Statement: To critique the effectiveness of a quality improvement project aimed at decreasing hospital acquired conditions (HAC) to zero events per month in Maynard Children's Hospital (MCH) patients within 6 months of project start in April 2018 by engaging multidisciplinary partners at all levels to change safety culture.

Details and Interventions: The 2019 Vidant Health Board Quality Leadership Award was given to the MCH for their Sea of Safety program initiative. This project was designed to reinforce the importance of patient and staff safety for MCH. A multi-disciplinary team were involved in making this program successful at reducing HACs compared with before program start.

Strengths: Intentionality around engaging a multi-disciplinary team, patients, and their families in changing the safety culture at MCH was highly effective as team members believed in the goal of the program and wanted to work together to achieve it. The Sea of Safety program flowed well with the existing nautical theme around the MCH and lead to a seamless transition recognizable by the various "You're Entering the Sea of Safety" signs around the building. Friendly competition was created using special starfish scrub pins that were awarded based on improving safety outcomes. This quality improvement initiative is ongoing and currently being monitored by a quality improvement team, shedding light on the positive impact of this sustainable program. This intervention successfully reduced HACs compared with before it started.

Opportunities: This "shotgun" approach to quality improvement, although expansive, is difficult to replicate due to the lack of methodically planned out steps. Granular level changes that impacted (or did not impact) patient safety outcomes are difficult to identify and reproduce. Additionally, smaller changes driven by data points observed from each unit may have resulted in better outcomes and reproducibility.

Recommendations: For future programs, a methodical and data-driven take on improving safety at a Children's Hospital is recommended as this may be more reproducible. A similar program may benefit from inter- and intra-unit competitions to increase buy in as seen in Sea of Safety. Integrating a similar program into existing hospital infrastructure (i.e., nautical theme) may improve program effectiveness.

Implementing Quality Improvement in the Med-Peds Resident Continuity Clinic

Author: Rishita Yeduri

Affiliation: Brody School of Medicine

Care Setting: This project was primarily set in ECU Physicians Adult & Pediatric Care Clinic where resident continuity clinic was held 4 afternoons a week. There were four different teams, each consisting of residents, 1-2 faculty members, and 1 CNA. By May 31, 2017, all Med-Peds residents will have completed one QI project in resident continuity clinic that addresses a Quality Metric outlined by the Brody SOM Enterprise Quality Committee.

Details and Interventions: Each of the four teams selected from the following projects:

1. Depression screening and follow up
2. Breast cancer screening
3. Colon cancer screening
4. Completion of diabetic foot exam

Several educational sessions were held during weekly pre-clinic conferences to provide appropriate resources. The residents completed IHI Open school modules and PDSA worksheets. All providers were informed on documentation of PHQ-9. MyChart was used to communicate with patients who were not in the clinic. Upon completion of this year-long project, the team tracked if the implemented changes led to improvement. Pre and post surveys of reported knowledge, skills, and confidence in QI were conducted on the residents. ACGME survey results in areas of scholarly activity, QI participation, and provision of practice habits data were also analyzed. Finally, improved scores on meaningful use reports generated by ECU were analyzed.

Strengths: The strengths of this project could transcend into other QI projects. For example, every team started on a small scale and expanded those changes clinic-wide. The teams utilized nursing assistants during triage to address health maintenance items, added tangible tools to patient exam rooms, and put informational posters about screenings in the clinic. All these interventions improved the efficiency the projects.

Opportunities: Initially there wasn't nursing leadership support which led to Nurse Assistant Scheduling issues. Some areas of improvement include increasing attendance of residents at the team meetings and completing IHI QI modules per timeline.

Recommendations: These are recommendations for future projects:

- Utilize nursing leadership to promote QI projects and continue expanding on nursing staff participation
- Have a more specific aim statement that focuses on one or two projects
- Have a well-structured flipped classroom approach so everyone is informed even if they miss team meetings

Medical Education & Teaching Distinction Track

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

The Integration of Video Conferencing Telemedicine in Primary Care Clinical Rotations at the Brody School of Medicine

Author: Noor Baloch

Affiliation: The Brody School of Medicine

Abstract: The aim of this study is to introduce video conferencing in primary care clinical rotations and investigate student confidence in technology use and competency. Geographic barriers to timely health care in eastern North Carolina have a significant impact on the utilization of health care in patients located in these rural regions. The use of tele-medicine has increased access to healthcare for these populations. With the COVID-19 pandemic, many medical schools were forced to incorporate virtual clinical experience. During this time, other medical schools were able to incorporate such technology in their clinical education with success.

The integration will begin with an orientation on video telemedicine and electronic health records (EHR) for students. Next, the students will participate in videoconferencing with primary care practices already using tele-health in Eastern North Carolina. This clinic will take place 3 days a week for two weeks during the four-week primary care rotation. Students will evaluate their confidence in using the video technology, communicating with patients, and working with their preceptors through a survey. Providers will also evaluate the student's use of technology and communication during the rotation. Potential limitations include the use of different EHR software, internet connection problems, and privacy concerns for patients. The changing tides in medical care to incorporate technology seem to be lacking when training student doctors. Incorporating telemedicine to medical rotations is essential in training better doctors for tomorrow.

Narrative Engagement and Information Retention in the Medical Student Population

Author: Morgan Beamon

Affiliation: Brody School of Medicine, East Carolina University

Abstract: There is emerging evidence that engagement with medical humanities promotes the development or enhancement of empathy in medical students. There is also a known correlation between experience of emotion and retention of factual memory if the two are connected in some way. I would like to explore the connection between medical humanities and 1) development of empathy and 2) retention of information in medical students. To this end, I am going to host a quarterly film event: I am going to openly invite the medical student body to watch a film related to a disease that either M2s in block 4 or M3s in block 3 have just learned about. There will be no explicit reinforcement of medical basic science material during this session, but I hypothesize that the engagement with art will enhance the recall of this information for the students present. A brief discussion will be held after the film. Following a 30-day washout period, the entire student body will be surveyed on 1) their current class year 2) whether or not they attended the showing and 3) questions about the disease at hand. A combination of multiple-choice recall questions and short answer reflection questions will be presented in this survey. The recall data collected will then be compared against cohorts: class years (with the expectation that M1s will have the lowest scores and M2s will have the highest with 3 and 4 in the middle) and attend vs not-attend (with the expectation that the mean recall score will be higher in the attend cohort). This project should help demonstrate the basic utility of medical humanities experiences and provide engaging discussion against the more common medical student grievances.

Standardization of Undergraduate Point-of-Care Ultrasound (POCUS) Curricula

Authors: Alex Doherty, MS2¹; Kimberly Fender, MD^{1,2}

Affiliations: ¹Brody School of Medicine, ²Department of Emergency Medicine

Need/Rationale: Point-of-care ultrasound (POCUS) education is becoming integrated into multiple undergraduate medical curricula across the country as its clinical use grows (Davis et al., 2018). However, there is no standardization of Undergraduate Medical Education (UME) POCUS curricula in addition to no requirements for POCUS education in the core expectations of graduating medical students entering residency (Sena et al., 2020).

Idea: By evaluating the expectations of POCUS use for graduating medical students by Residency Directors, we aim to create a set of standardized core competencies in POCUS according to specialty.

Methods: A survey will be sent out to all Residency Directors of accredited institutions across the United States in six specialties (Surgery, Family Medicine, Internal Medicine, Pediatrics, Obstetrics and Gynecology, and Emergency Medicine) to determine what POCUS skills and knowledge are expected by their specialty for graduating medical students. This information will be turned into a set of specialty-specific skills and competencies that fourth-year medical students should be able to achieve by the time they graduate. The chosen objectives will be based on common themes and expectations among the various residency programs.

Evaluation Plan: The next stage of this study will implement a Community of Practice model pilot program with fourth-year medical students to assess these core competencies with various ultrasound trained faculty from each specialty. Afterwards, an evaluation will be sent out to students to assess their perception of the utility of the sessions and their knowledge of POCUS skills, technique, and image interpretation.

Potential Impact: This study will attempt to develop and evaluate the first standardized set of POCUS skills and competencies by specialty for medical schools to adopt and integrate into their UME curriculum.

eENC: Telemedicine & M2 Doctoring at Brody SOM

Authors: W. Connor Haycox, MS2; David Gilbert, MD

Affiliations: Brody School of Medicine at East Carolina University, Department of Family Medicine

Idea: Telemedicine, defined as the use of telecommunications technology by physicians to deliver care remotely to patients, has become an increasingly important form of healthcare provision with the popular adoption of smartphones and computers equipped with video-conferencing tools. With the advent of the COVID-19 pandemic and ensuing disease-prevention and social-distancing protocols, telemedicine has assumed an even greater relevance in contemporary healthcare and medical education as providers, students, and patients can utilize its convenient and cost-efficient technology without risking infection.

Need/Rationale: Despite the ever-apparent utility of telemedicine to current and future directions of medical practice, many American medical schools have not yet developed substantive curricula to train undergraduate medical students on the effective use of telemedicine and, even if they do, such courses are usually limited to the clinical years. Introducing telemedical curricula in the preclinical years thus has the potential to enhance medical students' comfort and competence with interacting with patients virtually and to ultimately optimize students' learning on clinical rotations.

Methods: This multiphase-iterative, mixed-methods study proposes the introduction of didactic and practical modules into second-year Foundations of Doctoring courses at the Brody School of Medicine that will familiarize preclinical medical students with the techniques and significance of telemedicine. Modules may include lectures from faculty experienced in telemedicine, asynchronous online tutorials, standardized patient interviews, and objective structured clinical examinations (OSCEs).

Evaluation Plan: Students' perceptions of the curriculum will be assessed using pre- and post-module surveys, and qualitative interview data will be collected from randomly sampled participants. Clinical students who participated in the curriculum will be asked to assess their confidence and comfort in telemedical patient encounters during their clerkship rotations to provide data on the long-term impacts of the curriculum.

Potential Impact: This study aims to contribute to the limited yet growing scholarship on telemedical education and, more importantly, will indirectly benefit the patient population of eastern North Carolina as Brody students learn to deliver cutting-edge care more effectively to rural and medically underserved communities.

Impact of Pediatric Palliative Care Teaching Modules on Student Confidence and Competency with End-Of-Life Discussions

Authors: Ashish Khanchandani, MS, Dr. Dmitry Tumin, PhD, Dr. Leslie Peedin, MD

Affiliations: The Brody School of Medicine at East Carolina University

Idea: The purpose of this study is to evaluate the idea that exposure to palliative care education in pediatric populations in medical school can augment students' perceived sense of competency and self-efficacy with initiating and conversing with patients and colleagues about palliative care.

Rationale: The goal of Palliative Care is to improve the quality of life for children who are facing a poor prognosis. A palliative care team can be consulted when a provider wants to improve a patient's quality of life alongside a rigorous treatment plan. Logistical components such as a lack of resources or providers can dictate a patient's access to palliative care. However, access to palliative care can also be dictated by the physician's competency and comfort with initiating and having Palliative Care conversations with patients. Additionally, studies have explored the fact that residents feel they had not received adequate exposure to palliative care and thus were not prepared to have end-of-life conversations with patients.

Methods: The target participants for this study will be medical students in their third-year clinical rotation in pediatrics. When a student begins their clerkship, they will be notified by research coordinators (students) or the clerkship director that they can take a module to learn more about palliative care in pediatrics populations. Participating students will receive a pre-survey which will consist of knowledge questions regarding palliative care in pediatrics and subjective questions regarding participants' self-efficacy and comfort with palliative care in pediatrics populations. After taking the pre-survey, participants will complete the module. This module will be developed prior to data collection and will be delivered asynchronously. The goals of this module are for students to gain an overview of palliative care core principles and learn methods to converse with a patient regarding palliative care options. Upon completion of the module, participants will take a subsequent knowledge assessment and post-survey. The control group will consist of participants who take the pre- and post-surveys without completing the module. All participants will be selected on a voluntary basis from the cohort of individuals enrolled in the clerkship and will be randomly assigned to the experimental or control group.

Evaluation Plan: The change in percent correct for the knowledge questions will be analyzed to determine the overall change before and after the module. Some survey questions are based on 1-5 ratings and these numeric values can also be compared before and after the module to deduce any significant changes. Additional qualitative questions will be asked in an "agree" or "disagree" format. These will be displayed using graphical means to highlight any meaningful results.

Potential Impact: The potential impact of this study is the increase in competency and comfort with palliative care conversations in pediatric populations. These results will translate to clinical situations when students and residents are tasked with having end-of-life conversations with patients.

Ultrasound-Guided vs Blind Lumbar Puncture in the EM Clerkship

Authors: Divya Srinivas¹, Jennifer M. Bennett M.D.², Melanie Rodriguez-Carrion, M.D.², Allison W. Schiller D.O.²

Affiliations: Brody School of Medicine at East Carolina University, Department of Emergency Medicine

Abstract: Over three hundred thousand lumbar punctures total were performed across the United States in one year. This common procedure is performed throughout the hospital as a diagnostic tool to determine cerebral spinal fluid pressure and the presence of infective agents. However, injuries such as nerve palsy, herniation, hematoma, and hemorrhage can occur due to improper procedural technique. Adverse effects can be exacerbated if a medical student is not competent or confident in performing lumbar punctures. A study by Coberly and Goldenhar (2007), states that a majority of surveyed fourth-year medical students did not feel competent or confident in performing a lumbar puncture. Medical students are taught to find the needle insertion site by palpation (blind method); however, student confidence and mastery of the skill will be improved by learning the procedure through ultrasound guidance. As ultrasounds are gaining popularity, they can replace the need for fluoroscopy during a lumbar puncture, by providing visualization of spinal landmarks for the student.

This study will take place during the Emergency Medicine clerkship at the Brody School of Medicine. Six cohorts of eight-to-ten fourth-year medical students will be taught to perform lumbar punctures by traditional palpation, while another six cohorts will learn ultrasound-guided lumbar punctures. Students will complete an anonymous survey to rate their confidence in performing lumbar punctures independently. Clinical professors will then assess each student on their ability to perform a lumbar puncture based on the method the student was taught. Data of students who learned to perform lumbar punctures using traditional palpation will then be compared with data of students who learned ultrasound-guided lumbar punctures. If students have increased confidence and mastery when performing ultrasound-guided lumbar punctures, medical schools can adapt their curriculums to incorporate ultrasonography.

The Implementation and Evaluation of a Surgical Skills Program for Preclinical and Clinical Students at the Brody School of Medicine.

Authors: Virginia Vasquez-Rios, B.S.,¹ Anastasios Mitsakos, M.D.,² Dmitry Tumin, PhD³

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Idea: This study is intended to establish and evaluate a surgical skills program for students interested in surgery at the Brody School of Medicine. The Surgical Skills Program (SSP) at Brody was developed based on the need for a centralized entity that delivers education of surgical skills to preclinical and clinical students.

Rationale: Prior research supports the necessity for such a program due to variation in resident skills and in skill implementation accuracy during their first year of surgical residency. Third year surgical skill boot camps also have no data showing that participation translates to improved residency performance, nor benefit to knot tying or suturing skills.

Potential Impact: We hypothesize that student participants in the SSP will have higher performance in the skills taught, be better prepared to implement these skills during their first year of residency, and have less variation in skills as a cohort, than those who do not participate in the program.

Methods: The program will initially enroll fifteen students, randomly selected from a survey which assesses their interest in a surgical specialty. The program will include clinician led labs paired with asynchronous self-study videos. Video materials will be specifically made for the program by the department of general surgery at the Brody.

Evaluation Plan: Each student will have two minutes to perform the skill, where they will be video recorded and graded via a 5-point Likert scale and outlined grading metrics (instrument handling, tissue handling, time, accuracy, and knot strength). Additionally, physician assessors will provide commentary and feedback which will be sent back to the student. Skills assessed during the first six months will include 2-hand knot tying, simple interrupted suture, and horizontal mattress suture. Individual student improvement will be assessed every six months as quantitative data to examine the program's effects on student performance improvement. Sign-rank test will be utilized to evaluate the association of the program with individual progress for each skill. Interrater reliability measure along with interclass correlation coefficients (ICC) will be utilized to measure the reliability of physician assessors. IBM SPSS 24.0 will be used for all statistical analysis.

Service-Learning Distinction Track

Program Director: Jennifer Crotty, MD

Providing educational and mentoring opportunities to underrepresented teens to combat preventable social determinants of health

Authors: Al-Amin Aminu, Mr. Kelly Atlas, Dr. Jennifer Crotty

What? Building Hope is a faith-based non-profit youth and family development organization founded in 2001 with a desire to serve the children and families of our community. Building Hope has served over 1,500 youth and their families by providing academic support, spiritual formation, character and leadership development, service opportunities, summer programs, and parent engagement.

So What? Present day institutional systems place young black men at an overwhelming disadvantage by not allowing them to have access to adequate health care, educational opportunities, or the other basic necessities that are needed to be successful. Currently there is a shortage of African American male mentors available to build meaningful relationships with young African American boys and young men. Approximately 200,000 youth mentors are working in community agencies in any given year, yet only 6% of these mentors are African American men². Research supports that youth can benefit from a homogeneous mentoring relationship. The goal of this project is to foster a healthy relationship with Building Hope Community Life Center and mentor the young black adolescent males of the organization. For the summer, collaboration has been developed to implement a 3-week summer program addressing the areas of personal development for the attendees of the summer camp hosted by Building Hope. These programs have the following aspects built into the lesson plans:

- Increase the youth exposure to healthcare careers and professions in STEM.
- Improve minority physical health and mental health through interactive programs and projects
- Developing culturally competent servant leaders for our communities.

Now What? In essence, the program is needed to address the low number of minority male models to decrease the likelihood of preventable health conditions. The goal of the project is to address the social determinants and health disparities experienced by black male adolescents, adults, and communities via a transformative, multidisciplinary, community-based health initiative. There are four essential goals with the project: address health behavior practices and self-empowerment among youth via interactive lessons and medical student mentorship, support guardians to transcend information from the program to the home, train local barbers to serve as positive role-models and health advocates and engage with community members by providing health education materials.

Improving Awareness of Agricultural Health Basics: Sowing Seeds for Future Harvest

Authors: Bridget Gallagher, Robin Tutor Marcom, EdD, MPH

What? The NC Agromedicine Institute is inter-institutional institute whose partners are East Carolina University, North Carolina State University, and North Carolina Agricultural and Technical State University. With the ultimate goal that farming, logging, and fishing workplaces be safe and healthy for all, they conduct research that leads to practical solutions and develop effective educational approaches that can be of benefit daily to the end user.

So what? North Carolina is home to 46,000 farms and leads the US as a top agricultural producer of several commodities: 1 in sweet potatoes; 2 in turkeys; 3 in hogs and pigs; 4 in cucumbers and broilers; and 5 in peanuts, cotton, bell peppers and tobacco. The industry is supported by over 150,000 farmers and farmworkers alike, who experience unique occupational environments working in one of the most hazardous industries to human health.

Even here in Greenville, in the heart of North Carolina's large-scale agriculture, healthcare providers may be ill-equipped to properly recognize, treat, and manage illnesses and ailments related to agricultural work. Medical and other health professional students often receive deficient training in understanding the unique settings farmers and farmworkers work in and the exposures and risks they experience as a result.

In July 2021, both ECU's family and internal medicine residency programs were surveyed on existing knowledge on agriculture and its related health risks. Of the 7 directors surveyed, 5 stated their program offered no agricultural health related training. When asked about the most common hazardous exposure in agriculture (organic dust) and its related respiratory illnesses, those residents surveyed were unfamiliar with appropriate preventative measures. On a scale of 1 (unfamiliar) to 10 (extremely familiar), the twenty residents averaged a score of 2.1. In addition, none of the resident nor residency directors were familiar with the free online resources offered by the NC Agromedicine Institute.

Now what? This project will combine farm tours and trainings tailored to family, internal and emergency medicine residents to increase their awareness and ability to recognize, treat and manage highlighted health care issues unique to the farm environment. Trainings will seek to improve resident familiarity of the farm environment, daily schedule and activities of farmers & farmworkers, and common health hazards unique to agriculture, including but not limited to respiratory illnesses, pesticide-related illness, and infectious diseases. Pre and post surveys will be distributed to assess the effectiveness of the training and gauge changes in self-efficacy when caring for those who work in agriculture. Tours of local farms willing to partner with the NC Agromedicine Institute will be given to those who attend training sessions to further encourage familiarity and engagement with the agricultural community.

Enhancing Diabetes Management through the Diabetes Supply Initiative

Authors: Coleman Hayes¹ and Jessica Barbee²

Affiliations: ¹Brody School of Medicine at East Carolina University and ²HealthAssist at Access East

What? The Diabetes Supply Initiative is a HealthAssist sponsored program that provides eligible uninsured or underinsured patients in Eastern North Carolina with diabetes-treatment supplies such as blood glucose meters, test strips, lancets, alcohol prep pads, pen needles, blood sugar record books, and sharps containers. HealthAssist also collaborates with NC MedAssist to provide medications, including insulin, to uninsured diabetic patients.

So What? According to the 2021 North Carolina County Health Rankings report, 13% of the population do not have health insurance. The CDC reported that in North Carolina, 10.1% of adults aged 18 years or older are diagnosed with diabetes; this percentage rises even higher as income level decreases. Uninsured patients struggle to obtain diabetes medications and supplies without qualifying for the assistance of programs such as HealthAssist and MedAssist. Uninsured patients experience even more difficulty affording a healthy diet required by their diabetes. In addition, uninsured patients often do not have access to or cannot afford healthcare specialists such as podiatrists, optometrists, or dentists who are needed to prevent an array of complications resulting from their diabetes.

Now What? A diabetes management questionnaire was developed using the American Diabetes Association's standards of care. The questionnaire addressed daily practices of diabetes management, diabetes education, access to proper nutrition, and the screening/prevention of diabetes complications. Eighty-nine diabetic patients enrolled in the Diabetes Supply Initiative through HealthAssist were surveyed over the phone using the questionnaire. The questionnaire will be sent through the mail to those that were unresponsive to phone calls. The project will continue to move forward first by analyzing questionnaire responses for trends. Established trends will serve as a basis for future efforts. Based on the needs identified, resources will be provided to improve diabetes management in this uninsured population. Diabetes supplies and medications will be provided by HealthAssist and MedAssist, respectively. Additionally, we aim to partner with local organizations to provide healthy food provisions along with healthcare specialists to provide preventative screenings for diabetes complications.

Establishing a Community Garden Increases Access to Fresh Produce and Improves Overall Health

Authors: Kevin Le; Mentor: Ryan Moore, MD

Community Partners: Greenville Community Shelter Clinic and Community Crossroads Center

What? The Greenville Community Shelter Clinic (GCSC) is a student-run free clinic which primarily serves the residents of the Community Crossroads Center (CCC), as well as patients brought to the clinic by social workers from Access East. CCC is a shelter which provides homeless individuals and families temporary shelter for up to 6 months as well as access to several on-site programs and services, including mental health services and job application services.

So What? According to the Pitt County Food System Full Assessment, approximately 14,500 people are living in food deserts, which is roughly 9% of Pitt residents. Overall, 35,400 Pitt residents are food insecure. Though there are many resources available for the food insecure, such as food pantries and the Food Bank of Central and Eastern North Carolina, many of them operate during normal business hours, so the working poor are often unable to benefit from these resources. Community gardens are more flexible and would be a good resource for the food insecure to utilize in order to obtain fresh produce.

Establishing community gardens in food deserts would provide myriad benefits, including improving mental and physical health, providing opportunities to eat healthier, revitalizing communities, and improving social well-being.

Establishing a community garden for CCC residents is especially important, as poor nutrition is commonly associated with homelessness. According to the National Health Care for the Homeless Council, homelessness exacerbates chronic conditions such as high blood pressure, diabetes, and asthma. Additionally, homelessness makes it difficult to maintain a healthy diet, as meals high in salt, sugars, and starch tend to be cheaper and more filling.

A number of community gardens already exist in Pitt county; however, many community gardens are unknown to most county residents.

Now What? We will work with local partners and with CCC in establishing a community garden at CCC. One goal is that the garden provides residents more food security and greater access to healthy produce, ultimately improving their diet and any diet-related health condition they may have. Another goal is that the garden provides residents the opportunity to be more physically active and more involved with the community through gardening. Hopefully, the garden will be able to regularly provide the shelter with fresh produce. In the future, I hope to further expand on addressing nutrition and homelessness by working with the residents in developing recipes or organizing cooking demos in the cafeteria to educate residents on how to eat healthier and to incorporate the produce grown in the garden into their meals.

Building Bridges Mentorship Program

Author: Melenis Lopez

What? Building Bridges Mentorship Program was created for minority students by minority students. Its purpose is to match pre-med undergraduate students at various universities in North Carolina with current M2's at the Brody School of Medicine.

So what? Currently, about 11% of all physicians are Black or Latino/Hispanic. It has been that doctors can exhibit unconscious bias in caring for others, especially those who are minorities. Therefore, a diverse workforce, training and cultural competence are crucial when it comes to quality health care. To see change, targeting and helping college students will help minority students get accepted into medical school and increase the amount of minority doctors.

Now what? This program is designed to help pre-medical minority students with the medical school application process. Based on application responses and personality tests, pre-med students will be paired with medical students. There will be workshops from August until May consisting of various themes like MCAT resources, recommendation letters, extracurricular activities, and more. Building Bridges will provide pre-med students with long-term mentors that will be with them each step of the way.

Implementation of PhysioCamp at Farmville Middle and High Schools in Farmville, NC

Authors: Parth Panchal, Stephen Charles, PhD

Affiliations: Brody School of Medicine, East Carolina University, Greenville, NC

What? PhysioCamp is a “day-camp” that historically travels to local schools and other locations to help kindergarten-12th grade students understand the human body and navigate the healthcare profession. Sessions last between 1-4 hours and students from a plethora of healthcare backgrounds (medicine, dental, nursing, PA) are involved. In-person activities historically included discussion of organs and how organ systems work together. With the pandemic, camps were run online and outreach was limited. Schools that may have gotten the opportunity to run programs otherwise were not able to do so and as such, the already few after-school education resources were limited. Mentoring opportunities and demonstrations of life as a healthcare provider were not able to be provided to students and as such, it becomes even more difficult to introduce children from underrepresented areas into STEM. The goal of Physiocamp is at the end of each calendar year, underrepresented and underprivileged k-12 students are shown that STEM fields are accessible to them.

So What? Farmville Middle School and High Schools have historically been underperforming schools with a lower than county, state, and national average of students pursuing STEM fields. Farmville High School consistently ranks below other schools in Pitt County in regard to performance grade score. This score is determined by the accumulation of standardized test scores and compared to national averages. With regards to Farmville Middle School, they too have an extremely poor performance grade score when compared to other schools in Pitt County. Both schools are known to have a greater percentage of students who are economically disadvantaged than their peers, and as such, are less likely to pursue postsecondary education. When examining the students who pursued postsecondary education from Farmville High School, only 12.9% of polled students wished to pursue a career in STEM upon graduation. With the increasing national demand for healthcare providers and the need for doctors to serve rural areas, students from rural areas are the most likely to serve the areas in which they are from. As such, a better job must be done at increasing accessibility to those career paths. Numerous studies have shown the importance of after-school STEM programs in improving attitudes towards STEM increases the likelihood of students entering that field. By going one step further and showing students real world applications of material, it increases the likelihood of entering a STEM field even further. In fact, students who reported participating in a summer program that showed them the real-life relevance of STEM had 1.6 times the odds of reporting STEM career aspirations at the end of high school compared with students who participated in a program that did not show them the real-world relevance of STEM.

Now What? The establishment of in-person activities will begin this upcoming fall secondary to inability for many students to have personal transportation. Connections will be made with the dental, nursing, and PA students to create a rotating schedule of mentorships and exposure to healthcare fields. A club will be created here at ECU to have an ongoing number of medical student volunteers who can visit Farmville Middle and High School biweekly. Before the first session, a pre-activity survey will be sent to all participating students to gauge student self-efficacy along with desire to enter a STEM-related field. A second survey will be sent each year to assess growth in self-efficacy in STEM followed by a final survey during students’ completion of their senior year. The final survey will measure changes in self-efficacy along with a desire to pursue postsecondary education in a STEM-related field. At the beginning of the first session, high school and middle school students will be given the option of having a graduate student mentor who guides them throughout their secondary education and prepares them for postsecondary education.

Improving Quality of Care through Medical Spanish Education

Authors: Emily Parks; Thomas Irons, MD; Irma Corral, PhD, MPH

What? Many Spanish-speaking patients do not receive the same quality of care due to a lack of Spanish language resources and educational opportunities in the community. Language is a recognized contributor to health disparities and language barriers may result in more medical errors and poor health outcomes. Improving Medical Spanish capabilities of medical students and future physicians may improve access to quality patient education for Spanish-speaking patients, helping them to make informed decisions about their lifestyle and health.

So What? Brody School of Medicine students with intermediate to advanced Spanish-speaking skills are seeking additional training in Medical Spanish terminology and a space to practice and refine language skills. Compared with interpreter use in clinical settings, language concordance between physicians and patients is associated with better patient satisfaction and quality of care. Preparing future physicians to treat linguistic minorities is an important aspect of developing communication skills and cultural competence, supporting the implementation of Medical Spanish programs in the medical school curriculum.

Now What? Check out the *Medical Spanish Interest Group* this fall! The goal of this interest group is to prepare future physicians to feel confident and comfortable in interactions with Spanish-speaking patients. Events will include a Spanish Social, organ-system based vocabulary review and practice scenarios, education on interpreter use, and volunteer opportunities to provide health promotion and education to Spanish-speaking populations in the community. Once this group is established, we hope to develop a curriculum-based opportunity for students to learn Medical Spanish. Proposed components of the educational program include standardized Spanish-speaking patients, complex communication scenarios (informed consent, delivering bad news, etc.), pre/post course proficiency evaluation and sustainable community partnerships.

Teaching practical skills and launching a support group for postpartum women decreases levels of stress in the 4th trimester.

Authors: Karen Semaan, Serena Mooney, Jill Sutton, MD

What? The fourth trimester is a unique time for postpartum women, one of great emotional and physical change for mother and baby. Women are likely to develop postpartum depression (PPD) during this time. PPD occurs nationally in 10% of births, with 11.7% of North Carolina women reporting depressive symptoms during the postpartum period. Moreover, infant mortality is one of the top public health concerns for Pitt County. A significant disparity exists between White Non-Hispanic and African American Non-Hispanic infant deaths. In addition to the traditional postpartum stressors, the COVID-19 pandemic has added an extra difficulty to new mothers -- the inability to connect with others who may be experiencing the same challenges.

So What? Kaplan et al. found that social support during the postpartum period benefitted the population by: forming an immediately accessible support group, co-counseling within the group where participants will learn from others and teach from their experiences, and creating a foundation to build emotional intelligence and comfort in seeking help. Studies show that postpartum health outcomes improved simply because mothers were aware that there were people who cared about their well-being and could provide them with resources. Most importantly, the open discussion platform facilitates a safe space for these new parents to freely express difficult emotions. Allowing for open communication without fear of judgement will normalize the challenging experiences of the fourth trimester. Scrandis states that normalizing these feelings through social connections is the most beneficial way for women to manage their PPD. This is especially important during the COVID-19 pandemic as social isolation has exacerbated the feeling that their experiences are singular or abnormal. Ultimately, the confidence and skill set gained through the Infant CPR class will not only ease the anxiety of the fourth trimester by teaching a lifesaving skill but will also contribute to the reduction of Pitt County infant mortality rates.

Now What? Our proposed community project will serve these physical, mental, and social needs to the community's underserved population through an Infant CPR course and a virtual support group platform. We will reinstate the American Heart Association (AHA) Family & Friends Infant CPR and Choking Rescue course at Vidant Medical Center. We plan to utilize the previously established curriculum to teach this course safely and in a socially distant manner at the ECU SIM lab. We will also use the American Red Cross' Psychological First Aid course curriculum for the virtual support group. We plan to include patient education, organized group activity, and an open discussion platform. The topics discussed will be specifically tailored to the needs that participants express in their initial Postpartum Stressors Scale. This will be conducted under the guidance of a marriage-family therapist.

Creation of a health safety manual to better inform bedbug management at the Greenville Shelter

Author: Latasha Stabler; David Collier, MD

What? The Greenville Community Shelter is a night only shelter that provides residence for up to six months, up to 3 meals daily, housing assistance, and access to medical care via the student ran homeless clinic. Bedbugs can be transferred from person-to-person, can be hard to control and costly to eradicate. Many homeless shelters have issues with bedbug management because of the close living quarters.

So What? My current task is to begin learning as much as possible about bedbugs, their management and possible preventative measures that can be used to control this pest. Data suggest that bed bugs can be transported in the personal belongings of residents, and then move into walls and crevices once infestation has occurred. So, I believe that it is important to offer measures for both staff and residents regarding their roles in transportation, prevention, and control.

Now What? Going forward, I would like to learn more about the measures taken at the shelter to identify bedbugs and procedures utilized to destroy them once found. I would also like to possibly get the opportunity to provide education to the staff regarding this pest and help to implement operations that can be used so that they are able to identify the pest, prevent them from spreading to other residents and know how to control them once they are found. I would also like to possibly educate the residents on bed bugs and how to report possible infestations.

Building Hope

Authors: Lauren Thornton, Amin Aminu, Dr. Little

What? Building Hope Community Life Center is a faith-based non-profit organization founded in 2001 for youth and family development designed to serve the community. As future healthcare providers training in the community of Greenville, NC it is important to our team to serve and give back to the community which allows us to grow and learn in our respective fields. This collaborative effort has been designed to expose minority youth in the community to mentors, careers, and opportunities to gain exposure to fields in healthcare while also promoting health and wellness in adolescents

So What? Effective programs for youth can reduce problem behaviors and promote positive development. In particular, cultural assets (e.g., ethnic-racial identity) are important for African American youth's health and development (A.Lloyd). Representation *iso* matters. One of the main goals is to remain a consistent partner with Building Hope and provide positive African American role models for the children in the black community. So far, my team has conducted a 3 weeklong summer program that touches many different areas of personal and social growth. These programs have the following aspects built into the lesson plans:

- Increase the youth exposure to healthcare careers and professions in STEM
- Improve minority physical health and mental health through interactive programs and projects
- Developing culturally competent servant leaders for our communities

What Now? We want to statistically measure the effectiveness of our efforts, so we plan on employing a pre and post survey. We will also begin adding in other community partners to collaborate with for service projects and other educational endeavors. Lastly, we will continue to curate lesson plans for the fall that target our goals and maintain the project's mission and vision. See below:

Mission: To expose minority students to careers in healthcare through engaging activities while providing mentorship and academic support. To promote wellness and better health outcomes in adolescents.

- Key Points
 - Exposure to multiple career fields in healthcare (e.g. CRNA, PA, NP, etc.)
 - Leadership Development
 - Mentorship and academic support
 - Engagement
 - Team Building
 - Promotion of health and wellness in adolescents
 - Feedback – to ensure student goals and needs are being met

Vision: Our plan is to provide interactive activities to work with students on team building, self-perception, and health awareness.

Future topics of discussion

- Education about disparities in care for Americans
- Create workshops that emphasize racial reconciliation as it relates to healthcare
- Nutrition, healthy, eating

Summer Scholars Research Program

Program Director: Kori L. Brewer, PhD

Single Neuron Recruitment during Direct Electrical Stimulation in the Human Cortex

Authors: Oludamilola Ademoyero, MS;^{1,2} Sydney Cash, MD, PhD;² Angelique Paulk, PhD²

Affiliations: ¹Summer Scholars Research Program, Brody School of Medicine, Greenville, NC.

²Department of Neurology, Harvard Medical School, Boston, MA; Center for Neurotechnology and Neurorecovery, Department of Neurology, Massachusetts General Hospital, Boston, MA.

Background: Direct electrical stimulation (DES) has become a standard treatment for many neurological diseases including Parkinson's disease and epilepsy. Yet, our understanding of the effects of DES on cortical neurons in the human brain remains rudimentary. It has been suggested that DES engages excitatory cells followed by the inhibitory neurons but support for this mechanism is indirect.

Hypothesis: DES in the human cortex induces a sequence of excitation then inhibitory neuronal activity.

Methods: We recorded neuronal activity during DES to examine single unit activity (SUA) and local circuit responses (LFP) in human frontotemporal cortices (N=11) using PEDOT:PSS microelectrodes during intraoperative neurosurgical resection. DeepLabCut, a computer vision software, was used to track the stimulation location relative to the microelectrode. Separately, we also examined neural responses from microelectrodes implanted semi-chronically (< 29d, N=4) during clinical monitoring for seizures. Waveform characteristics and spectral decomposition identified excitatory or inhibitory dynamics and the relationship between stimulation intensity, distance, and the putative E-then-I sequence.

Results: Across recordings, we found stimulation would induce overall activation of neuronal populations ($p < 0.001$, Wilcoxon rank-sum test; N=9). A subset of neurons had an early activation response that lasted ~ 50 ms (mean 3 STD above threshold: 0.034 ± 0.036 sec). This brief response was also found in units recorded from semi-chronic microelectrodes when the stimulus reached 4 mA (n=10 trials). We found other populations of cells which were inhibited for a longer duration (2 sec, n=18 units). Moving the stimulating site induced different subsets of units to respond, with some locations inducing shorter duration (0.024 ± 0.058 sec) above threshold responses while some locations induced longer responses (0.17 ± 0.50 sec). Finally, we found that slow LFP waves, possibly representing inhibitory waves, were also induced with stimulation and occurred earlier when stimulation was closer to the recording electrode.

Conclusion: The observed neuronal dynamics supports the hypothesis that DES induces early, brief excitation followed by late, long-lasting inhibition in human cortex. Through this deeper understanding, we can design more focal, targeted, and informed stimulation approaches targeting specific neuronal cell types. This strategy may lead to more precise and tailored therapeutic applications of electrical stimulation for an array of neurological disorders.

Horse before the Carriage: Does Insulin Resistance Really Cause Type 2 Diabetes?

Authors: Aderounmu, RB, Vasquez-Rios, V, Keku, J, Pories, W

Background: Insulin resistance, the inability for beta cells to secrete enough insulin to maintain normal glucose values, has, traditionally, been accepted as a major factor in the development of type 2 diabetes (T2D). Furthermore, the treatment of T2D with insulin, only treats the symptoms, while the underlying disease process goes unchecked. Our investigations challenge these views and practices.

Methods: Data from ECU's participation in the NIH Longitudinal Assessment of Bariatric Surgery (LABS) as well as studies in the Department of General Surgery's patients are included in this study.

Results: The findings suggest that not only was the original idea that IR causes type 2 diabetes mellitus faulty, but that the opposite seems to be true. T2D causes IR.

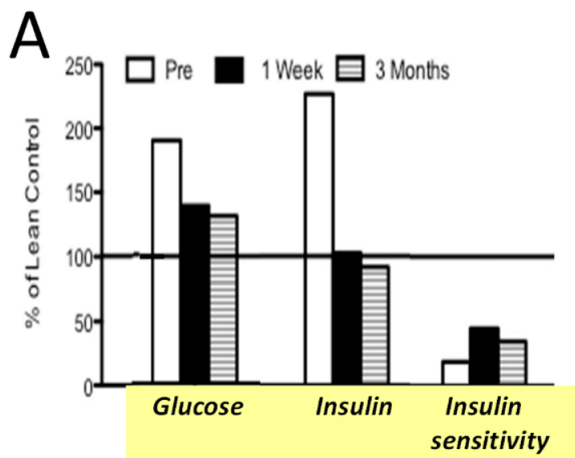


FIGURE A: Glucose, insulin, and insulin sensitivity index (ISI) for diabetic patients before surgery (pre) and after Roux-en-Y Gastric Bypass (RYGB) (1 week and 3 months) expressed as a percent of lean control subjects.

The treatment of T2D with insulin persists because it is traditionally accepted that insulin resistance causes T2D. Insulin has not improved the outcomes of T2D but rather increases the likelihood of complications and driving up the cost of healthcare.

Fig A shows how after 3 months insulin sensitivity has not been resolved while glucose levels have decreased, and insulin secretion has fallen to normal levels during the first week.

Conclusion: Bariatric surgery produces rapid, full, and durable remission of Type 2 diabetes without any improvement in insulin resistance for over three months. This suggests that insulin resistance is not the cause but may be a result of T2D. This finding can help to start the investigation of new treatment methods.

Social determinants of emergency department visits in severe and moderate asthma

Authors: Kamel Alachraf, BAsC; Caroline Currie, BS; Theresa Blount, RN, BSN, AE-C; William Wooten, MD; Dmitry Tumin, PhD

Background: Asthma is the most common chronic lung disease among children. Various Social determinants of health (SDOH) can influence asthma leading to increase of Emergency Department (ED) use. However, knowing the severity of the asthma whether it is mild or moderate/severe can help determine which group is more influenced by SDOH leading to an increase of ED use.

Objective: The objective of this study is to identify if there are stronger associations of social determinants of health in children with moderate/severe asthma in order to prioritize resources and reduce emergency department use and improve the health outcomes in this population.

Methods: For our study, we used data from the 2016-2019 NSCH, which is a nationally representative cross-sectional survey that collects data on the physical and emotional health of American children ages 0-17 years. We limited the analysis to children who had been diagnosed with asthma and still had asthma at the time of the survey. Following prior research, we stratified this sample by caregiver rating of asthma severity (mild vs. moderate or severe) and excluded cases with unknown asthma severity. Lastly, we excluded cases with missing data on the study outcome (ED visits) or study covariates. Data were summarized using weighted means or proportions and compared by categories of asthma severity using Wald test. The association between patient factors and ED visits was evaluated using ordinal logistic regression. Data analysis was conducted using Stata/SE 16.1 (College Station, TX: StataCorp, LP). $P < 0.05$ was considered statistically significant.

Results: Of the 9,937 children in the sample, 71% had mild asthma, 26% had moderate asthma, and 3% had severe asthma according to caregiver ratings. The moderate and severe groups were combined to represent 29% of the sample. Seventy percent of children in the mild group did not visit the ED in the last 12 months (95% CI: 68%, 73%), 21% visited once (95% CI: 19%, 23%), and 9% visited multiple times (95% CI: 7%, 10%). This is compared to the moderate/severe group in which 51% had zero visits to the ED in the last 12 months (95% CI: 47%, 56%), 26% visited once (95% CI: 22%, 30%), and 22% visited the ED multiple times (95% CI: 18%, 26%).

Discussion/Conclusion: Children with moderate/severe asthma had more Emergency Department (ED) visits compared to children with mild asthma. Knowing the severity of asthma beforehand can help prioritize resources to this group and reduce ED utilization in the long run.

A Survey Evaluating Food Pantry Use, Accessibility, and Food Insecurity

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Background or Problem Statement: Southeast Los Angeles has one of the largest food insecure populations in the nation. Compared to wealthier, white households, Black, Indigenous, People of Color (BIPOC) and immigrant communities continue to experience higher rates of food insecurity and are less likely to have been included in their community's decision-making processes. As the nation's largest federally qualified community health center, AltaMed launched My Community, My Health Coalition, and the Community Organizing Institute to partner with organizations, patients, and community members. Identifying the effectiveness and impact of healthier food pantries may inform dietary strategies that improve community advocacy and policy development efforts.

Objective/Hypothesis/Aim Statement: To assess healthy eating choices focused on oral health, food pantry use and access, and food insecurity after the positive improvements DESI pantry made

Methods: A survey of 14 questions was developed in collaboration with AltaMed project leaders, community partners, organizations, medical students, and health scholars and distributed to 43 participants at the DESI food pantry. Microsoft Excel was used to create charts quantifying the data and a t-test to compare consumption of sugary drinks and non-sugary drinks.

Results: Analysis of the data showed that participants' amount of non-sugary drinks consumed daily was significantly less than the sugary drinks consumed daily ($p>0.05$). In addition, 73.2 % of the participants affirmed substantial improvement to increased access to healthier and fresh produce with DESI food pantry. Furthermore, 90.6 % of participants said they received fruits and vegetables and 79.1 % grains from the food pantry. When asked if they worried about running out of food before having money to buy more in the past 12 months, 9.8 % said often, and 57.1% said sometimes. In a similar matter, when asked about how often they ran out of food before having money to buy more in the past 12 months, 22.8% said often, and 44.2% said sometimes. When assessing the accessibility to the DESI food pantry, participants noted that the sign was not visible (6.9%) or there was no sign (9.3%).

Conclusion: The improvements DESI made were affirmed by the results of the healthy eating choices and the participants' food pantry use. However, food insecurity is still a concern.

Survival and Cognition in Closely Surveyed Patients with Small Cell Lung Cancer Versus Prophylactic Cranial Irradiation

Author: Boluwatife Aluko

Purpose: The initial standard of care component for early stage (limited stage) small cell lung cancer (SCLC) is treating the thoracic disease with radiation therapy with concurrent chemotherapy. Because of the affinity of SCLC for the brain parenchyma and the low level of chemotherapy penetration across the blood brain barrier there is a proclivity for patients with SCLC to develop brain metastasis. Therefore, following thoracic chemoradiation it is standard to treat the brain with prophylactic cranial irradiation (PCI). A major drawback of irradiating the entire brain is the significant cognitive impact of such treatments, resulting in decreased short term memory. As SCLC patients live longer each year due to better systemic therapies the consequences of cranial irradiation and the effect on quality of life is becoming a greater concern. We hypothesize that close brain MRI surveillance of patients with limited stage SCLC and the utilization of focal Gamma Knife radiosurgery for those who develop small volume brain metastasis will improve survival and decrease cognitive decline.

Methods: The following work focused on a retrospective cohort of patients diagnosed with small cell lung cancer at Vidant Health Center from 2010 to 2021. We completed a chart review via EPIC and ECU's Department of Radiation Oncology's Aria database of this cohort to determine the patients' diagnosis date, initial stage, types of treatments received, and overall survival rates. Patients were excluded if they were extensive stage at diagnosis, if they did not receive any type of radiation therapy, or if they did not survive more than 90 days after diagnosis to exclude poor performing outliers. This cohort was separated into those who were observed for the development of intracranial disease vs those who underwent PCI. The primary outcomes measured in this study were survival rates, while an attempt was made to do secondary analysis of cognitive function between the two groups.

Results: Evaluation plan: Once Kaplan Meier survival curves are created; we will be able to compare the survival rates and cognitive decline of our two subject groups. We anticipate that the patients who were closely watched and received GKRS if intracranial disease occur will have similar overall survival to those who received PCI while saving the patients from cognitive decline.

Potential Impact: The current national guidelines state that patients in the early stages of small cell lung cancer should receive PCI since the brain is a very common site of metastasis. This study could show that with close surveillance of intracranial disease combined with modern focused radiotherapy similar overall survival can be achieved with less impact on cognition and improved quality of life. This could greatly impact the lives and families of the 30,000 patients that are diagnosed with SCLC in the United States each year.

In situ quantification of mitochondrial bioenergetics reveals disparate OXPHOS kinetics between mouse colorectal cancer cells and healthy tissues

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Abstract: Relative to cell of origin, many cancer cells satisfy their heightened energetic/anabolic demands by upregulating mitochondria. As such, targeting mitochondrial oxidative metabolism (i.e., oxidative phosphorylation; OXPHOS) to combat cancer is aggressively being investigated using a variety of small-molecule inhibitors. Aside from the few drugs specifically formulated against mutant dehydrogenases, most all mitochondrial-targeted compounds similarly disrupt energy transduction in both non-cancerous and cancerous mitochondria. Although cancer's heightened mitochondrial metabolism is assumed to constitute a therapeutic window relative to adjacent normal tissue, such comparisons fail to account for the body's preeminent oxidative organs (e.g., heart, muscle, brain). In this context, the magnitude of the therapeutic window for targeting mitochondrial OXPHOS in cancer remains unclear. To address this knowledge gap, we developed a methodological workflow designed to integrate in situ functional readouts of mitochondrial flux with mass-spectrometry-based proteomics. This allowed us to, for the first time, directly quantitate both total respiratory capacity and OXPHOS kinetics on both a per cell and per mitochondrion basis. Experiments were performed in permeabilized colorectal cancer (CRC) cells (e.g., CT26.WT) with results being compared to either permeabilized mouse colon or cardiac myofibers.

Results: Despite minimal differences between CRC and normal mouse colon, in cardiac myofibers, both total respiratory capacity and OXPHOS conductance were > 5-fold higher. Not only were these differences apparent upon normalization to total cellular protein, but also mass-spectrometry-based correction for mitochondrial content showed > 2-fold higher difference between the CRC versus cardiac myofiber.

Conclusion: Operating on the assumption that in situ evaluation of both total respiratory capacity and OXPHOS kinetics predicts OXPHOS reliance in vivo, these data caution against the use of indiscriminate mitochondrial inhibitors for cancer treatment.

First-in-man Cardiac Regeneration Using a Second-Generation Xenograft Bioscaffold: A Novel and Potentially Disruptive Treatment for Advanced Heart Failure

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Background: Heart disease is the leading cause of death in both the United States and the world. Current treatments range from medical therapy such as ACE inhibitors, beta blockers, inotropes, etc, to surgical therapy such as ventricular assist device implantation and heart transplantation. Both therapeutic interventions have been demonstrated to produce only a modest benefit or have other limitations. These treatments are also focused on improving hemodynamics rather than restoring the damaged myocardium. Proposed regenerative solutions that may directly address this damage have included various types of stem cell injections (iPSCs, fibroblasts, mesenchymal extracts, etc), exosome deliveries, and isolated growth factors. All of these techniques have had limited utility in clinical trials and practice and demonstrated only modest improvements in ejection fraction. This first-in-man case follows the first patient ever treated with a second-generation xenograft cardiac patch for severe heart failure following cardiac arrest and resuscitation.

Methods: A second-generation xenograft bioscaffold was applied to the infarcted ventricular region. This patch helps preserve and restore the function by two mechanisms. First, mechanical constraint achieved by a xenograft from porcine small intestine submucosa that has been shown to be anti-inflammatory and prevents scarring has been demonstrated to improve ventricular performance after infarction. Second, release of paracrine factors bound within the matrix into the epicardium and subepicardium mobilize resident repair cells to enhance proliferation and produce a microenvironment conducive to angiogenesis and remodeling of the tissue.

Results: The patient went from a preoperative ejection fraction of 10% requiring full mechanical support and progressively improved to an essentially normal ejection fraction of 55% over the course of a year. Over the postoperative course, septal wall thickness decreased, and aortic flow and left ventricular end diastolic volume (LVEDV) increased.

Postoperative Day #	Study Type	Ejection Fraction (%)	Septal Wall Thickness (cm)	LVEDV	Aortic Flow (mL/beat)	Stroke Volume (mL)
0	transthoracic echo	10				
4	transesophageal echo	20				
5	transesophageal echo	30				
16	MRI	31	11	180ml	82ml/m ²	50
33	transesophageal echo	15				
36	transthoracic echo	33				
60	transthoracic echo	35				
430	MRI	51	8	254ml	111ml/m ²	90
158	MRI	39	7	216ml	100ml/m ²	75

Conclusion: Although improvement is expected following revascularization therapy alone, the improvement seen is variable (typically in the range of 5-10%) and not expected to be of this magnitude or approach a normal ejection fraction (>50%), especially with the degree of damage seen on cardiac MRI. The present case suggests new upper limits for functionally restorative treatments of heart failure by xenografts, and strongly indicates a need for future study.

Increased mitochondrial respiration in bladder mucosal but not detrusor tissues from aged female mice

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Background: Aging-associated bladder dysfunction is a common pathology that impacts quality of life. Little is known about the pathophysiology of the aging bladder and whether impaired mitochondrial respiration plays a role in aged bladder dysfunction. Our objective is to quantify behavioral bladder function and mitochondrial respiratory physiology in young and old female mice.

Objective/Hypothesis: We hypothesize that mitochondrial respiratory capacity will be decreased in the bladders of aged female mice who present with decreased bladder function.

Methods: Young (10week, n=6) and old (2year, n=4) female C57BL/6NJ mice underwent void spot assays (VSAs) to assess *in vivo* bladder function. Animals were placed on filter paper in cages with or without grids to void for 4hrs. Bladders were weighed, separated into detrusor and mucosal layers, and placed into an Oroboros Oxygraph-2K machine to analyze respiratory capacity. Two substrate conditions were used: 1) Pyruvate/Malate (complex I) and 2) Succinate/Rotenone (complex II). These substrate additions were followed by phosphocreatine titration (energetic challenge) as well as FCCP titration (uncoupler). We evaluated mitochondrial changes in oxygen flux normalized to dry tissue weight.

Results: VSAs showed significant differences between grid and no grid use, with an increase in number of voids without a grid. With a grid in place, there was a significant increase in total void area and area per void in old mice; however, when normalized to body weight, no difference was identified between groups. There was no difference in oxygen flux or respiratory conductance across substrate conditions in the detrusor from old bladders. However, in both complex I and II driven conditions, mucosal mitochondrial respiratory rate in old bladders appears elevated. Additionally, mucosal respiratory conductance in the presence of pyruvate/malate is increased with age.

Conclusion: Though grid use appears to decrease the number of voids seen on VSA analysis, no difference was seen when comparing the overall bladder function of young and old mice. Additionally, there appears to be increased mitochondrial respiratory flux in the mucosal tissue of old mice. Our data are limited by a small sample size which needs to be increased to reduce variability and cystometry needs to be performed for a more reliable physiological assessment of bladder function.

Survival Rates in Stage IV Melanoma Patients Treated with Radiation and Immunotherapy Differ Depending on Age and Radiation Treatment Site

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Background or Problem Statement: Radiation can be combined with immunotherapy to potentially prolong survival in melanoma cancers. Radiation has been shown to reduce tumor sizes at the site of radiation and at non-irradiated lesions, also known as the abscopal effect. However, the interaction of immunotherapy and radiation in melanoma cancer is not well-defined.

Objective/Hypothesis/Aim Statement: This study seeks to characterize factors influencing survival in Stage IV melanoma patients treated with both radiation and immunotherapy.

Methods: Retrospective data was collected from melanoma patients receiving radiation and immunotherapy at our institution. Patient/treatment characteristics were examined for their influence on overall and progression-free survival using the log-rank test on Kaplan Meier survival curves. Radiographic response was assessed according to PERCIST/RECIST criteria and analyzed against patient/treatment characteristics using the Mann-Whitney U Test. For the abscopal effect, the percent changes before and after radiation treatment were subtracted in non-irradiated lesions to produce a “delta-delta” percent change.

Results: Younger patients trended towards worse overall ($p=0.141$) and progression free ($p=0.06$) survival as well as less favorable PERCIST/RECIST response to radiation ($p=.0562$) compared to older patients. Combination CTLA-4/PD-1 inhibition therapy tended to produce better PERCIST/RECIST tumor response ($p=0.09$), but it did not affect survival times. In addition, there was some lower overall ($p=0.22$) and significantly lower progression free ($p=0.012$) survival among patients with intracranial irradiated lesions. However, no difference was found in PERCIST/RECIST response in the irradiated lesions between the intra- or extracranial groups. Non-irradiated lesions in patients with extracranial irradiated lesions had a pattern of less favorable rate of change in tumor size ($p=0.16$).

Conclusion: Lower survival times in younger patients is unexpected and may reflect differences in immunotherapy response in patients receiving radiotherapy and immunotherapy. Combination CTLA-4 and PD-1 inhibition therapy leaning towards better tumor response confirms the effect is still present in this cohort receiving radiotherapy. The lower survival times among intracranial lesion patients is most likely due to lower expectancy of brain metastasized patients; however, it could also be the brain is less responsive to immunotherapy. Further research in a larger cohort is needed for deeper analysis, but this series is still comparable in size to other published series.

Health system encounters after loss to cardiology follow-up among patients with congenital heart disease

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Background: Nearly 1% of all children in the United States are born with a congenital heart defect (CHD).¹ Long-term follow-up with cardiology, even for patients with less complex disease, improves survival and health status in this population.²⁻⁵ However, maintaining continuity of care as patients with CHD age is a challenge. Health system encounters outside of the cardiology service may serve as an avenue to capture CHD patients lost to follow-up and help them re-establish care. Such encounters may include routine primary care visits, other subspecialty clinic appointments, and acute care in the ED.

Objective: This study aims to determine how frequently patients with CHD who have been lost to cardiology follow-up continued receiving care within the broader health system at inpatient, ED, or outpatient settings.

Methods: We are collecting data from patients with CHD who had at least one visit at the ECU pediatric cardiology clinic from 1 January 2015 to 31 December 2019. Loss to follow-up was defined as not being seen for at least 6 months past the most recent recommended follow-up date. Among patients lost to follow-up, we examined attendance at any other encounter within the same health system until 31 December 2020.

Results: The primary outcome was receipt of any outpatient, inpatient, or ED encounters in the ECU/Vidant health system after loss to follow-up from pediatric cardiology. We are screening patients charts for eligibility and will be collecting outcome data in the upcoming semester.

Conclusion: With this analysis we hope to demonstrate the areas within the broader health system in which CHD patients could be identified and re-enrolled in care with cardiology. These data will provide context for future interventions needed to improve follow-up rates among patients requiring lifelong cardiology care.

Artificial Carious Dentin for Education Purposes

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Background: An important skill that dental students learn is the surgical removal of carious dentin. The current models are monolithic and are not comparable to carious teeth.

Objective: The goal of this project is to design a process that forms an artificial material that mimics the hardness and morphology of carious dentin. The process forms hydroxyapatite crystals within a collagen gelatin through an alternate soaking process. (Strange & Oyen, 2011) The long-term goal of this project is to create a new model for dental students to use to learn the tactile hand skills necessary to remove carious tissue.

Methods: The process begins with creating a 1 M solution of CaCl_2 in 200 mL of dH_2O and a .25 M solution of Na_2HPO_4 in 200 mL of dH_2O . Then dissolve TRIS HCl into each solution and buffer the Ca^{2+} solution to a pH of 7.4 with 5 M NaOH. Add 25 gr of porcine gelatin to each solution after the solutions reach a temperature of 37

$^\circ\text{C}$. A mold is then subjected to an alternate soaking process, soaking in the Ca^{2+} solution, deionized water, the PO_4^{3-} solution and deionized water, respectively. This process is repeated until the mold is full and then the hydroxyapatite-gelatin is dehydrated. The resultant crystals were assessed using infrared spectroscopy FTIR, and the organization within the gelatin was observed with a Scanning Electron Microscope (SEM).

Results: The FTIR confirms the Hap presence (peak at 1042 cm^{-1}) at $\sim 16.17\text{ mg/mL}$ concentration. SEM was used to collect images of the hydroxyapatite-gelatin being formed. The crystals of the sample are clear in the SEM images and allows us to compare them to that of hydroxyapatite. **Conclusion:** Hydroxyapatite-gelatin formed through the alternate soaking process bares similar characteristics to carious dentin and with further investigation should be able to be used to create models for future dental students to practice on.

Employment and early exit from Medicare coverage after kidney transplantation

Authors: Jacob A. Ford, MS; Dmitry Tumin, PhD; Hostensia Beng, MD; Liliana Michelle Gomez Mendez, MD

Introduction: Kidney transplantation (KTx) is the standard of care for most patients with end stage renal disease. Currently Medicare covers immunosuppressive medications for 3 years after the date of transplantation. We examine how return to employment or increase in functional status moderates the associated hazard of graft failure with exit from Medicare prior to 36 months after y transplantation.

Methods: Using data from the United Network for Organ Sharing we modelled graft and patientsurvival (conditional on survival with functioning graft to 3 years) across four groups: (1) no change in coverage, no return to work (2) no change in coverage, return to work (3) change in coverage, no return to work (4) change in coverage, return to work. Survival analysis used Kaplan-Meier curves with a log-rank test, and multivariable Cox proportional hazards models.

Results: The sample included 45,289 patients with a median follow-up time of 7 years. Of this sample, 12,797 patients (28%) experienced death or graft failure during follow-up and 12,777 (28%) changed insurance coverage from Medicare. During the first 3 years post-transplant, 16,673 patients participated in paid work (37%), and 23,489 achieved a functional status score of 100%(51%). Among patients who returned to work, a change in insurance coverage from Medicare was associated with a 7% reduction in hazard of the composite outcome of graft failure or patient mortality (HR: 0.93; 95% CI: 0.87, 0.99; p=0.024). Particularly, a change to private insurance was associated with reduced hazard of graft failure or patient mortality among those returning to work (HR: 0.89; 95% CI: 0.83, 0.96; p=0.001).

Conclusion: Early exit from Medicare was favorably associated or not associated with patient and graft survival >3 years after transplant, depending on whether patients returned to work. Patients who return to work regardless of insurance coverage type tend to have better graft survival. Among those returning to work, a change in insurance from Medicare is associated with reduced hazard of graft failure or mortality.

Patient-Level Risk Factors Associated with Pediatric Trauma Mortality Have a Stronger Influence on Outcomes Within Smaller Facilities

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Background: Pediatric trauma outcomes can vary across facilities. However, evidence on the independent association between facility bed size and pediatric trauma outcomes has been mixed. Our study aims to identify how facility characteristics, specifically bed size, modify the impact of patient risk factors on mortality among this patient population. We hypothesized that patient risk factors would have a stronger impact on mortality at smaller trauma centers.

Methods: Deidentified data will be obtained from the Trauma Quality Programs (TQP) database, which represents data collected by trauma centers participating in the Trauma Quality Improvement Program (TQIP) and Pediatric TQIP. In bivariate analysis, patient outcomes and characteristics will be stratified by facility bed size. Data will be compared between groups using Chi-square tests for categorical variables, and t-tests for continuous variables. We will use logistic regression to evaluate factors associated with mortality. Patient-level factors will include demographics, injury mechanism, injury severity, transfer status, and insurance coverage. Our study will determine if the association between each of these predictors and in-hospital mortality varies according to facility bed size.

Results: In Progress.

Conclusions: We anticipate that patient-level risk factors, such as injury severity, demographics, and insurance coverage will have a stronger influence on pediatric trauma mortality at smaller facilities, when compared with larger facilities.

Leveraging the Electronic Health Record to Collect Social Determinants of Health Data in Patients with Cancer

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Background: Socioeconomically disadvantaged patients experience disparities in cancer care. It is challenging to study these disparities and their impact on cancer outcomes because we do not routinely collect data on specific social determinants of health (SDOH). Current proxy markers used to measure socioeconomic disadvantage include zip code of residence and median income, but these are less detailed than measures such as financial burden, food insecurity, transportation barriers, or extent of social support system.

Aim Statement: The primary aims of this study are to evaluate the feasibility of an underutilized screening instrument to collect the SDOH and to estimate the prevalence of these specific social determinants in patients with newly diagnosed gastrointestinal cancers.

Methods: A single-institution, prospective cohort study will be performed of all patients. Our study population includes any patient ≥ 18 years of age with a newly diagnosed GI cancer at Vidant Medical Center. We surveyed patients using a SDOH tool in Epic's Electronic Health Record. Primary outcome measures include the prevalence of each SDOH domain and the number of SDOH needs per patient. We will use descriptive statistics to summarize this information. At the study's completion, we will perform multivariable regression analysis to evaluate the association of the SDOH domains with race, rural residency, income, and primary insurance status.

Results: 6 out of the 23 patients (23%) screened from June through July of 2021 warranted referral for assistance with their SDOH burdens. Since the study began, most patients to date ($n = 112$) had 1-2 moderate or severe needs. Most common severe needs include physical activity ($n=60$), stress ($n=52$), tobacco ($n=22$), and food insecurity ($n=9$). Most common moderate needs include social isolation ($n=71$), tobacco ($n=43$), physical activity ($n=19$), and financial strain ($n=12$).

Conclusion: There are several specific SDOH domains affecting our GI cancer population which may contribute to disparities in cancer care but are currently not assessed on standard intake forms. SDOH screening will continue for a period of 1 year. Further investigation will be required to test for associations between specific SDOH domains and oncologic outcomes.

Ghrelin: Is the Foregut responsible for T2DM

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Background: Ghrelin's correlation with Type 2 diabetes mellitus (T2DM) is that it may be the signal from the foregut blocking metabolic processes leading to inefficient processing of glucose. Ghrelin is a primarily released from the gastric fundus during times of fasting and or starvation. These factors allow Ghrelin to play an important role in controlling food consumption and energy balance. The processes in question are glycolysis and its transition into the TCA cycle. Studies have shown that there is a regression in obesity and T2DM when patients have gotten either RY gastric bypass, gastric sleeve, and Gastric band surgeries. All 3 of these procedures target the foregut which begs the question, is there a signal coming from the foregut blocking acetyl CoA?

Methods: A literature review was conducted to look at the remission of T2DM, weight loss/ obesity along with Ghrelin levels in patients who had RY Gastric bypass, Gastric band, and Gastric sleeve procedures.

Results: The literature review showed that there was remission of T2DM and noted weight loss in patients who had Gastric band, sleeve, and bypass procedures done. Gastric bypass led both categories with 80% of patients with the procedure showing T2DM remission and 58% showing weight loss after surgery. Ghrelin levels also were shown to be decreased in patients with T2DM as well.

Conclusions: The notion that Ghrelin is the hormone causing T2DM may not be the case as it has been shown in cases of patients with hyperglycemia and obesity that Ghrelin levels are diminished.

Induction of Nrf2 Activity May Decrease the Risk of Pollutant-Induced Neurodevelopmental Disorders

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Background: While pregnant, women are commonly exposed to chemicals and pollutants that can increase the risk of the fetus having neurodevelopmental disorders. For example, fetal exposure to the drug valproic acid (VPA) increases the risk of developing Autism Spectrum Disorder (ASD).

Hypothesis: We hypothesize that upregulation of cellular detox and antioxidant pathways via increased activity of Nrf2 may be adequate to circumvent the development of ASD.

Methods: To study this, we grew human fetal cortical spheroids (HCSs) which allowed us to monitor the characteristics of developing brains. To induced Nrf2 activity, we used sulforaphane (SFN), a nutrient obtained from cruciferous vegetables. SFN phosphorylates Nrf2 so that it will be translocated to the nucleus in its active form rather than being targeted for degradation by the proteasome. We exposed HCSs to VPA alone, VPA and SFN, SFN alone, or solvent control. We created each of these treatment groups in brains transduced with a lentivirus containing enzymatically dead Cas9 conjugated to transcriptional repressor KRAB with either Nrf2 sgRNA or scrambled sgRNA.

Results: We expect to see the SFN treated brains develop normally and without the hyperexcitability seen in ASD HCSs. Additionally, we expect to see Nrf2 increased in SFN treated brains transduced with Cas9/KRAB scrambled sgRNA compared to those treated with Cas9 and Nrf2 sgRNA.

Conclusion: Our research indicates that pregnant women who are exposed to toxicants such as valproic acid could benefit from supplementing with sulforaphane to reduce the risk that their baby will have neurodevelopmental abnormalities. This is of particular importance because ASD prevalence increased more than two-fold over the last two decades, and environmental pollutants could be a significant factor in this dramatic rise.

Viral-Candida Interactions and Elucidation of Host Cell-Signaling Pathways

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Background: HIV is responsible for the development of AIDS. The risk of becoming infected through the oral route is extremely low and it is generally assumed that transmission does not occur through oral contact even with those with high viral loads. People with advanced HIV infection are vulnerable to opportunistic infections such as candidiasis often caused by the organism *Candida albicans*. Candidiasis affects up to 50% of untreated HIV-1 subjects and 90% of AIDS patients. Interestingly, HIV-1 interacts with *Candida* spp and this interaction overrides the production of HIV-1 by infected macrophages.

Objective: The aim of the study was to investigate the pathways by which *Candida* spp interferes with HIV-1 pathogenesis and to elucidate cell-signaling pathways of *Candida* pathogen associated molecular pathways. The pathways by which *Candida* spp affect HIV-1 infection involve the upregulation and downregulation of genes.

Methods: Human monocytes (THP-1) were cultured in RPMI-1640 medium with 10% fetal bovine serum and 0.05mM of 2-mercaptoethanol at 37°C in 5% CO₂. The cells were exposed to a variety of *Candida* spp (tropicalis, glabrata, and dubliniensis) and HIV-1 BaL for a period of 4.5 hours. RNA was extracted and purified utilizing a Qiagen RNA extraction kit. The RNA was reverse-transcribed and the cDNA was barcoded and pipetted into an Oxford Nanopore Mk1C device for sequencing. The data from the Mk1C was analyzed using EPI2ME software to determine modulation of genes.

Results: There is modulation of genes associated with the toll-like receptor signaling pathway which may induce proinflammatory effects. Over 8000 genes were analyzed using EPI2ME-LABS software and genes that showed a log₂ fold change above 2 and below -2 were inputted into the DAVID functional annotation bioinformatics microarray analysis to find pathways with upregulation or downregulation. Genes such as KRT8, TM4SF1, and KRT18 showed some of the most upregulation while genes such as FCER1G, XAGE1A, and XAGE1B showed some of the most downregulation.

Conclusion: There is modulation of genes in response to candida infection in the toll-like receptor pathway which primarily involve the PI3K and MAPK signaling pathways. Inflammatory cytokines are upregulated and result in proinflammatory effects.

Heart Rate Variability as a measure of emergency medicine physician stress: interns and attendings

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Background: Heart rate variability (HRV) is a method of assessing stress by evaluating the autonomic nervous system and the balance between the sympathetic and parasympathetic nervous systems. The Grit scale is a method of self-assessing the extent to which individuals can maintain focus, interest, and persevere in obtaining long-term goals, a higher Grit score has been shown to be a protective factor against stress and therefore burnout. HRV has been used to effectively measure stress in physicians but has not been used to monitor emergency medicine physicians for entire clinical shifts in order to determine stressors. The purpose of this study is to identify and compare stressors between interns and attending physicians during clinical shifts and to determine if Grit can be used to predict the degree of stress.

Methods: This was a prospective cohort study where twenty emergency medicine physicians, ten attending and ten intern physicians, wore a clip-on ear HRV device during a clinical shift. Each activity was documented in real time and time linked to HRV data. Stress was identified using ratio of low frequency to high frequency HRV.

Results: For attending physicians interactions with non-emergency medicine providers was the most frequent stressor (20.83%) as determined by number of stressors relative to total number of interactions in that category. Attending physicians were stressed less than 10% of the time when interacting with high acuity patients. In contrast, interns the most frequent stressor among the intern cohort was interacting with patients and their families (24.62%). There was no clear correlation between Grit score and the number of stressors.

Conclusion: This pilot study suggests that attending emergency medicine physicians are not stressed due to sick patients but instead due to procedural regulations including difficult consults with other physicians. Interns appear to be more stressed during interactions with patients and families perhaps due to the fact that they are seeing these patients alone. The self-assessed Grit did not seem to accurately assess EM physician stress and burnout. Further studies are warranted in order to better address the causes of physician stress and burnout.

Author: Ashley Moore

Abstract: Chronic pain is defined as pain experienced on most days or every day in the previous three months. This type of pain affects millions of Americans with epidemiologic studies estimating the prevalence of chronic pain between 18% and 34.5%. While research and treatment techniques continue to advance, most chronic pain conditions remain inadequately understood and managed. Among adults with chronic pain, we sought to determine how many respondents endorsing a general measure of disability also reported functional limitations specifically due to pain. Our secondary aim was to analyze which demographic and clinical characteristics were associated with reporting (a) both general and pain-specific limitations; (b) only general, but no pain-specific limitations; and (c) neither general, nor pain-specific limitations among adults with chronic pain. Using a chronic pain module introduced in the 2019 edition of National Health Interview Survey, we found that 58% had some kind of disability, including 27% with both general and pain-related disability, 21% had only general, but not pain-related disability, and 9% reported only pain-related, but not general disability. Overall using multivariable regression analyses of disability, we reported only general disability was more likely among respondents who had more severe pain, respondents were more likely to report only pain-related disability, rather than both pain-related and general disability, if they were younger; if they were born in the US, and if they had private as compared to public or other insurance coverage. Smoking, diabetes, and hypertension were all associated with greater likelihood of reporting both pain-related and general disability, rather than pain-related disability alone. Due to these findings attention to managing the burden of this disease is warranted.

Survival and Cognition in Closely Surveyed Patients with Small Cell Lung Cancer Versus Prophylactic Cranial Irradiation

Author: Brittney Moore

Purpose: The initial standard of care component for early stage (limited stage) small cell lung cancer (SCLC) is treating the thoracic disease with radiation therapy with concurrent chemotherapy. Because of the affinity of SCLC for the brain parenchyma and the low level of chemotherapy penetration across the blood brain barrier there is a proclivity for patients with SCLC to develop brain metastasis. Therefore, following thoracic chemoradiation it is standard to treat the brain with prophylactic cranial irradiation (PCI). A major drawback of irradiating the entire brain is the significant cognitive impact of such treatments, resulting in decreased short term memory. As SCLC patients live longer each year due to better systemic therapies the consequences of cranial irradiation and the effect on quality of life is becoming a greater concern. We hypothesize that close brain MRI surveillance of patients with limited stage SCLC and the utilization of focal Gamma Knife radiosurgery for those who develop small volume brain metastasis will improve survival and decrease cognitive decline.

Methods: The following work focused on a retrospective cohort of patients diagnosed with small cell lung cancer at Vidant Health Center from 2010 to 2021. We completed a chart review via EPIC and ECU's Department of Radiation Oncology's Aria database of this cohort to determine the patients' diagnosis date, initial stage, types of treatments received, and overall survival rates. Patients were excluded if they were extensive stage at diagnosis, if they did not receive any type of radiation therapy, or if they did not survive more than 90 days after diagnosis to exclude poor performing outliers. This cohort was separated into those who were observed for the development of intracranial disease vs those who underwent PCI. The primary outcomes measured in this study were survival rates, while an attempt was made to do secondary analysis of cognitive function between the two groups.

Evaluation plan: Once Kaplan Meier survival curves are created; we will be able to compare the survival rates and cognitive decline of our two subject groups. We anticipate that the patients who were closely watched and received GKRS if intracranial disease occur will have similar overall survival to those who received PCI while saving the patients from cognitive decline.

Conclusion: Potential Impact: The current national guidelines state that patients in the early stages of small cell lung cancer should receive PCI since the brain is a very common site of metastasis. This study could show that with close surveillance of intracranial disease combined with modern focused radiotherapy similar overall survival can be achieved with less impact on cognition and improved quality of life. This could greatly impact the lives and families of the 30,000 patients that are diagnosed with SCLC in the United States each year.

Unmet Needs for Vision Care Among Children with Gaps in Health Insurance Coverage

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Background: Routine vision care is essential for diagnosing and treating vision impairments such as amblyopia within children. Gaps in health insurance coverage may prevent children from receiving routine vision care and lead to unmet needs for other vision care services.

Aim Statement: The primary aim of this study was to analyze whether experiencing a recent gap in health insurance coverage was associated with greater likelihood of unmet needs for vision care among US children. The secondary aim was to determine whether recent gaps in insurance coverage were associated with lower likelihood of completion of vision screening within the past 12 months.

Methods: This study used de-identified data and was not considered human subjects research by the local Institutional Review Board. Data were obtained from the 2016-2019 National Survey of Children's Health. For this study, we limited the sample to children ages 3-17 years, and excluded children with missing data. The primary outcome was caregiver-reported unmet needs for vision care in the past 12 months. The secondary outcome was whether the child had their vision tested within the past 12 months (assessed in 2018-2019 only).

Results: Based on a sample of 106,876 children, 3.8% of US children had a recent gap in coverage and 5.0% lacked insurance in the entire year leading up to the survey. The estimated population prevalence of unmet needs for vision care was 0.7%. This prevalence was higher among children with year-round un-insurance (3%) and children with a recent gap in coverage (6%; $p < 0.001$). Based on the 2018-2019 subsample (N=49,072), 73% of children had completed a vision screening within the past 12 months. This rate was lower among children with year-round lack of insurance (58%), and children with recent gaps in coverage (61%; $p < 0.001$).

Conclusion: Children with gaps in coverage have a higher likelihood of unmet vision care needs when compared to children with year-round private/year-round lack of coverage. Gaps in coverage also decreased the likelihood that a child completed a vision screening within the past 12 months. It is recommended that policy interventions are implemented specifically for children with gaps/lack of coverage to minimize unmet vision care needs in children.

Maternal exit from employment after premature birth

Authors: Olivia Nieto Rickenbach, MS;¹ Nick Preziosi, MD;^{1,2} Dmitry Tumin, PhD;¹ Katherine D. Taylor, DO¹

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Background: Preterm birth (PTB) and low birth weight (LBW) are associated with long-term chronic health problems in infants. We sought to evaluate whether infant birth characteristics including PTB, low birth weight (LBW), and infant hospital length of stay (LOS) were associated with maternal exit from employment after birth.

Methods: We performed a secondary analysis of a longitudinal cohort study (National Longitudinal Survey of Youth—1979 cohort) to track maternal employment after each birth. Births were included in the study if the mother was working at the beginning of the birth month. Employment after birth was ascertained via annual or biennial interviews collecting detailed monthly employment history. Time to exit from paid employment (becoming unemployed or leaving the labor force) was tracked up to 2 years after each birth.

Results: Of 2,647 births, 243 infants were born preterm (13%) and 192 were LBW (7%, including 132 preterm LBW births). On multivariable Cox regression, LBW was independently associated with 34% greater hazard of maternal exit from employment (hazard ratio: 1.34; 95% confidence interval: 1.08, 1.66; $p=0.007$) while PTB and infant LOS were not independently associated with maternal exit from employment.

Discussion: In this population-based cohort, LBW was associated with increased risk of maternal exit from employment, regardless of gestational age. Our results highlight the need for additional support for mothers following PTB (especially birth of LBW infants) to support maternal employment after the birth of a child with health care needs or medical complexities associated with prematurity.

Factors associated with follow-up outside a transplant center among pediatric kidney transplant recipients

Authors: Olivia Nieto Rickenbach, MS; Dmitry Tumin, PhD; Liliana Michelle Gomez Mendez, MD; Hostensia Beng, MD

Background: Transfer of follow-up care after pediatric kidney transplantation (KTx) may jeopardize quality of care and patient outcomes. We sought to determine if minority status and socioeconomic factors were associated with increased likelihood of follow-up outside a transplant center, and whether this transition of care was associated with worse long-term graft and patient survival.

Methods: We performed an analysis of the United Network for Organ Sharing database, including children age <18 years who received a kidney transplant between 2003 and 2018. Survival analysis (conditional on survival with functioning graft to 1 year) was performed using a Cox proportional hazards model where transfer of care (place of follow-up recorded as any setting other than a transplant center) was entered as a time-varying covariate.

Results: 10,293 patients were included in the study, of whom 2,083 received care outside of a transplant center during follow-up. Medicare coverage, but not minority race/ethnicity or socioeconomic status, was associated with increased likelihood of follow-up outside a transplant center. Follow-up outside a transplant center was associated with a 10% increased hazard of death or graft failure (hazard ratio: 1.10; 95% confidence interval: 1.004, 1.21; p=0.041).

Discussion: Follow-up outside of a transplant center increased risk of poor outcomes, though the likelihood of receiving care outside a transplant center did not vary by race/ethnicity or socioeconomic status. Our results highlight the need to improve continuity of care after KTx and to further understand the mechanisms leading to poor survival rates among minority populations.

Fractographic Analysis of Different Commercially Available Zirconia Blocks for CAD/CAM Technology

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Background: Zirconia ceramics for dental restorations are commonly machined by the grinding of pre-sintered blocks and then sintered at temperatures ranging from 1350 and 1650°C for durations between 1 and 5 hours depending on the manufacturer. The most predictable outcomes are achieved when sintering is performed from 1500-1550°C.

One key factor that determines the clinical performance of restorations made of dental zirconia is the presence of processing flaws created either at the fabrication stage or during chair side adjustments. The presence of flaws and microcracks is likely to be detrimental to their short and/or long-term performance.

Fractographic analysis of two-phase zirconia ceramics showed that regions with high tetragonal phase fracture inter-granularly, while regions with high amount of cubic phase fracture trans-granularly. High amounts of tetragonal phase, which fracture inter-granularly, is indicative of improved mechanical properties and therefore better clinical performance.

Purpose of the study: The purpose of this study was to perform fractographic analysis to evaluate crack behavior of commercially available zirconia for CAD/CAM technology.

Materials and methods: Four different commercially available zirconia blocks (IPS e.max ZirCAD, 3M™ Chairside Zirconia, CEREC® Zirconia & KATANA™ Zirconia) were sliced into discs 1.25 mm thick using a low-speed diamond saw. Specimens ($n=5$ per group) were sintered following manufactures' recommendation. Specimens were then polished to a mirror polish using a series of abrasives ending with a diamond polishing suspension. Polished specimens were indented under a 98N load. Specimens were thermally etched, ultrasonically cleaned and gold coated prior to SEM examination. Crack patterns were analyzed on digital images. The length ratio of trans-granular to inter-granular fracture were determined.

Results: Crack patterns analyses showed that the ratio of trans-granular to intergranular fracture was affected by the sintering temperature and the different phase composition of the different blocks.

Conclusion: Crack patterns are strongly influenced by the crystalline phase composition of the material. Following the recommended manufacturer's sintering temperature is crucial for predictable outcomes and therefore better clinical performance.

Impact of perfluorooctanoic acid (PFOA) exposure on the urogenital physiology in adult male mice

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Background: Per- and polyfluoroalkyl substances (PFAS) are synthetic compounds found throughout NC. Humans exposed to PFAS, exhibited adverse effects on cardiovascular, endocrine, immune, reproductive systems, and development. We will determine if chronic PFOA exposure negatively affects urogenital morphology and function, and localized immune system activation in male mice.

Hypothesis: We hypothesize that adult mice exposed to PFOA for 15 days through oral gavage will show increased urogenital fibrosis, impaired smooth muscle function, and produce decreased immune system activation compared to controls.

Methods: Male C57BL/6 mice (6-8 weeks old) were exposed to PFOA for 15 days via oral gavage. Penile, vaginal, and bladder tissue were collected, fixed in 10% formalin overnight and embedded in paraffin. Tissues were sectioned and stained with the following: picro sirius red, hemotoxylin and eosin, and Masson's trichrome. Bladder smooth muscle area and wall thickness were measured via ImageJ. We extracted and purified mRNA from a separate set of bladders and ran RT-PCR to examine gene expression of inflammatory markers (TLR4, TNF alpha, TGF- β , IL-10, and IL-1 β), occludin, uroplakin II, and 18S. Bladder contractility was tested using another set of bladder tissue. Whole bladders were isolated, cut into strips, and mounted in the myograph tissue bath. Bladder strips were exposed to KCl, ATP, and carbachol. Penile contractility was also assessed using KCl, phenylephrine, and acetylcholine.

Results: There were no changes in bladder contractility between PFOA treated vs control mice. Similarly, we did not find any differences in bladder smooth muscle area between the same groups of mice. We did find significant increase in bladder wall thickness in mice exposed to PFOA compared to control. No changes in the expression of inflammatory markers or urothelial barrier genes were found between bladders from treatment vs control mice.

Conclusion: We found significant differences in bladder wall thickness following PFOA exposure. However, this morphological change did not translate into a functional change in contractility. Overall, there were no changes in the bladder's gene expression of markers of inflammation with PFOA exposure. This leads us to believe that more investigation is needed to understand if PFOA is influencing the urogenital tissues.

Identifying Cell Adhesion Defects in Keratinocytes Expressing TP63 Mutations Linked to Ectodermal Dysplasias

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Abstract: Ankyloblepharon-ectodermal defects-cleft lip/palate (AEC) and Ectrodactyly-ectodermal clefting syndrome (EEC) are ectodermal dysplasias characterized by a series of developmental abnormalities involving the skin, sweat glands, and nails, as well as other ectodermally-derived tissues. They are caused by mutations in the transcription factor TP63, which has been shown to be a master-regulator of epidermal development. One of the most severe clinical symptoms is the presence of skin erosions caused by severe skin fragility. This can lead to multiple clinical issues including lack of skin barrier function, skin blistering, and painful wounds. Our previous research has demonstrated abnormalities in the structure and function of desmosomes in AEC patients. We propose that cell adhesion defects also occur in EEC patients. To test this hypothesis, we used lentiviral constructs expressing AEC and EEC TP63 mutations in keratinocytes in order to study the effects within the context of the cell adhesion system. We will determine the expression and localization of adhesion proteins in these cells using western blotting and immunofluorescence techniques. We also expect to observe cell adhesion defects in the EEC mutations, which will be tested using a disperse functional assay. This research will further our understanding of the pathological process underlying ectodermal dysplasias, which is an important first step to design new treatment options for these devastating diseases.

An Examination of Inflammatory Marker Abnormalities in Emergency Department Patients with mood disturbance, suicidal ideations, and suicide attempt.

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Background: Many studies have examined the correlation between subclinical markers of inflammation and psychiatric diagnoses involving depression or suicidality. They have shown that higher levels of subclinical inflammation are correlated with more severe psychiatric diagnoses. To our knowledge these types of studies have not yet been conducted in the setting of an Emergency Department (ED).

Objective/Hypothesis/Aim: We hypothesize that when compared to patients presenting with suicidal ideations who were discharged, patients who were admitted would be found to have evidence of subclinical inflammation. If true, this could help guide future disposition decisions regarding patients presenting with suicidal ideations.

Methods: Upon IRB approval patients who presented to the ED with psychiatric diagnoses in 2016 were randomly selected and a retrospective chart review was conducted. Subclinical levels of inflammation were analyzed using neutrophil-to-lymphocyte ratios, mean platelet volumes, leukocyte numbers, and platelet to lymphocyte ratios found in standard CBCs. Linear regression was then used to identify group differences in inflammatory markers while accounting for a number of other factors that are known to impact subclinical inflammation (time of the lab blood draw, age, gender, history of unipolar depression, history of hypertension, current SSRI use, and positive urine drug screen).

Results: Fitted regression models were used to assess predictability of increased subclinical inflammation based on various variables. For neutrophil-to-lymphocyte ratios and platelet-to-lymphocyte ratios models showed no significance in predictability ($R^2 = 0.083$, $F(8, 133) = 1.509$, $p = 0.160$; $R^2 = 0.039$, $F(8, 133) = 0.674$, $p = 0.714$). Only age significantly predicted leukocyte number ($R^2 = 0.073$, $F(8, 133) = 1.315$, $\beta = -0.251$, $p = 0.013$). Lastly, age ($R^2 = 0.095$, $F(8, 133)$, $\beta = -0.247$, $p = 0.014$) and hypertension ($R^2 = 0.095$, $F(8, 133) = 1.746$, $\beta = 0.224$, $p = 0.026$) were able to significantly predict mean platelet volumes.

Conclusion: Our findings showed that there was no significant correlation between patients who presented to the ED with Suicidal Ideations and inflammatory markers regardless of whether these patients were admitted or discharged. With these findings, we can begin to examine if inflammatory markers can be correlated with other group differences in patient populations. For example, we can explore differences in levels of inflammation in those who present with Suicide Attempt versus those who present for nonpsychiatric diagnoses.

Describing Palliative Sedation Therapy in Pediatric Oncology Patients: A Potential New Role for Dexmedetomidine

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Background: The majority of children with cancer experience significant suffering during the end-of-life (EOL). Approximately 80% of these patients are confronted with persistent pain despite the utilization of analgesics². Literature on propofol and dexmedetomidine use for pediatric palliative sedation therapy (PST) is insufficient. This is the first study reporting on a large cohort of pediatric oncology patients receiving PST. No data focusing on the relationship between the clinical characteristics, demographics, or disease burden of pediatric oncology patients and the extent of such sedative measures required to relieve suffering at the EOL currently exists. Improving clinical guidelines will allow for targeted assessment of the specific PST that is most effective in patients with a particular oncological diagnosis. We hypothesized that dexmedetomidine prevents escalation to propofol at the EOL, yielding an enhanced pediatric PST algorithm.

Methods: A retrospective chart review was conducted of pediatric cancer patients treated at SJCRH between April 1, 2011, and January 1, 2021. Included patients were those with a confirmed cancer diagnosis, aged ≤ 25 years who passed away after receiving PST consisting of propofol and/or dexmedetomidine at the end of life (EOL). Variables were collected around general demographics, disease characteristics, clinical characteristics, and medication use. Descriptive statistics and frequency tables were utilized for participant data analysis. The analyses were carried out using SAS statistical software.

Results: PST was most often used in solid tumor clinic but parsing for oncological diagnosis demonstrated that PST in leukemia patients composed the highest percentage of our patient cohort (38%). Patients who were only administered dexmedetomidine required, on average, fewer number of palliative medications and opioids during EOL. Utilization of dexmedetomidine in an improved PST algorithm prevented escalation to propofol for adequate sedation in most of our patient cohort regardless of race, BMT status, gender, and cancer diagnosis.

Conclusion: Integrating dexmedetomidine into national pediatric PST clinical guidelines has the potential to provide effective symptom management without compromising arousability, enabling pediatric cancer patients to spend meaningful time with their loved ones at the EOL.

Assessing Salt Literacy in CHF Patients Using an Image-Based Approach

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Background or Problem Statement: There are many causes for exacerbations of congestive heart failure (CHF). Common non-cardiac reasons include medication nonadherence and dietary indiscretion. Patients with CHF are often instructed to restrict their salt intake.

Objective/Hypothesis/Aim Statement: In this study, our objective is to conduct a cross-sectional assessment of salt content knowledge in 100 patients who have experienced two exacerbations of CHF in the past 6 months. We hypothesize that patients may not realize how much salt is in common foods they eat regularly.

Methods: To do this, first, we have created an image-based assessment tool to remove any understanding barriers that patients may face in a word-based tool. Next, we will assess salt content understanding in 100 patients at either the emergency department at Vidant Hospital or a CHF Clinic in Greenville, NC.

Results: The image-based assessment tool provides researchers a new way to assess salt knowledge in different patient groups. This data will serve to reveal knowledge gaps in patients who are experiencing CHF exacerbations due to dietary indiscretion.

Conclusion: Looking ahead, the data collected will provide a foundation for future studies and insight for physicians to provide targeted dietary advice to their congestive heart failure patients.

Expression of Na⁺/K⁺ ATPase Isoforms and Na⁺/Ca²⁺ Exchanger in cardiac cells of Ren-2 Transgenic model of Hypertension

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Introduction: The Renin Angiotensin Aldosterone System (RAAS) is composed of various reactions in the regulation of blood pressure and plays crucial roles in cardiovascular physiology and pathophysiology. Classically, renin cleaves liver-derived angiotensinogen (AGT) into angiotensin I (Ang I), a decapeptide [Ang (1– 10)] which is then further processed by angiotensin-converting enzyme (ACE) into the octapeptide Ang II [Asp- Arg-Val-Tyr-Ile-His-Pro-Phe, Ang (1–8)]. Ang II is known to physiologically regulate blood pressure and is a key player in hypertension. Ang II causes vasoconstriction and production of aldosterone leading to retention of sodium (Na⁺) and water resulting in cardiovascular dysfunction.

Objective: To study Ang II receptor mediation and the expression of intramembranous transporter of Na⁺ and Ca²⁺ in cardiomyocytes and correlate activities of different Na⁺/K⁺-ATPase isoforms with the (mRen2)²⁷ transgenic phenotype.

Methods: The left ventricle of 12-15-week-old (mRen2)²⁷ transgenic and Hannover-Sprague Dawley (HnSD) rats was isolated where protein was used for SDS PAGE and Western blotting analysis.

Results: showed a significant increase in the Mean Arterial BP in (mRen2)²⁷ transgenic rats but no change in pulse rate compared to HnSD control. There was a significant protein expression for Ang II receptor sub-type 1 (AT₁R) in (mRen2)²⁷ when compared to control normotensive rodent. There were no differences in Na⁺/K⁺ ATPase α -1 isoform in both strains but a significant diminution of α -2 isoform in (mRen2)²⁷ transgenic hypertensive rodents, suggesting an increase in intracellular Na⁺ and Ca²⁺ concentrations in cardiac myocytes through the Na-Ca exchanger system.

Conclusion: The finding suggests an increased AT₁ receptor protein, a diminished Na⁺/K⁺-ATPase α -2 isoform expression and augmented intracellular Na⁺ and Ca²⁺ concentrations in (mRen2)²⁷ transgenic hypertensive rodents, all of which may contribute to an increase in cardiac contractility, cardiac output, and sustained blood pressure.

No Evidence of Erectile Dysfunction, Nerve Injury or Change in SDF-1 Signaling 2 Weeks Following Prostatic Radiation

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Background or Problem Statement: Prostatic radiation therapy (RT), a leading therapy for prostate cancer, leaves 50% of men with erectile dysfunction (ED). Currently, there are no effective drugs for the prevention or recovery of RT-induced ED. Preliminary studies show stromal cell-derived factor-1 (SDF-1) recombinant protein penile injections improve erectile function in rats with bilateral cavernous nerve injury. Although not fully understood, RT causes pathophysiological changes similar to the injury mechanism observed in rats with cavernous nerve crush injury-induced ED. This study aims to characterize changes in the gene expression of nerve injury or SDF-1 signaling markers in the major pelvic ganglia and erectile function at 2- and 9-weeks post-RT.

Hypothesis: We predict prostatic RT will not cause ED or increase SDF-1 expression at 2 weeks post-RT but will cause ED and increase SDF-1 expression at 9 weeks post-RT.

Methods: Male rats (10 weeks old) were exposed to 0 Gy or 25 Gy prostatic single-dose radiation. At 2 weeks or 9 weeks post-RT, erectile function was evaluated by behavioral apomorphine assay. Rats are injected subcutaneously with apomorphine (80ug/kg), and erections and yawns are monitored over 30-minute testing period. RNA was isolated from rat major pelvic ganglia (MPG), and quantitative real-time polymerase chain reaction was done to assess the expression of genes related to nerve injury and repair (ATF3, GAP43, CASP3, GFAP), autonomic nerve markers (TUBB3, NOS1, TH), and SDF-1 signaling pathway (SDF-1, CXCR4, VEGFa). Penile tissues will be fixed, sectioned, and stained with Masson trichrome staining to assess smooth muscle content and fibrosis.

Results: At 2 weeks post-RT, there was no erectile dysfunction--erectile stimulation with apomorphine was unchanged. Additionally, all gene expression of nerve injury markers, autonomic nerve profiles, and SDF-1 signaling pathway were unchanged at 2 weeks post-RT.

Conclusion: Evidence of ED and neuronal injury are absent at 2 weeks post-RT, suggesting a prolonged progression in ED development. Our next step is to evaluate erectile function and SDF-1 signaling at 9 weeks post-RT. If changes in SDF-1 signaling are evident when RT-induced ED is present, we will explore the SDF-1 as a therapeutic option to recover erectile function.

Tooth Brush Abrasion and Light Curing Effects on the Gloss Retention and Repolishability of Composite Resins

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Abstract: Esthetic restorative treatments strongly rely on material's optical properties for accurate tooth mimicking. Optical properties of composite resins depend on proper monomer conversion through light curing. Little is known about the influence light curing procedures have on gloss retention and repolishability after exposure to mechanical wear (brushing). The following research aims to compare the effect of light curing and toothbrush abrasion on the repolishability and gloss retention of composite specimens. 48 specimens (10mm diameter and 2mm thick; N=6) were fabricated using 4 different composites (Surefil, Sonicfill 3 Soncifill, Admira Fusion, and Dentsply Sirona Quixx) and 2 different light curing settings on Valo Grand LCU (Standard and Xtra). An initial polishing was given to each specimen before baseline gloss measurements were taken. Subsequent abrasion was performed via a brushing simulator (Odeme MEV3 8LC) in 5000, 10000, and 20000 cumulative cycles. A total of three repolishings were performed between each cycle and additional gloss measurements were taken before and after each repolishing. Preliminary results found significant differences in gloss means while varying of total brushing cycles (.027) and composite type (<.01). Differences in gloss observed between composite groups is likely due to a difference in matrix and inorganic composition while increased cumulative wear explains the differences observed in gloss between abrasion cycles. Significant differences were also found between Baseline and 3rd Polish of Surefil (0.04), Sonicfill (>0.01), Fusion (0.02), and Quixx (0.24) when lighting curing by Xtra setting. Light curing procedures had little effect on gloss retention of the specimens; however, differences between baseline and 3rd polishings were more significant when curing using the Xtra setting. Quixx were found to be the lowest gloss of all the specimens while Fusion had the highest. Further research is needed to understand significant differences encountered comparing the baseline and 3rd polishing subsets when utilizing the Xtra light curing setting.

Association of the Early Use of Hydrocortisone with the Prevention of Bronchopulmonary Dysplasia in Preterm Neonates

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Background or Problem Statement: Bronchopulmonary dysplasia (BPD) is a potentially severe complication that occurs most commonly in extremely preterm infants (EPT, <28 weeks of gestation). The development of BPD is linked to systemic inflammation. Steroid medications have been the main method of prevention and treatment of BPD, due to their anti-inflammatory properties. Previously, dexamethasone has been used as the steroid of choice due to its efficacy in decreasing the incidence of BPD and death in infants; however, it has been linked to an increased risk of neurodevelopmental impairments, so there is a need to identify an effective alternative treatment with fewer side effects. Hydrocortisone has been proposed as an alternative to dexamethasone for preventing BPD due to its milder side effects.

Objective/Aim Statement: This study sought to determine whether early administration of stress dose of hydrocortisone to preterm babies at the time of illness is associated with a decreased incidence of BPD at 36 weeks of gestation. Secondly, this study investigated the association between the early use of stress-dose of hydrocortisone and neurodevelopmental impairments at 18 months of age, corrected for prematurity.

Methods: This study was a retrospective cohort study. Extremely low birth weight (<1000g at birth) or EPT neonates born at or admitted to the NICU before 24 hours of age, between January 1, 2017 and December 31, 2019 were identified. The primary exposure variable was receiving a course of stress dose of hydrocortisone (3-4 mg/kg/day for 5 days or more) in the first week of life. The cohort was further stratified based on whether repeated courses of hydrocortisone or any use of dexamethasone were recorded during the remainder of the NICU stay. For primary analysis, the control group was comprised of neonates who did not receive a stress dose of hydrocortisone in the first week of life. The primary outcome of this study was diagnosis of moderate or severe BPD, using the NICHD criteria of the need for supplemental oxygen or any positive pressure support at 36 corrected weeks of gestation. The secondary outcome was moderate to severe neurodevelopmental abnormalities at 18 months of age, corrected for prematurity.

Results: In progress.

Pre- versus Post-Kidney Allocation System Does Not Differentially Influence the Effect of HLA Mismatch on 3-Year Graft Survival

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Background: New Kidney Allocation System (KAS) was implemented in 2014 to improve distribution of deceased donor kidneys. A critical change in the allocation algorithm was to reduce the priority of HLA mismatches.

Objective: To evaluate the effect of HLA mismatch on graft survival post-kidney transplantation in the pre-KAS versus post-KAS allocation era.

Methods: We examined adult kidney transplant recipients (≥ 18 years) of a deceased donor kidney between 2011-2017, excluding pediatric, multiorgan transplants, pre-emptive transplants, and previous kidney transplants. Clinical outcomes included risks of all-cause graft failure (permanent dialysis or death) and death-censored graft failure. The cohort was divided into two groups: pre-KAS (n=19,765), defined as transplants between 2011-2013, and post-KAS (n=26,519), defined as transplants between 2015-2017. The latter cohort was defined to have at least three years follow-up. Pre-KAS cohort, graft survival was truncated to 3-years. Survival curves were calculated using the Kaplan-Meier method and compared by the log-rank test. Multivariable Cox hazards model was used to evaluate the effect of total number of HLA mismatches (at the HLA-A, -B, and -DR loci) on risks of all-cause graft failure and death-censored graft failure between pre-and post-KAS cohorts.

Results: Total number of HLA mismatches (ABDR) was comparable between the 2 cohorts (Pre-KAS: mean (SD, range) =4.2 (1.5, 0-6) versus Post-KAS: 4.3 (1.3, 0-6)). However, post-KAS cohort had significantly lower percentage of 0 HLA mismatches (3.2% versus 6.2%; $p < 0.001$). Results of the Cox hazards model are provided in Table 1. There was no statistical evidence to suggest a differential effect of HLA mismatches on risks of graft outcomes between the two cohorts. Risk of all-cause graft failure decreased by 8% in the post-KAS cohort (Hazard ratio (HR)=0.918), irrespective of HLA mismatches. There was a notable increase in risk of death-censored graft failure with 6-ABDR mismatches (HR=1.405).

Conclusion: The new KAS allocation did not differentially impact the effect of HLA mismatches on graft survival. Despite the new allocation rules, HLA mismatches still plays an important role. These results reinforce the need to optimize HLA matching where feasible to improve graft outcomes. Further research is needed with longer follow-up to verify study results.

Table 1: Adjusted Hazard Ratio of 3-year Graft Failure

Outcome	Variable	Effect	HR*	95% confidence interval	P-value
All-cause graft failure	KAS	Post-KAS	0.918	(0.873, 0.965)	0.0008
		Pre-KAS	-	-	
	HLA Mismatch	0	-	-	-
		1	0.899	(0.657, 1.229)	0.5038
		2	1.034	(0.861, 1.242)	0.7195
		3	1.051	(0.908, 1.218)	0.505
		4	1.021	(0.888, 1.172)	0.7731
5		1.134	(0.989, 1.301)	0.0718	
6	1.132	(0.980, 1.307)	0.0929		
Death-censored graft failure	KAS	Post-KAS	0.838	(0.782, 0.898)	<.0001
		Pre-KAS	-	-	
	HLA Mismatch	0	-	-	-
		1	1.031	(0.649, 1.639)	0.8965
		2	1.219	(0.928, 1.603)	0.1551
		3	1.276	(1.020, 1.598)	0.0331
		4	1.235	(0.997, 1.529)	0.0534
5		1.334	(1.079, 1.650)	0.0078	
6	1.405	(1.128, 1.751)	0.0024		

*Adjusted for KDPI, gender, delayed graft function, waiting time, cold ischemic time, cPRA, racial/ethnic groups, history of diabetes, age, antibody induction, CNI, MPA, MTOR, Steroids, and other immunosuppressants

The Effect of Sex Hormone Exposure on EphrinA1 Expression in Human Umbilical Vein Endothelial Cells and Implications for Treatment of Myocardial Infarction

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Abstract: Myocardial infarction, defined as occlusion of blood flow to one or more areas of the heart, is estimated to be responsible for 15% of total mortality every year, and may cut down the lifespan of survivors by more than 10%. While there are a myriad of treatments for MI, ranging from *Nitroglycerin* which induces vasodilation during an acute episode, to *BioVentrrix Rivivent TC System* which seals off the infarcted area of the heart after a heart attack, there is currently a dearth of treatments that can reverse the damage to the cardiomyocytes and induce neovascularization. Epidemiological studies have shown that the occurrence of MI differs by age and sex and researchers have hypothesized whether these differences are due to the varying expression of sex hormones between different sexes and ages, particularly Estradiol(E2) and Testosterone(T), both of which are linked to cardio-protection and whose decreased expression in the elderly may contribute to their increased risk of MI. One mechanism that these hormones may use for cardioprotective outcomes, which was the focus of this project, is altering the expression of the protein Ephrin A1, which was originally investigated in the context of hepatocellular carcinoma and has been linked to cardioprotective qualities such as stimulating angiogenesis and neovascularization and promoting autophagy over apoptosis within infarcted hearts. To test this hypothesis, varying concentrations of the androgens Estradiol and Testosterone were applied to Human Umbilical Vein Endothelial cells (HUVEC's) to determine whether their presence affected the release of Ephrin A1. The level of EphrinA1 protein content will be analyzed to determine whether E2 or Testosterone impact EphrinA1 production.

African American Preterm Birth Rates During the COVID-19 Pandemic

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Summary: Vidant Medical Center is in Eastern, North Carolina and serves surrounding rural counties. Research studies have shown that living in a rural area is associated with increased rates of eclampsia, preterm births, and obstetric embolisms compared to women in urban areas (Lespérance et al., 2016). Research also shows that African American women are at an increased risk for preterm birth. In a cohort study of over 18,000 deliveries that occurred during the COVID-19 pandemic, one research group found that there was a significant increase in PTB among Black and Puerto Rican women (Craig et al., 2021), but not Caucasians. Additionally, Black women had an increased rate of late and very early preterm birth (Craig et al., 2021). While the association between PTB and COVID has been studied generally, the factors associated with the increase PTB in Black women during COVID has not been evaluated. This study has three main objectives:

- To determine if CBC values are increased in preterm births in African American women during versus before COVID.
- To determine which CBC values are significant predictors of PTB before COVID versus during COVID.
- To determine if social vulnerability index (SVI) is an indicator of adverse pregnancy outcomes in African American women compared to before and during COVID-19.