Wake Forest®
School of Medicine

2021
Medical Student Research Day
Poster Abstracts

Wednesday, October 13, 2021

The Medical Student Research Program is supported through grants from the National Institutes of Health, Wake Forest School of Medicine Departments, Centers and Institutes, and private gifts.

Medical Student Research Program

NIH Short-Term Training Grant T35 – DK007400

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2021 Medical Student Research Day

Wednesday, October 13, 2021

All are welcome to attend the virtual MSRD keynote address and poster session but you must register to receive the link. Please register at https://redcap.link/MSRD2021

My Journey of a Thousand Miles:
Sickle Cell Disease Care Across the Globe

Ifeyinwa (Ify) Osunkwo, MD, MPH

Professor of Medicine and Pediatrics
Director, Sickle Cell Disease Enterprise
Atrium Health

Dr. Ifeyinwa "Ify" Osunkwo is a Professor of Medicine and Pediatrics and the founding director of the Sickle Cell Disease Enterprise at Levine Cancer Institute, Atrium Health in Charlotte, NC. She holds a medical degree from the University of Nigeria and a Master's in Public Health from Johns Hopkins University. She completed her fellowship in Pediatric Hematology/Oncology and Bone Marrow Transplantation from Columbia University, NY.

Board-certified in pediatric hematology/oncology, Dr. Osunkwo has over 28 years of clinical and research experience focused on Sickle Cell Disease, public health, and access to care for disparity populations.

She leads a robust Sickle Cell Disease research enterprise that includes numerous clinical trials ranging from phase 1 through phase 4 and is the Principal Investigator of a $9.8M PCORI-funded multicenter comparative effectiveness trial.

During her career she has built a reputation for clinical excellence, innovative strategic thinking, and a deep passionate commitment to improving clinical outcomes beyond the individual patient to the entire population of patients in her care.

Student Research Posters

Following the keynote, medical students will present their research posters. All posters will be judged by WFSM faculty. Students with the most meritorious research posters will be selected for awards.

Keynote Presentation
12:00 pm – 1:00 pm

Student Research Posters
1:10 pm – 4:00 pm

Concluding Remarks
4:00 pm

Please register to attend the virtual MSRD keynote and poster session.

https://redcap.link/MSRD2021

Atrium Health

Wake Forest® School of Medicine

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Poster Judging Committee

Michael Bancks, MPH, PhD
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Assistant Professor, Internal Medicine

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Tao Ma, MD, PhD
Associate Professor, Gerontology and Geriatric Medicine

Xue Ma, PhD
Assistant Professor, Orthopedic Surgery

Joost Maier, PhD
Assistant Professor, Neurobiology and Anatomy

David Manthey, MD
Professor, Emergency Medicine

Eric Marrotte, DO, PhD
Assistant Professor, Neurology

Candice McNeil, MD, MPH
Associate Professor, Infectious Diseases

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Mariana Murea, MD
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Professor, Pediatrics

Ellen Quillen, PhD
Assistant Professor, Molecular Medicine

Kimberly Raab-Graham, PhD
Professor, Physiology and Pharmacology

Bonnie Sachs, PhD
Associate Professor, Neuropsychology

Amit Saha, PhD, MSIQ, CSSGB
Assistant Professor, Anesthesiology

Anand Karthik Sarma, MD
Assistant Professor, Neurology

Christopher Schaich, PhD
Assistant Professor, Surgery Hypertension

E Shen, PhD
Assistant Professor, Medical Education

Yusuke Shiozawa, MD, PhD
Assistant Professor, Cancer Biology

Kiran Solingapuram Sai, PhD
Associate Professor, Radiology

David Soto-Pantoja, PhD
Associate Professor, Surgery Hypertension

Andrew South, MD
Assistant Professor, Pediatrics

Lindsay Strowd, MD
Associate Professor, Dermatology

Umit Topaloglu, PhD
Associate Professor, Cancer Biology

Allen Tsang, PhD
Associate Professor, Molecular Medicine & Biochemistry

Christopher Tuohy, MD
Associate Professor, Orthopedic Surgery

Jimmy Turner, MD
Assistant Professor, Anesthesiology

Bharathi Upadhya, MD
Associate Professor, Cardiology

Jillian Urban, PhD
Assistant Professor, Biomedical Engineering

Rakhee Vaidya, MBBS
Assistant Professor, Hematology and Oncology

Ashleigh Wells, DPM
Assistant Professor, Orthopedic Surgery

Donna Williams, MD
Associate Professor, Internal Medicine

Alan Woodruff, MD
Assistant Professor, Anesthesiology

Yuanyuan Zhang, MD, PhD
Associate Professor, Wake Forest Regenerative Medicine

Poster Session Moderators

Amanda Burcham
Nicholas Casacchia, PharmD
Amy Dawson, MS
Kimberly Ford, MS
Kendall Freeman, MS
Jon Goforth, MBA
Todd Haberkost
Abigail Hedges
Melissa Hutchens
Jennifer James, MBA
Dianne Johnson
Ashley Knight
Sarah Langdon, MPH, MCHES
Jasmine Malachi, MA
Kimberly McDonough, MSN,RN, CCRN
Tonya Mock
Luke Morales
Lindsay Munn, PhD, RN
Brittney Patterson
Anna Perry, MPH
Isaiah Randall, BS, CHES
Andy Rives, MBA
Sarah Sabanis, MEd
Carolyn Shadrick, MPH, CHES
Michael Skidmore, MS
John Strong
Andrea Vallevand, PhD
Gary Willis

Poster Session Schedule

Wednesday, October 13, 2021
1:10 pm – 4:00 pm

Medical students will present their research posters during the two MSRD poster session times, 1:10 pm - 2:30 pm (groups 1–12) and 2:40 pm - 4:00 pm (groups 13–24.) Each group will have five students, two WFSM faculty judges and a moderator. Each student will have 15 minutes each to present their poster and field questions from the judges. After the judges finish, if time remains the moderator will allow questions from anyone in attendance until the 15 minutes have expired.

Use the schedule below to find posters of interest, locate students, and poster groups. All poster groups will take place in a single WebEx meeting utilizing breakout rooms. Just go to the breakout room that corresponds to the poster group you wish to attend. As an attendee, you are welcome to visit as many groups as you wish throughout the afternoon.

Poster Group 1 (1:10 pm - 2:30 pm)
Judges: Christopher Tuohy, MD & Jillian Urban, PhD
Moderator: Andy Rives, MBA

Student	Poster Title
Georges Abdelahad	The Role of Fibula Fixation in Preventing Malalignment in Distal Third Tibia Fractures Treated with Intramedullary Nailing
Amelia Davidson	Analysis of Tranexamic Acid Administration in Orthopedic Hip Trauma Patients
Connor Dean	Optimal anchor placement for collateral ligament reconstruction in elbow trauma: A 3D modeling study
Meckenzee Frank	Complications following posterior total hip arthroplasty utilizing a piriformis-sparing posterior approach
Sasha Kondrasov	Novel Magnetic Resonance 3D Reconstruction and Modeling of the Acetabular Labrum: A Pilot, Translational Study in Biomedical Engineering, Advanced Musculoskeletal Imaging, and Orthopaedic Hip Joint Preservation

Poster Group 2 (1:10 pm - 2:30 pm)
Judges: Donna Williams, MD & Justin Moore, PhD
Moderator: Melissa Hutchens

Student	Poster Title
Sophia Alvarado	Access to Trauma Care in Winston-Salem, N.C.: An Analysis of Trauma Deserts and the Effects of Highway Closure
Ryan Hilton	The Role of Social Determinants in Post-Sepsis Readmission and Mortality: A systematic review
Vanessa Lukas	Catastrophic Events Related to Tuberous Sclerosis Complex Are Unlikely in those Undergoing Routine Surveillance
Joseph Nickel	Readability Analysis of Spanish Language Patient-Reported Outcome Measures in Laryngology
Brian Robusto	Associations Between Cognitive Function and Sex Hormones in the Look AHEAD Cohort

Poster Group 3 (1:10 pm - 2:30 pm)
Judges: Ashleigh Wells, DPM & Christopher Schaich, PhD
Moderator: Jon Goforth, MBA

Student	Poster Title
Tyler George	Using foot radiography and serum markers to assess foot impairment risk across CKD-MBD stages
Mark Glover	Lumbopelvic Postural Differences in Adolescent Idiopathic Scoliosis: A Pilot Study
Emily Sparks	Case Series: Treating Fractures with Revision Total Knee
Lauren Strickland	Do vascular risk factors falsely elevate ankle-brachial index measurements in the evaluation of tibial plateau fractures concerning for vascular injury?
Keon Youssefzadeh	Outcomes 2-Years After Hip Microfracture Augmented with Allograft Cartilage and Autologous Platelet Rich Plasma

Poster Group 4 (1:10 pm - 2:30 pm)
Judges: Xue Ma, PhD & Sean Dobson, MD, PhD
Moderator: Todd Haberkost

Student	Poster Title
Anthony Elias	Identification and histological mapping of senescent stromal cells in adipose tissue: a path towards tissue desenescence
Rob Glover	Machine Learning in Medicine: Predicting Total Hip Arthroplasty Surgical Outcomes
Ryan Layton	Morphology of the Occipital Bones and Foramen Magnum resulting from Premature Minor Suture Fusion in Crouzon Syndrome.
Abigail Peoples	Establishing Probiotic Biofilm on Organic Wound Matrices: A Potential Step Towards Innovative Treatment of Pathogenic Biofilm
Davis Temple	The Effects of Reframing: Interventional Resilience Training on Inpatient Physical Therapy

Poster Group 5 (1:10 pm - 2:30 pm)
Judges: Jimmy Turner, MD & Claudia Campos, MD
Moderator: Sarah Sabanis, MEd

Student	Poster Title
Caleb Bercu	Evaluation of a Novel Multimodal Opioid-Free Postoperative Pain Management Pathway Following Robotic-Assisted Radical Prostatectomy: A Pilot Series in the Veteran Population
Rohin Gawdi	Perioperative Chemotherapy for Resectable Colorectal Liver Metastases: Analysis from the Colorectal Operative Liver Metastases International Collaborative
Zachary German	A Single Center Experience with Forearm Arteriovenous Loop Grafts for Hemodialysis
Margaret Havunjian	Mortality and visual and anatomic outcomes following pars plana vitrectomy for diabetic tractional retinal detachments
Stephanie Ira	Characterizing Safety and Efficiency of Umbilical Hernia Repair on the Resident Run Surgical Service

Poster Group 6 (1:10 pm - 2:30 pm)
Judges: Steven Clayton, MD & Cynthia Burns, MD
Moderator: Jennifer James, MBA

Student	Poster Title
Whitney Floyd	Association of Antenatal Corticosteroids with Future Kidney Function in Adolescents Born Preterm with Very Low Birth Weight
Daniel Ines	SGLT Inhibition: A Novel Approach to Reducing Hypoglycemia in T1D
Neema Moeini-Rastegar	The Association Between Vitamin D and Hypertension-Related Heart Changes in Youth Referred for Hypertensive Disorders
Ashish Patel	Twice-Weekly Hemodialysis with Adjuvant Pharmacotherapy and Conversion to Thrice-weekly Hemodialysis: A Pragmatic, Fully-Embedded, Individually-Randomized Pilot Clinical Trial
Nicholas Tully	Preterm Birth and its Association with Altered Renal Sodium Handling in Response to Mental Stress in Young Adults

Poster Group 7 (1:10 pm - 2:30 pm)
Judges: Kimberly Raab-Graham, PhD & Yuanyuan Zhang, MD, PhD
Moderator: Kendall Freeman, MS

Student	Poster Title
Hisham Qadri	Characterizing Blood Transfusion on Distal Aortic Blood Flow during Supraceliac Complete Aortic Occlusion in Swine Animal Model
Shambavi Rao	Readability of Commonly Used Patient Reported Outcome Measures in Laryngology
Alexis Restrepo	Monitoring Early Postoperative Mobility at Scale
Pooja Shah	Racial Disparities and Sociodemographic-Based Differences in Rhegmatogenous Retinal Detachment Presentation and Postoperative Outcomes
Sharon Thomson	Outcomes of Patients with Oral Cavity Malignancies Invading the Skin

Poster Group 8 (1:10 pm - 2:30 pm)
Judges: Ellen Quillen, PhD & David Manthey, MD
Moderator: Jasmine Malachi, MA

Student	Poster Title
Ryan Morgan	Rapid Outpatient Follow-up Reduces Emergency Department Re-admission for Patients with Acute Chest Pain
Kevin Soltany	Clinical Characteristics Associated with Acute Pulmonary Emboli in SARS-CoV-2 Positive Patients in the Emergency Department Setting
Mitchell Tingey	Comparison of Visual Outcome After Hyperopic LASIK Using a Wavefront-Optimized Platform Versus Other Excimer Lasers in the Past Two Decades
Gabrielle Walsh	Sex differences in thoracic injury patterns and mechanisms in seriously injured motor vehicle crash occupants
Hope Werenski	Can Old Imaging Alter the Preoperative and Operative Course of Patients Undergoing Parathyroidectomy for Primary Hyperparathyroidism?

Poster Group 9 (1:10 pm - 2:30 pm)
Judges: Kiran Solingapuram Sai, PhD & Eric Marrotte, DO, PhD
Moderator: Amy Dawson, MS

Student	Poster Title
Beddome Allen	Scoping Review of Literature on B-Mode Cranial Ultrasonography to Detect Intracranial Hemorrhage
Priscila Arellano Zameza	A Systematic Review to Assess the Domains of Disparities Affecting Outcomes in Intracerebral Hemorrhage
David Baskin	Brain network clustering and frontal lobe connectivity in Latinx rural farmworker children
Claudia Coffin	Vascular and Microstructural Markers of Cognitive Impairment and Dementia
Arlen Gaba	Depressive symptoms score and risk for incident delirium: a prospective cohort study

Poster Group 10 (1:10 pm - 2:30 pm)
Judges: Bonnie Sachs, PhD & Anand Karthik Sarma, MD
Moderator: Carolyn Shadrick, MPH, CHES

Student	Poster Title
Connor Hile	Effect of Repetitive Head Impacts on Neurocognition in Motor Sport Athletes
Rebecca Merrill	The impact of a ketogenic-based diet on circulating metabolomics in patients with glioma: a bedside to bench study.
Tiffany Ong	Social Determinant Predictors of Outcomes in Intracerebral Hemorrhage
Ashley Phoenix	Inhibition of ferroptosis using UAMC-3203 in the post stroke period does not impact cognitive outcomes in diabetic rats.
Bryce Polascik	COVID-19 in older adults with and without pre-infection neurocognitive impairment

Poster Group 11 (1:10 pm - 2:30 pm)
Judges: Gagan Deep, PhD & Joost Maier, PhD
Moderator: Brittney Patterson

Student	Poster Title
Dhvani Raghupathy	Physical Activity and Sleep Habits in Adults with Epilepsy
Hadley Walsh	Deconvolution analysis and differential exon inclusion at the 17q21.31 locus in patients with autopsy-confimed PSP
Brock Yager	Adaptation and Validation of the Garcia Score for Neurobehavioral Testing in ICH Rat Models
Chelsea Yun	A Focused Neuromuscular Ultrasound Approach for the Diagnosis of Chronic Inflammatory Demyelinating Polyneuropathy
Tamir Zitelny	Oncogene-Induced Senescence in RTK-fused Infant High-Grade Gliomas

Poster Group 12 (1:10 pm - 2:30 pm)
Judges: Jim Beardsley, PharmD, BCPS & Katherine Poehling, MD, MPH
Moderator: Ashley Knight

Student	Poster Title
Miranda Allen	Knowledge and Attitudes towards Expedited Partner Therapy in Family Planning and Sexual Health Service Settings of a Local Health Department
Caroline Minnick	Perspectives from the Field: A Qualitative Analysis of a Depression Management Pilot-Program within HIV Clinics in Malawi
Chiagoziem Ogbonna	HSV Central Nervous System Infections and Immune Compromise
Menaka Reddy	Implementation of a Direct Observation Program for Pediatric Trainees using a QR Code Linked Evaluation Tool
Stephanie Snyder	Ethnic and Racial Breakdown of Patients with Staphylococcal Scalded Skin Syndrome

Poster Group 13 (2:40 pm - 4:00 pm)
Judges: Michael Bancks, MPH, PhD & Allen Tsang, PhD
Moderator: Andrea Vallevand, PhD

Student	Poster Title
Danielle Black	Phenomenological Research: A qualitative approach to assessing patient experiences in the ED
Allison Boone	A retrospective assessment of HIV screening efforts at Wake Forest Baptist Health
Jimshad Farooque-Wooden	Gut Check: Prebiotics and Probiotics May Reduce the Risk of Covid-19-Related Mortalities
Benjamin Highland	Twice-Weekly Hemodialysis with Adjuvant Pharmacotherapy and Conversion to Thrice-weekly Hemodialysis: A Pragmatic, Fully-Embedded, Individually-Randomized Pilot Clinical Trial
Morgan Yapundich	Relationship Between Race, Barriers to Prenatal Care, and Receipt of Prenatal Care Among Pregnant Individuals at Atrium Health Wake Forest Baptist

Poster Group 14 (2:40 pm - 4:00 pm)
Judges: Paula Gangopadhyay, DPM & Amit Saha, PhD, MSIQ, CSSGB
Moderator: Michael Skidmore, MS

Student	Poster Title
Joey Kurtzman	Examining Peripheral, Mixed Nerve Reconstruction Failures Using Processed Nerve Allografts
Nihir Parikh	Closing Time: One Last Call for Patient Preference
Michelle Qiu	The Effect of the Strengthen Opioid Misuse Prevention Act on Opiate Prescription Practices After Total Joint Replacement
Madeline Rieker	An innovative device for rotator cuff repair surgery
Gabriel Sowards	Dual Plating of Periprosthetic Distal Femur Fractures Leads to Near Anatomic Coronal Plane

Poster Group 15 (2:40 pm - 4:00 pm)
Judges: Elizabeth Halvorson, MD & Callie Brown, MD, MPH
Moderator: Nicholas Casacchia, PharmD

Student	Poster Title
Kychelle Del Rosario	Dance for Diabetes: A Study Design and Implementation Project Using Dance to Improve Diabetes Self-Management
Jesse Heinen	Incidence and Economic Evaluation of Pediatric Abusive Head Trauma with Retinal Hemorrhage During the COVID-19 Pandemic
Samantha Kline	COVID-19-related knowledge, attitudes, practices, and vaccine intention among North Carolina medical students
Julia Pickel	Acceptability of Telehealth for Adolescent Healthcare Delivery During the COVID-19 Pandemic
Drew Recker	Fellaship: A Peer-Facilitated Social Support Group for Preclinical Medical

Poster Group 16 (2:40 pm - 4:00 pm)
Judges: Chad Grotegut, MD, MBA & Nicholas Hartman, MD, MPH
Moderator: Tonya Mock

Student	Poster Title
Alexa Lacy	Cost Consciousness of General Surgery Residents During Laparoscopic Cholecystectomy and Open Inguinal Hernia Repair
Brianna Maniscalco	Development of a Foam Delivery Syringe (FDS) & Medication Canister Connector and Foam Creation Syringe (FCS) Tip for Dispensing Medication into the Ear as a Foam
Alexandria Marshall	Trabeculectomy Revision via Needling Augmented with Sub-conjunctival Mitomycin
Glen McKinney	Incidence of Symptomatic Lacrimal System Obstruction Following Maxillectomy
Palak Patel	Efficacy of strabismus surgery training models: comparing the enucleated pig eye model to the anesthetized porcine model

Poster Group 17 (2:40 pm - 4:00 pm)
Judges: Brandon Hays, MD & Hugh Dowlen, MD
Moderator: Gary Willis

Student	Poster Title
Tarek Haggy	Emergency Stabilization of Pelvic Fractures: An Evaluation of Virginia EMS Training Protocols
Nicholas Mouser	The Effects of Mechanical Tissue Resuscitation (MTR) for Treatment of Ischemia Reperfusion Injury in a Swine Model of Acute Myocardial Infarction
Kristen Nicole Rogers	Pilot Study of Head Kinematics in Rodeo
Anita Rong	Effect of dressings imbued with methylene blue and gentian violet in the treatment of chronic hidradenitis wounds
Christopher Sheridan	Resting-State Connectivity Between the Insula and the Ventromedial Prefrontal Cortex Is Sensitive to Injury and Recovery after Sport-Related Concussion

Poster Group 18 (2:40 pm - 4:00 pm)
Judges: Patrick Ober, MD & Andrew South, MD
Moderator: Anna Perry, MPH

Student	Poster Title
Corrinne Dunbar	Perspectives of Community Organizations on Clinical-Community Partnership to Address Social and Functional Needs of Older Adults
Quinn Powell	Effect of Weight Loss on Lumbar Bone Marrow Adipose Tissue in Older Males and Females
Abdu Roussi	Short- and long-term outcomes in retransplanted elderly kidney recipients
Madeline Seagle	Role of Dietary Iron in Metformin Action
Karolina Wadolowska	Weight and Nutritional Correlates with Bacterial Vaginosis - A Pilot Study

Poster Group 19 (2:40 pm - 4:00 pm)
Judges: Timothy Pardee, MD, PhD & Yusuke Shiozawa, MD, PhD
Moderator: Lindsay Munn, PhD, RN

Student	Poster Title
Michael Christensen	Evaluating cardiac toxicity in locally advanced lung cancer treated with chemo radiation
Deborah Cull	Response and Local Control in Patients Treated with Low-Dose Radiotherapy for Tumoral Mycosis Fungoides
Elena Gavrila	Role of Tumor Mutational Burden Comparative with PD-L1 in HNSCC
Ankitha Iyer	Validation of Swallowing-related Organs at Risk in Patients Treated with Radiotherapy for Oropharyngeal Squamous Cell Carcinoma
Gregory Lombana	High-Risk Breast Cancer Screening in Patients Under 40

Poster Group 20 (2:40 pm - 4:00 pm)
Judges: Rakhee Vaidya, MBBS & Umit Topaloglu, PhD
Moderator: John Strong

Student	Poster Title
Sarah Friday	SBRT Versus Surgical Resection in Elderly Early-Stage Lung Cancer Patients: A Retrospective Review
Meghan Nelson	Examining the Impact of Cholecystectomy and the Microbiota in Breast Cancer Tissues in Breast Cancer Patients at Wake Forest Baptist Medical Center
Saadia Nur	Mitochondrial motility: assessing its role following chemotherapy treatment
Arsh Patel	Exploring addiction and addictive tendencies among adult tanning bed users
Zachary Patel	Interpreting the Initial Post-treatment PET/CT in Head and Neck Cancer Patients Treated with Radiotherapy

Poster Group 21 (2:40 pm - 4:00 pm)
Judges: Janel Hunter, MD & E. Shen, PhD
Moderator: Amanda Burcham

Student	Poster Title
Samuel Allen	Increasing Interest in Nuclear Medicine: Evaluation of an Educational Workshop
Sam Fabian	Quick Response (QR) Codes to Facilitate Formative Feedback
Virginia Lane	Identifying Faculty Motivators and Barriers to Participation as a Scholarly Mentor for Pediatric Residents: A Qualitative Approach
Hannah Mugford	Active Resilience Training- The Cure for Physician Burnout?!
Haley Park	Social and Functional Needs of Frail Older Adults: Qualitative analysis of patients' voices

Poster Group 22 (2:40 pm - 4:00 pm)
Judges: Jennifer Jackson, MD & James Kimball, MD
Moderator: Isaiah Randall, BS, CHES

Student	Poster Title
Jonathan Axford	VEGF Levels in RVO
Natalie Cignetti	A standardized ultrasound approach in neuralgic amyotrophy
Alexander Horn	Evaluating Long-term Outcome Trajectories of Selective Laser Amygdalohippocampectomy for Medically Intractable Mesial Temporal Lobe Epilepsy
Jeff Powell	Characterization of Injection Drug Use-Associated Endogenous Endophthalmitis
Mallory Suarez	Comparison of Different Methodologies for Sutureless Sclerotomy Wound Closure In a Porcine Animal Model

Poster Group 23 (2:40 pm - 4:00 pm)
Judges: Candice McNeil, MD, MPH & Bharathi Upadhya, MD
Moderator: Kimberly McDonough, MSN,RN, CCRN

Student	Poster Title
Miles Mayberry	The relationship between zinc use and COVID-19 clinical outcomes
Zackary Park	Validation of the FUNC Score for predicting functional outcomes and eventual disposition for patients admitted with non-traumatic ICH in the inpatient rehabilitation setting
John Petela	Utilization of Platelet-Rich Plasma in the Treatment of Hair Loss
Samuel Rafla	Comparative Analysis of Costs of Caring for Inpatient COVID-19 Patients and Non-COVID-19 Patients at One Academic Center
Katherine Salisbury	Electronic Consults in Dermatology: A Retrospective Analysis

Poster Group 24 (2:40 pm - 4:00 pm)
Judges: David Soto-Pantoja, PhD & Mariana Murea, MD
Moderator: Dianne Johnson

Student	Poster Title
Joshua Grosser	The Impact of Dynamic Perfusion on Ex-Vivo 3-Dimensional Vasculogenesis: Lessons for the Future
Bridget Krol	Prognostic Significance of Focal and Multifocal Positive Surgical Margins Following Robotic-Assisted Radical Prostatectomy among African American Men
Symonne Martin	Unmasking the Confounder- Inherent Physiological Variability in Swine During Automated Ischemia-Reperfusion Injury
Nathan McMullen	Serum IL-1β and IL-12 measurements in transgenic (mRen2)27 rats: an animal model of cardiometabolic dysfunction
Tallia Pearson	Administration of a biased kappa opioid receptor agonist as a non-addictive analgesic in mice

2021 Medical Student Research Day
Index of Authors and Poster Abstracts

Poster Title: The Role of Fibula Fixation in Preventing Malalignment in Distal Third Tibia Fractures Treated with Intramedullary Nailing

Student: Georges Abdelahad, Class of 2022
Faculty Mentor and Department: Eben Carroll, MD, Orthopedic Surgery

Funding Source: Wake Forest Baptist Medical Center Department of Orthopedics

ABSTRACT

Background: Distal third tibia and fibula fractures treated with intramedullary nailing can fail into angular deformity despite appropriate nailing technique. The purpose of this study was to examine variables specific to the injury pattern, nail placement, and whether fibula fixation assisted in preventing post-operative angular deformity or catastrophic failure.

Hypothesis: Fibula fixation in distal third tibia fractures treated will intramedullary nailing will assist in preventing post-operative angular deformity or catastrophic failure.

Methods: We performed a retrospective chart review of all distal third tibia and fibula fractures treated with intramedullary tibia nailing at a level 1 trauma center. Immediately post-operative and 3-month imaging were examined to determine the distal nail location as well as any angular deformity. Other demographic information, injury pattern, hardware failure, and infection complications were documented. Regression analysis was performed to identify factors associated with malalignment.

Results: 27 distal tibia-fibula fractures were identified, 3 of which had concurrent fibula fixation. Fractures with a more unstable fracture pattern were statistically associated with malalignment. Tibia nail endpoint was not associated with malalignment overall, however, among segmental and highly comminuted fractures, tibia nail endpoint was statistically associated with malalignment postoperatively. The addition of fibula fixation did not prevent malalignment. In contrast, tibia nail endpoint did not affect malalignment in simple fractures.

Conclusions: This study highlights the importance of precise tibia nail endpoint particularly in the setting of highly comminuted, unstable distal third tibia-fibula fractures. Furthermore, it suggests that fixation of fibula fracture may not compensate for medial endpoint of tibia nail in preventing malalignment. Catastrophic hardware failure was observed in a highly comminuted distal third tibia fractures with associated simple fibula fracture that was not fixed, despite adequate tibia nail endpoint. Although further research is warranted, these findings suggest that distal third tibia-fibula fractures with more complex fracture characteristics may likely benefit from stiffer constructs to prevent future deformity and catastrophic hardware failure.

Poster Title: Scoping Review of Literature on B-Mode Cranial Ultrasonography to Detect Intracranial Hemorrhage

Student: Beddome Allen, Class of 2021
Faculty Mentor and Department: Aarti Sarwal, MD, Department of Neurology

Funding Source: None

ABSTRACT

Background: Transcranial color-coded sonography (TCCS) is a commonly used diagnostic modality for evaluating cerebrovascular pathology. B mode imaging is the initial step towards image acquisition, but parenchymal assessment using B mode has not been widely adopted. With emerging reports on point of care cranial ultrasound imaging of intracranial hemorrhage (ICH) in the critical care setting, we performed a scoping review of literature to evaluate the utility of cranial ultrasound B mode in ICH diagnosis.

Hypothesis: Cranial ultrasound is an accurate neuroimaging alternative for patients who do not have timely access to computed tomography (CT) and magnetic resonance imaging (MRI) in the detection of ICH in critically ill patients.

Methods: We conducted a literature search of PubMed, Embase, Cochrane, Web of Science, Scopus, and CINAHL databases to identify articles evaluating the use of ultrasound in ICH diagnosis compared to CT or MRI using a broad set of Medical Subject Headings. All pediatric and adult studies were included if they reported at least one measure of diagnostic accuracy. Exclusion criteria included neonatal studies, studies reporting only Doppler findings, post-mortem studies, animal studies, and studies that lacked corroborating CT or MRI. Measures of diagnostic accuracy and ultrasound settings were extracted.

Results: We identified 18 studies meeting criteria (17 adult, 1 pediatric) conducted between January 1990 and July 2021. The diagnostic accuracy of cranial US in identifying ICH compared to CT or MRI varied between 78% and 100% in thirteen studies. Six studies reported sensitivities ranging from 46.7% to 100%. Four studies reported specificities with ranges from 92.9% to 100%. Small vessel disease and micro-hemorrhages were the most often reported false positive findings. The correlation coefficient between cranial ultrasound-derived and CT-derived ICH volume ranged from 0.4 to 0.981. Regarding ultrasound settings, seven studies provided the insonation depth, one study provided the mechanical index, and no papers reported the power or gain parameters. No studies reported the ultrasound presets used.

Conclusions: Cranial ultrasound may have reasonable accuracy in point of care ICH diagnosis, especially in austere environments or clinical scenarios where head CT is not accessible to a critically ill patient. Future studies should investigate cranial ultrasound parameters to identify clinically relevant presets that further enhance the diagnostic accuracy of ICH.

Poster Title: Knowledge and Attitudes towards Expedited Partner Therapy in Family Planning and Sexual Health Service Settings of a Local Health Department

Student: Miranda Allen, Class of 2023
Faculty Mentor and Department: Candice McNeil, MD, MPH Infectious Diseases

Funding Source: National Association of County and City Health Officials

ABSTRACT

Background: Expedited partner therapy (EPT), is a strategy that allows providers to prescribe treatment for the partners of patients infected with certain sexually transmitted infections (STIs) without first examining these partners. EPT has been found to increase rates of partner treatment and decrease rates of repeat gonorrhea and chlamydial infection. EPT for heterosexual partners of chlamydia patients has been permitted in North Carolina and supported by the North Carolina Medical Board since 2009; however, studies have shown that it has not been widely utilized by providers in North Carolina local health departments. The aim of this study is to assess the current state of EPT in Forsyth County, a North Carolina county with a high STI morbidity, as a pilot site to assess patient and provider barriers inhibiting EPT utilization and to improve EPT prescribing practices among providers. Ultimately, this data may be used to determine whether there are specific areas within the North Carolina healthcare system that can be adjusted to accommodate EPT usage and thus increase EPT uptake among patients and providers working both within and outside of Forsyth County.

Hypothesis: 1) Providers will express gaps in their knowledge of EPT criteria or some other disinhibition for prescribing EPT. 2) Clients will report a lack of knowledge about EPT and will have specific barriers to receiving EPT. 3) There will be a lack of uptake of EPT amongst eligible clients.

Methods: Forsyth County Department of Public Health (FCDPH) team members who provide sexual health and family planning services and key opinion leaders were given a choice of either a phone or self-administered online survey. Knowledge gaps in current EPT criteria/guidelines as well as attitudes pertaining to EPT utilization were assessed. A paper survey was administered on a voluntary basis to clients presenting for sexual health and family planning services at the same FCDPH clinic to assess opinions surrounding and barriers to EPT. Knowledge and understanding of the availability of EPT among this client population was assessed, as well as the significance of common barriers to utilizing EPT among this population.

Results: 95 participants were enrolled from October 2020 – June 2021 including 7 providers and 88 Family Planning and sexual health clients. The median age of clients was 28.5 and 62.5% were female, 36.36% male, and 1.14% intersex. Clients were Black/African American 67.5%, White 15.7%, Asian/Pacific Islander 4.81%, and reported other race 12.05%. Among providers, 85.71% were unaware of guidelines restricting EPT to heterosexual partners of chlamydia-positive clients and 28.57% were unaware of guidelines supporting treating multiple partners per client within 60 days. 33.33% of providers reported that prescribing EPT requires a significant amount of their time compared to only treating the client. Among clients, 91.57% of responders report no barriers to using or obtaining EPT. 98.7% of clients report no knowledge of EPT despite 48.81% of responders having a history of chlamydia infection. 82.5% of patients with prior history of chlamydia report that they have never been given EPT for their partner.

Conclusions: There are knowledge gaps related to EPT guidelines among providers in our study. The studied client population lacks knowledge or prior usage to EPT. Further investigation of effective interventions for increasing the uptake of EPT and decreasing provider time burden for prescribing EPT would be beneficial. Education on EPT guidelines may aid in maximizing EPT screening and prescription.

Source of mentor's funding or other support that funded this research: This project was supported by Grant Number 2020-063001 from the National Association of County and City Health Officials.

Poster Title: Increasing Interest in Nuclear Medicine: Evaluation of an Educational Workshop
Student: Samuel C. Allen, Class of 2022
Faculty Mentor and Department: Paige Bennett, MD, Department of Radiology
Funding Source: None

ABSTRACT

Background: Attracting more students to nuclear medicine is an important issue that must be addressed to improve diversity and meet growing staffing needs. Nuclear medicine is only taught in roughly one-third of medical schools with an associated nuclear medicine program and often this education occurs late in the curriculum once students have already chosen a different specialty. Increasing the exposure of medical students to the field early in their training is imperative to motivating students to pursue this specialty as a career. In this study, we implemented two short workshops about nuclear medicine and evaluated its impact on students' perceptions of the field.

Hypothesis: We hypothesized that the workshop will increase student knowledge, interest, and confidence in pursuing nuclear medicine as a career.

Methods: We developed and presented 30-minute "Introduction to Nuclear Medicine" workshops to undergraduate college students and preclinical medical students. After the workshops, participants completed a post-pre survey. This type of survey asks participants to indicate their level of agreement with a statement after completing the workshop and to retrospectively estimate what their response would have been before attending the workshop. Within this survey, students were asked to indicate their level of agreement (ranging from strongly disagree to strongly agree) with statements about perceived understanding of nuclear medicine as well as interest and confidence in pursuing the field if they were to choose it. Responses were coded on a Likert 1-5 scale with pre- and post- workshop results compared using T-test of means and ANOVA.

Results: Of the 83 students who attended the workshop, 79 (95.1%) students participated in the survey including 67 preclinical medical students and 12 undergraduate students. Of the 78 participants that provided demographic information, there were 38 (48.7%) women, 5 (6.4%) first-generation college students, and 39 (50.0%) people who identified as either multiracial or a race other than White/Caucasian. Among all participants ($n = 79$), there was a significant increase in perceived understanding of nuclear medicine ($p<0.001$), confidence in ability to pursue nuclear medicine ($p<0.001$), and interest in becoming a nuclear medicine professional ($p<0.001$). Perceived increase in knowledge was greatest among first-year medical students ($p = 0.031$) while interest ($p=0.40$) and confidence ($p = 0.85$) in pursuing nuclear medicine did not differ based on educational level.

Conclusions: Student interest in nuclear medicine can be improved using an easily implemented, short workshop. The significant improvements in perceived knowledge, interest, and confidence in pursuing nuclear medicine among this diverse cohort shows promise in utilizing similar workshops for improving diversity in the future. While there may be a benefit in specifically targeting first-year medical students in regards to knowledge gained from the presentation, the overall goal of increasing interest in a nuclear medicine career and empowering students to believe they can achieve this goal were met for all three cohorts without a significant difference between them. Future workshops should target students from all educational levels to increase interest and diversity in the field of nuclear medicine.

Poster Title: Access to Trauma Care in Winston-Salem, N.C.: An Analysis of Trauma Deserts and the Effects of Highway Closure

Student: Sophia Alvarado, Class of 2024
Faculty Mentor and Department: Amy N. Hildreth, MD, Trauma Surgery

Funding Source: Clinical and Translational Science Institute of Wake Forest School of Medicine

ABSTRACT

Background: Injury is the leading cause of morbidity and mortality in the United States, and many studies have previously demonstrated a higher incidence of limited access to trauma care in communities with higher proportions of racial minorities and socioeconomically disadvantaged persons. The goal of trauma systems is to decrease the morbidity and mortality with timely evaluation and early management, but distribution of trauma centers is not uniform. Communities can suffer from lack of access due to geographic distance among other factors. In Winston-Salem, NC, Atrium Health Wake Forest Baptist (AHWFB) is the only designated Level 1 trauma center.

Hypothesis: (1) Living in a trauma desert correlates with lower socioeconomic status and lower rates of insurance, and injuries originating inside the trauma desert will experience longer transport times to AHWFB. (2) The temporary closure of Interstate 40 in downtown Winston-Salem increased transport times and worsened outcomes for traumas originating inside trauma deserts.

Methods: Trauma registry data including location of injury, documented transport times to our facility, and patient disposition, were obtained for all injured patients presenting to AHWFB from June 1, 2017, to December 31, 2020. Data were divided into 3 time periods according to status of construction of Interstate 40: a 15-month pre-test period prior to construction, a 15-month test period during highway closure, and a post-test period after the highway was re-opened. Maps were constructed to illustrate the boundaries of the trauma desert in Winston-Salem, which was defined as a distance greater than 5 miles from AHWFB. Locations of injury were geocoded and mapped to determine their distance from the hospital and were also categorized by trauma desert status, defined as either within or outside of the trauma desert. Maps were imported into esri™ ArcGIS Community Analyst to identify socioeconomic characteristics inside and outside the trauma desert. Transport times were calculated for blunt versus penetrating injuries and one way ANOVA was used to compare transport times for each time period.

Results: Preliminary analysis found that both mean and median household income in 2021 was higher inside the trauma desert than outside. Additionally, the unemployment rate in 2021 was 6.3% inside the trauma desert compared to 7.2% outside. There were no significant changes in the mean total transport times for blunt versus penetrating injuries across the three time periods indicating that major highway construction did not significantly impact transport time. The highest concentrations of both blunt and penetrating injuries across the three time periods were located within a 5-mile radius of the hospital, as well as higher concentrations of injuries resulting in patient disposition to morgue or hospice.

Conclusions: Trauma desert definitions used in previous studies of larger metropolitan areas may not adequately describe access to trauma care in middle-sized cities such as Winston-Salem, NC. Decreased geographic distance from trauma centers may be less indicative of adequate access to trauma care and positive outcomes in cities where socioeconomically disadvantaged neighborhoods are within 5 miles of the hospital. This warrants further investigation into the existing non-geographic factors contributing to poorer patient outcomes.

Source of mentor's funding or other support that funded this research: We would like to acknowledge the Spatial Justice Studio at the Center for Design Innovation for their support. There were no other funding sources for this project.

Poster Title: A Systematic Review to Assess the Domains of Disparities Affecting Outcomes in Intracerebral Hemorrhage

Student: Priscila Arellano Zameza, Class of 2024
Faculty Mentor and Department: Aarti Sarwal, MD, Department of Neurology, Neurocritical Care

Funding Source: None

ABSTRACT

Background: Intracerebral hemorrhage (ICH) has high mortality and morbidity, with the 30-day mortality approaching 40%.[1] ICH patients often need specialized care available only at tertiary care medical centers requiring interhospital transfers, and many patients expire in the first few hours of evaluation. Of the patients admitted to the WFBMC and CMC neuro ICU, 80% are admitted as interhospital transfers. These patients are at risk of delayed care, and this disproportionally affects patients from rural communities. ICH outcomes and mortality rates are not improving significantly despite several advances in stroke systems of care, and social disparities and delays in transfer account for lack of improvement outcomes.[2] Multiple studies have investigated the risk factors that drive disparities in ICH and contribute to health inequity. Understanding how these drivers impact outcomes, and how providers can mitigate risk factors, is important in reducing ICH mortality and morbidity. There is heterogeneity in literature in disparities reported, outcomes evaluated, and interventions tested accounting for such inequities. There is no comprehensive resource on domains in which disparities have been identified to guide current clinical efforts and future research.

Hypothesis: We undertook a systematic review to identify and categorize all quantitative and qualitative studies on factors driving differences in ICH outcomes in the US population and define the domains in which disparities have been reported.

Methods: We used the PICO framework, PRISMA flow diagram, and Covidence software to conduct this systematic review. Three team members searched PubMed, Embase, and Google Scholar for population-based studies of healthcare disparities reported on acute ICH evaluation or treatment driving differences in patient outcomes using predefined eligibility criteria. Searches using a variety of MeSH terms, key terms, and filters were conducted June 2021. A modified STROBE checklist was used to assess and report the quality of study design and bias for each quantitative study, and a modified SRQR checklist to report on study design quality and bias for observational studies.

Results: A total of 760 potentially relevant studies were uploaded to Covidence. Eight additional studies were added through manual review of cited references. Based on preset criteria, 15 quantitative studies and 39 qualitative studies were included in the final review. Risk factors were grouped into seven encompassing categories. Preliminary results show that quantitative studies represent a smaller number of risk factor categories. This highlights a need for further inclusion of social determinants in ICH studies. Analysis of study design quality and bias using STROBE or SRQR checklists is ongoing.

Conclusions: Studies exploring disparities in ICH outcomes in the US population vary in study design and quality. There is a significant research gap identified in quantitative studies in not including entire categories of risk factors that contribute to disparities in ICH care. This systematic review can help healthcare professionals to account for the risk factors that impact ICH outcomes for different patient populations by adjusting clinical and research protocols. Additionally, this can help guide further research in interventions that can address disparities in a pragmatic way.

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Poster Title: VEGF Levels in RVO
Student: Jonathan Axford, Class of 2024
Faculty Mentor and Department: Mark Nelson, MD and Rebecca Sappington, PhD, Department of Ophthalmology
Funding Source: The Harry O. Parker Neuroscience Research Fund

ABSTRACT

Background: Retinal vein occlusion (RVO) is one of the most common retinal vascular diseases. An occluded retinal vein leads to elevated hydrostatic pressure and compromised retinal perfusion. This inadequate perfusion then induces the secretion of vascular endothelial growth factor (VEGF), which has been linked to several vision-threatening conditions, such as macular edema and neovascular glaucoma. Attempts to remove RVO's have done more harm than good. For this reason, once a patient is diagnosed with an RVO they will require indefinite intravitreal injections with an anti-VEGF agent to preserve their vision. The frequency of these injections is determined on an as-needed basis and is highly variable among patients. The current standard of care aims to minimize unnecessary treatments while preserving visual acuity through trial and error. This is done by routinely extending the treatment interval until visual decline or macular edema appears between injections. This retroactive approach often results in patients suffering from visual decline before treatment is warranted. This study aims to assess if patient data can be used to create a model that would indicate the need for treatment before these symptoms appear.

Hypothesis: The time between injections should be inversely correlated with the macular volume, central retinal thickness and visual decline. Additionally, the data could be able to provide some predictive value.

Methods: This was a retrospective analysis where the injection frequency, macular volume, visual acuity and central retinal thickness were gathered from patient records. The data was then analyzed and used to create a regression model.

Results: Results are pending further analysis at this time.

Conclusions: Results are pending further analysis at this time.

Source of mentor's funding or other support that funded this research: This project was supported by pilot research funds from the Department of Ophthalmology (PI: Mark Nelson, MD), Wake Forest School of Medicine.

Poster Title: Brain network clustering and frontal lobe connectivity in Latinx rural farmworker children and urban non-farmworker children

Student: David Baskin, Class of 2024
Faculty Mentor and Department: Paul Laurienti, MD, PhD, Department of Radiology
Funding Source: Department of Medical Education, Wake Forest School of Medicine

ABSTRACT

Background: Latinx rural farmworker children are a high-risk group for exposure to agricultural pesticides. Recent analysis has shown chemical exposure to be stratified by a greater detection of organophosphate (a neurotoxic agricultural pesticide) in rural farmworker children compared to urban non-farmworker children. In contrast, urban non-farmworker children were found to be exposed mostly to other pesticides. Exposure to neurotoxic pesticides is concerning for both populations as it may cause deleterious effects on neurodevelopment.

Hypothesis: We hypothesized that brain networks would differ between the two populations of Latinx children, with rural farmworker children exhibiting lower brain network clustering and reduced connectivity of the Default Mode Network (DMN) compared to urban non-farmworker children.

Methods: Whole brain networks were constructed from resting state fMRI data for forty-eight rural farmworker children and thirty urban non-farmworker children (age 8). These networks were then clustered using modularity into network communities, which yielded data driven analogs of large-scale brain networks defined in the literature. The DMN was the focus for analysis as prior literature suggests that organophosphates may alter the development of this circuit. The consistency of the DMN network community for each cohort was determined using a statistic called Scaled Inclusivity, which describes spatial overlap of the measured DMN community with a pre-defined template. The connectivity of the frontal lobe, a major component of the DMN, was assessed and regions that were two network steps away (second-order connections) were compared between groups. Scaled Inclusivity for the DMN and 2nd Order Connectivity for the rural farmworker children and urban non-farmworker children were compared using permutation tests.

Results: The network analyses clearly demonstrated that the DMN community was intact in both study populations. Contrary to our hypothesis, there was no significant difference between the groups ($p=0.582$). Brain maps of the frontal lobe connectivity suggested group differences in the projections to the posterior brain areas, however, these findings were not significant ($p=0.841$).

Conclusions: Although this analysis did not yield statistically significant differences in brain network connectivity between Latinx rural farmworker children and urban non-farmworker children, visualizations of the data did show subtle differences. While it is reassuring that differences in pesticide exposures have not yet been shown to result in significant variation, intra-cohort variability may factor into the results. In addition to a consistent expression of neuropathology, an increased variability within a cohort may represent effects of exposure. Future work should compare brain development in children having high pesticide exposure to children having low pesticide exposure. It is possible that both pesticide-exposed populations in our study have experienced detrimental effects on neurodevelopment. As more longitudinal data is collected, temporal changes in development may be identified. Our findings should not deter the continued implementation of efforts to reduce neurotoxic pesticide exposure in North Carolina children.

Source of mentor's funding or other support the at funded this research: Preventing Agricultural Chemical Exposure among North Carolina Farmworkers (PACE5) study Grant Number R01ES008739 National Institute of Environmental Health Sciences (NIEHS).

Poster Title: Evaluation of a Novel Multimodal Opioid-Free Postoperative Pain Management Pathway Following Robotic-Assisted Radical Prostatectomy: A Pilot Series in the Veteran Population

Student: Caleb Bercu, Class of 2024
Faculty Mentor and Department: Ram Pathak, MD, Department of Urology

Funding Source: Kulynych Family Funds for Medical Research in Honor of Timothy C. Pennell, MD

ABSTRACT

Background: Veterans have disproportionate risk of opioid misuse and abuse compared to the civilian population. Managing acute postoperative pain without opioids is of the utmost importance for the Veteran patient population. This pilot study evaluates a novel multimodal opioid-free pain control regimen by assessing postoperative pain in Veterans undergoing robotic-assisted radical prostatectomy (RARP).

Hypothesis: Postoperative RARP pain treatment using a novel opioid-free multimodal pathway will demonstrate no significant differences in mean visual analogue pain scores on postoperative days 0 and 1 compared to traditional opioid treatment modalities.

Methods: Prospective data was collected from patients undergoing RARP at a Department of Veterans Affairs Medical Center. Patients in the opioid-cohort received tramadol, hydrocodone-acetaminophen, or oxycodone-acetaminophen postoperatively. The opioid-free novel multimodal approach consisted of 100mg gabapentin TID, 15mg ketorolac Q6 hours, and 1mg scheduled IV acetaminophen Q6 hours. Pain scores were collected using a visual analogue pain scale on postoperative days 0 and 1.

Results: Data was collected from 57 patients, 33 treated with opioids and 24 with the opioid-free pathway. There were no significant differences in demographics ($p > 0.05$) between cohorts. No significant differences were observed for preoperative and intraoperative variables ($p > 0.05$). Average postoperative day 0 pain scores for opioid-free (2.2 ± 3.1) and opioid treatments (3.1 ± 3.1) were not statistically different ($p = 0.1321$). Postoperative day 1 differences of average pain scores for opioid-free (0.9 ± 1.9) and opioid (1.6 ± 3.1) treatments were not statistically significant ($p = 0.1647$).

Conclusions: The novel multimodal opioid-free treatment in this study may be effectively utilized for postoperative pain during hospital recovery of Veterans undergoing RARP. Future directions include a randomized control clinical trial in the general population.

Source of mentor's funding or other support that funded this research: Department of Urology, Atrium Health, Wake Forest Baptist

Poster Title: Phenomenological Research: A qualitative approach to assessing patient experiences in the ED

Student: Danielle Black, Class of 2024
Faculty Mentor and Department: Marquita Norman, MD; Department of Emergency Medicine

Funding Source: Wayne and Gayle Meredith Student Research Support Fund

ABSTRACT

Background: Emergency Departments (ED) exist as a major component of the healthcare system, serving both emergent and primary care needs of its patients and acting as a "safety net" within the US healthcare system at large. Despite its vital role within the healthcare system, several disparities across racial/ethnic groups have been documented within Emergency Medicine care. Recent Press Ganey data revealed that Black/African-American patients at Wake Forest Baptist Medical Center report longer perceived wait times than their White counterparts, but the underlying cause for this difference remains unclear.

Aims: The purpose of this study is to use a phenomenological methodology to gain a deeper understanding of the factors contributing to the perception of longer wait times among Black/African-American patients utilizing the ED at Wake Forest Baptist Medical Center. The specific aims of this project are to: **(1)** describe patient experiences with wait times among adult (age 18+) African-American patients recently discharged from the emergency department, and **(2)** use data collected from the patient interviews to identify opportunities for improving experiences with wait times among adult African-American patients being seen in the emergency departments.

Methods: Telephone interviews will be conducted with 20 patients who received care at the Emergency Department at the Wake Forest Baptist Medical Center campus, within 2 months of the patients' visits. All interviews will be recorded and transcribed. Thematic coding will be conducted using NVIVO software, and data will be analyzed to assess for code and meaning saturation.

Poster Title: A retrospective assessment of HIV screening efforts at Wake Forest Baptist Health
Student: Allison Boone, Class of 2023
Faculty Mentor and Department: Katherine Schafer, MD, Internal Medicine
Funding Source: National Center for Advancing Translational Sciences, National Institutes of Health, through Grant Award Number UL1TR001420

ABSTRACT

Background: Southern states currently bear the greatest HIV burden in the United States. In 2016, 47% of deaths due to HIV occurred in the South, and over half of new diagnoses in 2017 were made in Southern states. Several factors distinguishing the South from other regions of the US may play a role in this regional disparity, including the relatively high proportion of people living in rural areas. This poses a unique challenge, as these individuals tend to have decreased access to healthcare providers locally and are less likely to have access to reliable transportation. Racial disparities in the South also play a significant role in access to HIV screening and care; African American men who have sex with men are particularly affected. Given the higher rates of HIV diagnosis and mortality in the South, screening efforts within hospital systems may be falling short of CDC guidelines for HIV screening. The objective of this study is to assess Wake Forest Baptist Health's adherence to HIV screening recommendations outlined by the CDC and investigate if race, sex, and geographic location influence a person's probability of being screened.

Hypothesis: We hypothesize that Wake Forest Baptist Health will fall short of the CDC's guidelines and that the demographic factors mentioned previously will be strong predictive factors of this deficit.

Methods: Patient data, including address, sex, race, ethnicity, and birth date, for those who had an encounter in the WFBH system from January 1, 2018 – December 31, 2018 were obtained from Epic/Wake One and stored in REDCap. Patient addresses were identified as "rural" or "urban" using 2010 US Census data. Only patients ages 13 – 64 years of age at the time of their visit were included. Data were analyzed using Pearson's Chi-squared test with significance defined as $p<0.01$ to account for multiple comparisons. Python, GraphPad and Excel were used in data processing and analysis.

Results: Of the 138666 patients who met the CDC's screening criteria, 18% were screened for HIV at WFBH. Patients living in urban areas were more likely than those in rural areas to be screened, at a rate of 24.7% and 14.0% respectively ($p<0.0001$). Females were also screened more frequently than men (20.8% vs. 13.9%; $p<0.0001$). Screening was not evenly distributed among races ($p<0.0001$), with African Americans screened at the highest rate, 33.9%. When broken down by type of residence, the rate of screening in African Americans residing in urban areas was lower than that of rural areas (29.1% vs 41.9%; $p<0.0001$). In other racial groups, those residing in urban areas were more likely or equally as likely to be screened compared to their rural counterparts. When considering ethnicity, Hispanic patients were screened at a higher rate than non-Hispanic patients (28.7% vs. 17.8%; $p<0.0001$).

Conclusions: These data indicate low rates of HIV screening among eligible patients receiving care at WFBH. Additionally, HIV screening at WFBH fits published trends indicating lower screening rates in rural areas versus urban areas. This trend held when accounting for sex and ethnicity, but was not consistent when considering race. Overall, these data indicate room for improvement in HIV screening efforts at WFBH.

Source of mentor's funding or other support that funded this research: The authors gratefully acknowledge use of the services and facilities of the Center for Biomedical Informatics, funded by the National Center for Advancing Translational Sciences (NCATS), National Institutes of Health, through Grant Award Number UL1TR001420.

Poster Title: Locally Advanced Lung Cancer and Radiation Therapy Contour Study
Student: Michael Christensen, Class of 2024
Faculty Mentor and Department: Michael Farris, MD, Radiation Oncology
Funding Source: Kulynych Family Funds for Medical Research in Honor of Timothy C. Pennell, MD

ABSTRACT

Background: Lung cancer is the leading cause of cancer death in the United States. Radiation therapy is a modality often used in the treatment of locally advanced lung cancer, but there is extensive room for better defining the critical thresholds associated with cardiac toxicity. Recent small studies have investigated the dose delivered to key cardiac substructures and have shown that this approach may serve as a better predictor of toxicity than just assessing the dose delivered to the heart as a whole. Our objective is to validate the utilization of these substructure approaches with patients that have been treated for locally advanced non-small cell lung cancer at Wake Forest Baptist Health (WFBH).

Hypothesis: It is hypothesized that there will be more adverse cardiac events (ACE) associated with patients who received more radiation therapy to particular cardiac substructures.

Methods: We reviewed patients with locally advanced non-small cell lung cancer who were treated at WFBH during the year 2015 using radiation therapy. We excluded patients who did not have radiation treatment plans or dosimetric data available to review or at least 1 month of follow up. Cardiac substructures were contoured using MIM, a radiation therapy specific software for treatment planning, using each patient's existing simulation CT imaging. The cardiac substructures contoured included: right atrium, right ventricle, left atrium, left ventricle, left anterior descending artery (LAD), right coronary artery (RCA), circumflex artery, and the whole heart. The actual dose and beam profiles used during treatment delivery were used to quantify the mean and max (D0.03 cc) dose of radiation delivered to each substructure. Subsequent adverse cardiac events (ACE) were extracted from an existing REDCap database and correlation of ACE with dose delivered to the cardiac substructures was evaluated using statistical analysis.

Results: Of the 34 evaluable patients with locally advanced lung cancer treated in 2015, the median age at diagnosis was 65.7 years, had ECOG 0-1 (85.2%), and all were current (35.3%) or former smokers (64.7%). All patients were staged using PET/CT, a majority were stage III (82.3%), and the predominant histology included adenocarcinoma (46.9%) or squamous cell carcinoma (40.6%). Patients were treated with several radiation therapy approaches including neoadjuvant (11.8%), definitive (79.4%), and adjuvant (8.8%). Twenty-three (67.6%) patients were treated with three-dimensional conformal therapy while 11 (32.4%) patients were treated with intensity-modulated radiation therapy, with a median dose of 60 Gy. Concurrent chemotherapy was given for 29 (85.3%) patients, induction chemotherapy for 4 (11.8%), and adjuvant chemotherapy was given for 6 (17.6%) of patients. Only four patients (11.8%) received immunotherapy. After completions of radiation therapy, 6 patients (17.6%) developed an ACE. No cardiac substructure mean or max dose was found to significantly correlate with development of ACE after radiation therapy.

Conclusions: Dose to cardiac substructures did not correlate with development of cardiac events in this preliminary analysis. This conclusion is limited due to the retrospective nature of this analysis, the small sample size included for analysis, as well as the low cardiac event rate which may be limited due to the lack of quality and reporting of such events within the electronic medical record. Further analysis will be completed after full dosimetric information is available for the patients in the time period from 2013-2020.

Poster Title: A standardized ultrasound approach in neuralgic amyotrophy
Student: Natalie Cignetti, Class of 2022; Siobhan Cox, Class of 2024
Faculty Mentor and Department: Michael Cartwright, MD, Neuromuscular, Neurology

ABSTRACT

Background: Neuralgic Amyotrophy (NA), also referred to as idiopathic brachial plexitis and Parsonage-Turner syndrome, is an uncommon peripheral nerve disorder characterized by acute severe shoulder pain followed by progressive upper limb weakness and muscle atrophy. NA likely has a multifactorial etiology and frequently involves specific nerves of the upper limb. While NA is under-appreciated and often difficult to diagnose, early recognition may prevent unnecessary tests and interventions, and potentially allow for treatment of the active inflammation. High resolution ultrasound is an inexpensive, real-time, point of care test that has demonstrated utility in NA. Certain ultrasound findings are specific to NA and may help predict prognosis and need for surgical intervention. The purpose of this study is to develop a standardized ultrasonographic approach for the diagnosis and evaluation of suspected NA.

Methods: Current literature was reviewed to determine appropriate recommendations to diagnose NA. We used a GE logic E ultrasound device and 12 MHz linear array transducer to image the nerves most frequently involved in NA on an ultrasound model. We first located each nerve near a well-defined anatomic landmark in the short axis view. From this site, we scanned proximally and distally along the entire length of the nerve or to the extent of which a reasonable image could be obtained. We saved images of each nerve at relevant locations throughout the neck and upper extremity. Anatomic reconstructions were created using Adobe Photoshop app to depict the relevant anatomy of each nerve course.

Results: Ultrasound images of the musculocutaneous, median, ulnar, radial, suprascapular, axillary, long thoracic, and phrenic nerves were obtained and displayed alongside photographs demonstrating probe location on an ultrasound model and anatomic reconstructions. Technical instructions on patient position, probe orientation, and how to locate and trace each nerve were described.

Conclusions: Our study describes a clinically relevant and feasible systematic approach for utilizing ultrasound as an adjuvant to history, physical exam, and electrodiagnostic testing in evaluating and diagnosing suspected NA.

Poster Title: Vascular and Microstructural Markers of Cognitive Impairment and Dementia
Student: Claudia Coffin, Class of 2024
Faculty Mentor and Department: Sam Lockhart, PhD, Gerontology and Geriatric Medicine
Funding Source: Department of Gerontology and Geriatric Medicine and Center for Healthy Aging and Alzheimer's Prevention, Wake Forest School of Medicine

ABSTRACT

Background: Arterial stiffness may play a role in the development of dementia, presumably through its effects on white matter integrity and hyperintensities (WMH). However, the relationships among arterial stiffness, white matter microstructure, and WMH volumes remain poorly understood. Arterial stiffness increases monotonically with age and its increase is accelerated by cardiometabolic disorders, e.g., hypertension, metabolic syndrome, and diabetes. Further exploration of these relationships is key to the development of targeted therapies, early management, and detection.

Hypothesis: (1) Higher pulse wave velocity (PWV) is associated with higher free water, lower fractional anisotropy, lower white matter and grey matter cerebral blood flow, and higher volume of WMH. (2) Higher PWV is associated with worse cognitive performance.

Methods: Arterial stiffness was measured using carotid-femoral pulse wave velocity (cfPWV) in individuals with baseline systolic blood pressure (SBP) measurements, detailed cognitive testing, cognitive adjudication, and brain MRI. We examined associations of cfPWV and SBP with cognitive function (Montreal Cognitive Assessment (MoCA), Preclinical Alzheimer's Cognitive Composite (PACC5), and domain measures of memory and executive function) and brain MRI measures of: macrostructure [volume of gray matter and WMH from T1-weighted and FLAIR imaging], white matter microstructure [neurite orientation dispersion and density imaging (NODDI) free water (FW) and diffusion tensor imaging (DTI) fractional anisotropy (FA)], and cerebral blood flow (CBF) in white matter (WM) and gray matter (GM). Age, race, gender, education, and APOE-4 status were included as covariates and in interaction terms in linear regression analyses.

Results: Among 463 participants with a mean age 70±8 years and cognitive adjudication (44 dementia, 159 MCI, 260 normal cognition), higher cfPWV was associated with lower WM microstructure (higher FW and lower FA), higher WMH volume, and worse cognitive performance (MoCA, PACC5, and executive function). While no main effects between cfPWV and CBF were detected, cfPWV had stronger associations with FW, FA, and WMH in men, and with lower WM CBF in people with dementia. Higher SBP was associated with higher FW, higher WMH volume, and lower WM and GM CBF. SBP had stronger associations with WMH in older participants and GM CBF in participants with impaired fasting glucose. No other interactions were detected.

Conclusions: Arterial stiffness is associated with microstructural changes and poorer global and executive cognitive function.

Source of mentor's funding or other support that funded this research: The project described was supported by Grant number P30 AG049638 from the National Institutes of Health.

Poster Title: Response and Local Control in Patients Treated with Low-Dose Radiotherapy for Tumoral Mycosis Fungoides

Student: Deborah Cull, Class of 2022
Faculty Mentor and Department: Ryan Hughes, MD, Wake Forest Department of Radiation Oncology
Funding Source: None

ABSTRACT

Background: Mycosis fungoides (MF) is a cutaneous T-cell lymphoma characterized by disfiguring and pruritic patch or plaque lesions that may progress into tumoral lesions (TLs). Low-dose radiotherapy (LDRT: 8 Gy delivered in 2 daily fractions) is an effective option for local palliation, but little evidence exists regarding its efficacy for TLs. We assessed response and local control (LC) rates for patients treated with LDRT for MF and compared these outcomes between TL and non-TL.

Hypothesis: It his hypothesized that low-dose radiotherapy (LDRT) is an effective option for palliation and local control in tumoral lesions (TLs).

Methods: A total of 73 lesions in 18 patients treated with LDRT for MF between 2013-2020 were analyzed. Patients were treated with superficial electrons (90%) or photons (10%) using beam energies of 6-12 MeV or 6-10 MV, respectively. Response was defined at first follow-up (median: 7 weeks) and defined as follows: complete response (CR), 100% reduction/disappearance of skin lesions and symptoms involved; partial response (PR), >50% but <100% reduction; no response (NR), <50% reduction. Overall response (OR) was a composite outcome of CR/PR versus NR. LC was defined as the duration of time from RT to local relapse (determined clinically or pathologically) or last follow-up (censor), was estimated using the Kaplan-Meier method and compared between groups using the log-rank test. Median follow-up of individual lesions was 9.3 months (95% CI 1.2-68.3).

Results: Median age was 68 years, 85% of patients were male, 64% identified as Caucasian, 34% as Black/African American (B/AA), and 1% other. Lesion site included the lower extremity (34%), upper extremity (30%), chest/abdomen/trunk (19%) and head/face/neck (16%). Of the 73 lesions, 25 were tumoral and 48 were non-tumoral. A greater proportion of B/AA race was observed in the TL group (52% TL v. 25% non-TL, $p = 0.05$). Five lesions had biopsy-confirmed large cell transformation, all in the TL group. OR was 93.2% overall (97.9% non-TL v. 84% TL, $p = 0.04$). In the non-TL versus TL groups, CR was observed in 16.7% v. 4.0%, PR in 81.2% v. 80.0%, NR in 2.1% v. 16.0%, respectively. Local progression was noted in 6/25 TL and 0/48 non-TL. LC at 6, 12, and 24 months was 100% for non-TLs compared with 86.6% (95% CI 73.4-100), 80.8% (65.3-100), and 60.6% (38.5-95.4) for TLs ($p < 0.01$). Median time-to-progression in the 6 TL that failed was 5.5 months (95% CI 3.2-17.3).

Conclusions: LDRT yields excellent response and lesion control for non-tumoral MF. OR rates and LC were significantly lower in TLs compared with non-TLs. However, LDRT still offers clinically meaningful response and durability of palliation in most patients with tumoral MF. A higher dose may improve outcomes in select patients (i.e. single TL or large cell transformation), but LDRT appears to be a reasonable option for palliation of tumoral lesions for patients in whom the risk/benefit profile is acceptable.

Source of mentor's funding or other support that funded this research: The project described was supported by the Department of Radiation Oncology.

Poster Title: Analysis of Tranexamic Acid Administration in Orthopedic Hip Trauma Patients
Student: Amelia Davidson, Class of 2024
Faculty Mentor and Department: Jason Halvorson, MD, Department of Orthopedic Surgery
Funding Source: Department of Orthopedic Surgery (MRSP)

ABSTRACT

Background: Traumatic injury and its precipitating conditions, such as orthopedic fracture, have resulted in a societal loss of $2.2 trillion in the United States from 2013-2018 and are predicted to become the third leading cause of injury in 2022. Many of these conditions have increased morbidity and mortality when associated with unstable hemodynamic changes. Thus, an agent that addresses hemodynamic instability would pose great therapeutic advantage. Tranexamic acid (TXA), a synthetic version of lysine and antifibrinolytic, is one such possibility. It has been established that TXA decreases all-cause mortality within 4 weeks of injury in war-associated traumas, but it is unknown whether this is true for civilian trauma patients. The few studies that have been conducted in civilian populations focus predominantly on obstetric-gynecologic injuries and do not address other hemodynamic factors such as hemoglobin levels in post-operative anemia and show mixed evidence for TXA's utility. Therefore, analysis of Orthopedic-specific trauma patients and their hospital stay are likely to provide valuable insight in elucidating TXA's role in civilian trauma.

Hypothesis: (1) TXA administration will demonstrate a decreased amount of blood products and (2) will demonstrate an effect on post-operative anemia.

Methods: A retrospective cohort study was performed for orthopedic trauma patients that reported to Wake Forest Baptist Health for care between 2015 and 2019. Inclusion criteria consisted of: 1) coded for ORIF of the hip and 2) were Leveled trauma patients within the last 10 years. Variables of interest included demographic, TXA administration, blood transfusions, pre-op and post-op hemoglobin, ASA status, and hip fracture type. Data were reported as mean (standard deviation (SD)), median (quartile 1 or 2), or count (percentage). The relationship between TXA administration and blood transfusion was assessed by a mixed effects linear regression with random effects calculated for each patient with offset of intra-operative blood loss. A mixed effect linear regression with random effects by patient was also conducted for hematocrit levels over a four-day period. Confounders that were controlled included sex, age, ASA score, MAP, and an interaction between TXA and time. Sensitivity analyses were then utilized to understand the stability of the results and included: 1) only analyzing blood transfusion during ED evaluation and 2) excluding APA fracture types.

Results: 283 patients (Age: 45.0 (SD=20.4), BMI: 27.3 (SD=19.4), Female %: 46) were included in the study, of which 40 (14%) had received TXA. There were no significant differences in demographics between groups except for ASA physical status classification, which had averages of 3.5 and 2.3 (95% CI (-1.1, -0.5), $p<0.0001$) in the TXA group and non-TXA group, respectively. (Intraoperative blood loss was significantly less in the TXA group ($p=0.015$). This contrasts with overall blood transfusion, which was about 260 (95% CI (143.8, 375.9), $p<0.001$) mL greater in the TXA group. Post-operative hemoglobin was also significantly lower in the TXA group (95% CI (-1.9, -0.7), $p=0.004$).

Conclusions: Patients who received TXA had significantly greater volume of blood transfusion without a subsequent change in post-operative anemia. However, no significant difference was detected after stratifying for ASA physical status or type of injury in each group. This was likely from a significantly higher ASA status, and thus, it can reasonably assumed that TXA helps minimize hemodynamic issues in more-severe cases. In patient care, TXA can lessen the amount of blood product use and cost in the setting of orthopedic trauma. Future studies may delve into other operative procedures or compare blood loss in TXA patients to similar patients before its implementation in 2015.

Poster Title: Optimal anchor placement for collateral ligament reconstruction in elbow trauma: A 3D modeling study

Student: Connor Dean, Class of 2024
Faculty Mentor and Department: Benjamin Graves, MD, Orthopedic Surgery
Funding Source: Department of Student Affairs, Wake Forest School of Medicine

ABSTRACT

Background: Anchor fixation in the medial and lateral distal humeral columns is a critical step in many variations of MCL(UCL) and LCL repair in elbow trauma. The correct placement of surgical hardware in these procedures is critical for postoperative recovery and for avoiding revision surgeries. With the novel advancement of 3D modeling software there exists an opportunity to analyze anchor fixation with digital precision.
Orthopedic surgical planning utilizing CT guidance for screw placement in the humerus has been studied in procedures including Laterjet but not in MCL and LCL repair. There is also limited data that dives into specific dimensional analysis of screw placement in the distal humerus.
Surgery to repair the LCL and MCL is prevalent and challenging. Revisions are common and often relate to errors in selection of the morphological position of hardware or errors in bone tunnel placement in the distal humerus. A 3D analysis of this area to would be a novel approach to surgical planning allowing for an in-depth analysis of the proper positioning of hardware to prevent post-op complications and revisions.

Hypothesis: This study is not hypothesis based, we are looking to analyze a surgical approach and describe this approach using dimensional analysis.

Methods: Subjects will be recruited CT scans of the humerus were reconstructed from DICOM stacks in Blender software. These models were be analyzed for screw placement in the medial and lateral epicondyles along the point of isometry. Data was collected relating to screw depth, angle and position of when inserted into the medial and lateral columns of the distal humerus.

Results: These results are preliminary (n=10).
LCL ligament fixation from the lateral isometric point of the distal humerus can be undertaken with a BioComposite SwiveLock 4.75mmx19.1mm. Insertion angle cannot deviate anteriorly form the sagittal axis of the humerus more than (31.72° ± 7.58°). Deviation posteriorly from the sagittal axis cannot exceed (56.17° ± 3.60°). without breaching the surface of the humerus and exiting the lateral column. Deviation of anchor insertion superiorly cannot exceed (39.97° ± 18.07°). Deviation of anchor insertion inferiorly cannot exceed (43.38° ± 9.45°) without breaching the surface of the humerus and exiting the lateral column.
MCL ligament fixation from the medial isometric point of the distal humerus can be undertaken with a 3.5 mm PEEK SwiveLock. Insertion angle cannot deviate anteriorly to the mid coronal plane of the humerus more than (9.14° ± 4.78°). Deviation of anchor insertion posteriorly to the mid coronal plane cannot exceed (40.99° ± 17.75°). without breaching the surface of the humerus and exiting the lateral column. Deviation of anchor insertion medially from the coronal plane of the humerus cannot exceed (14.67° ± 9.93°). Deviation laterally from this axis cannot exceed (108.47° ± 17.49°). without breaching the surface of the humerus and exiting the medial column.

Conclusions: Three-dimensional analysis can provide a framework for approaching MCL and LCL ligament fixation in the elbow. An understanding of the spatial limitations of anchor fixation will lead to fewer postoperative complications and revision surgeries. This study provides a framework for guided approaches to anchor fixation in the lateral and medial column of the humerus.

Source of mentor's funding or other support that funded this research: MSRP: Department of Student Affairs, Wake Forest School of Medicine

Poster Title: Dance for Diabetes: A Study Design and Implementation Project Using Dance to Improve Diabetes Self-Management

Student: Kychelle Del Rosario, Wake Forest School of Medicine Class of 2023
Faculty Mentor and Department: Julienne Kirk, PharmD, Wake Forest Baptist Health Department of Family Medicine

Funding Source: North Carolina Albert Schweitzer Fellowship

ABSTRACT

Background: Exercise is a vital component of diabetes management, but it is often one of the most difficult lifestyle changes for patients to make. Reluctance to exercise may come from low motivation, lack of time, or inability to find an enjoyable form of exercise. It is often accompanied by low self-esteem and guilt. Dance has been previously shown to be beneficial to both physical health in patients with chronic illness. Its therapeutic nature has also been utilized to improve psychological health in patients with mental illness. Investigations into the utility of dance as exercise in the management of diabetes are novel. The investigators looked into the characteristics of patients with diabetes mellitus or prediabetes who are interested in dance as a form of exercise.

Hypothesis: Patients with diabetes who are highly empowered to take care of their diabetes are more likely to enroll in a dance intervention for diabetes management.

Methods: An interventional study was conducted including 25 adults diagnosed with diabetes mellitus (Type 1 or Type 2) or prediabetes. Baseline data on demographics and diabetes health [including diagnosis, medications, body mass index (BMI), hemoglobin A1c] were obtained from chart review. Initial surveys regarding current level of physical activity using the National Health and Nutrition Examination Survey Physical Activity and Physical Fitness Questionnaire (NHANES 2019-2020 PAQ) and self-perception of the quality of diabetes self-management using the Diabetes Empowerment Scale (DES) were taken via phone interview. Participants attended a 1.5-hour class with a 1-hour dance workshop and 30-minute diabetes education class either once or twice weekly for 8 weeks via a virtual meeting platform.

Results: The 25 participants that were a part of the study were very similar in terms of demographic data. The mean age was 58.8 years with a standard deviation of 10 years. All but one of the participants were female. All of the participants were diagnosed with Type 2 diabetes except for one with prediabetes. The BMI of participants was variable at 33.8 with a standard deviation of 4.69. All of the participants that attended 1 or more classes of the intervention were patients who had attended or were currently attending diabetes education classes. The mean Diabetes Empowerment Scale (DES) score was 4.51 out of max score of 5, with a standard deviation of 0.45.

Conclusions: The high DES scores and history of diabetes education in the participants of the study indicate that similar people would be motivated to participate in a dance intervention compared to those without this history. This type of dance intervention appears to be more appealing to women, ages 40-60 years old.

Source of mentor's funding or other support that funded this research: North Carolina Albert Schweitzer Fellowship.

Poster Title: Perspectives of Community Organizations on Clinical-Community Partnership to Address Social and Functional Needs of Older Adults

Student: Corrinne Dunbar, Class of 2024
Faculty Mentor and Department: Deepak Palakshappa, MD, MSHP, Internal Medicine; Kate Callahan, MD, MS, Gerontology

Funding Source: Department of Medical Education, Wake Forest School of Medicine

ABSTRACT

Background: Collaboration between health systems and community-based organizations is increasingly incentivized and adopted to address patients' social determinants of health. The role of these partnerships, however, in addressing the social and functional needs of frail, older adults, is not well characterized.

Hypothesis: The primary objective of this qualitative study was to gain a greater understanding of community organizations' perspectives in collaborating with health systems to address frail, older adults' needs.

Methods: All organizations that provide social services to older adults (>60 years old) in Forsyth County, NC were eligible to participate in this qualitative study. We used snowball recruitment to identify additional eligible organizations. Organization representatives who completed an interview included staff members who were involved in the organization leadership and/or involved in organization programming. All interviews were digitally recorded, audio taped, and transcribed. We developed a coding scheme and used the constant comparative method to identify themes. We used a modified grounded theory approach to analyze the data.

Results: We invited 43 organizations to participate, of which 28 representatives from 22 distinct community organizations completed an interview. Of the interviewed organizations, 11 provide social services only, 5 provide functional/mobility assistance, and 6 provided both social and functional services. We identified 3 primary themes with additional subthemes. The 3 primary themes included: 1. the social and functional needs of frail, older adults are intertwined; 2. availability of community-based services does not translate into access; 3. intentional clinical-community partnerships could help address older adults' needs.

Conclusions: For frail, older adults, social and functional needs are often intertwined, as limitations in mobility can impact adults ability to address basic needs (e.g. food, social interaction) and limited economic resources can make it challenging to improve function (e.g. transportation). Health systems and community organizations have distinct areas of expertise, and purposeful collaboration between them could be important to meeting the social and functional needs of older adults.

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Poster Title: Identification and histological mapping of senescent stromal cells in adipose tissue: a path towards tissue desenescence

Student: Anthony Elias, Class of 2024
Faculty Mentor and Department: Ramon Llull, MD, PhD, Department of Plastic and Reconstructive Surgery

Funding Source: Department of Plastic and Reconstructive Surgery, Wake Forest School of Medicine

ABSTRACT

Background: Cellular senescence – a cell cycle dysregulated state – has widely been considered to be detrimental to tissue turnover and thus contributory to histotypical aging. Weeding out tissue resident senescent cells, hence "desenescing" aging tissues, may improve tissue upkeep while rendering senescent-rich cell populations. We hypothesize that the distribution of these cells within tissue is determined by their developmental progression: as precursor cells accumulate around the PERIvascular region, their descendant postmitotic cells – which are more likely to be senescent – are displaced further out from the vascular axles (the PARAvascular region). $p16^{INK4a}$, a cyclin-dependent kinase inhibitor, is considered to be a cellular marker for senescence.

Hypothesis: By quantifying the population of $p16^{INK4a}$-expressing cells in these regions, we aim to confirm the unequal distribution of senescent cells within adipose tissue.

Methods: Adipose whole tissue samples (n=5) were needle biopsied and stained with anti-$p16^{INK4a}$ monoclonal antibody. Equivalent samples were enzymatically dissociated, and their resulting isolated cell suspensions were cytospun, anti-$p16^{INK4a}$ stained, and quantified by manual count and image cytometry.

Results: $p16^{INK4a}$+ stromal cells were readily present in enzymatically isolated cell suspensions: mononuclear bodies of 20-35 ø with a small nuclear/cytoplasm ratio, homochromatic nucleus, and clear cytoplasm. Initial manual cell count ranged between 1-3% in high power magnification fields, similar to preliminary image cytometry readings of approximately 4%. A number of large $p16^{INK4a}$+ cluster structures were also identified; their cellular composition remains under study. In biopsied tissue samples, $p16^{INK4a}$+ stromal cells were present with an approximate density of 70.33 ± 29.96 cells/mm^3. Interestingly, $p16^{INK4a}$+ cells were preferentially located in PARAvascular regions and sparsely in PERIvascular regions (81.23 ± 8.41% PARAvascular, P= 0.0007, paired t test).

Conclusions: Senescent stromal cells within adipose tissue are identifiable in lipoaspirated samples as $p16^{INK4a}$+ cells. They are predominately housed within the paravascular regions, and enzymatic dissociation appears to effectively extract $p16^{INK4a}$+ cells.

Source of mentor's funding or other support that funded this research: Department of Plastic and Reconstructive Surgery, Wake Forest Baptist Health

Poster Title: Quick Response (QR) Codes to Facilitate Formative Feedback
Student: Sam Fabian, Class of 2023
Faculty Mentor and Department: Jennifer M. Jackson, MD; Donna Williams, MD
Funding Source: None

ABSTRACT

Background: High quality feedback is imperative to promote lifelong learning, inspire goal setting, and improve medical students' knowledge and skills. The Clinical Skills course (CS) at Wake Forest School of Medicine (WFSM) is a preclinical course consisting of longitudinal small-group instruction in communication, history taking, physical examination, clinical documentation, clinical reasoning, and oral presentation skills. The CS course is designed such that students receive verbal feedback from their coaches and peers during each class session. In order to improve the effectiveness of feedback delivered, we proposed that written documentation via Quick Response (QR) codes and compilation of feedback over time would increase opportunities for student self-reflection and longitudinal improvement.

Hypothesis: The educational objective of this study was to determine if documented feedback facilitated by QR codes leads to a perceived increase in the amount of, quality of, and learner reflection on verbal feedback provided to students in the CS course.

Methods: The CS course consists of 26, 3.5 hour class sessions across the course (18 sessions in year 1; 8 sessions in year 2). Individual QR codes were created and distributed to the 312 1st and 2nd year students enrolled at WFSM from July 2020 to April 2021. Both students and the 38 faculty coaches were instructed on QR code use prior to the first class session. Each QR code provides a unique link to the individual student's feedback form in RedCap, which is pre-populated with the student's name, multiple choice questions for core clinical skills, and a free text field for narrative comments. After submitting the form, students are emailed a copy of their feedback. The aggregated feedback for a student is stored in RedCap and accessible for faculty at the mid-year and end-of-year course meetings. We distributed a 6 question survey on the QR code feedback system to all students and faculty participating in the CS course during the 2020-2021 academic year. In addition, we emailed the faculty with the highest rates of QR code usage to request additional insights on their perspectives of the QR code system. Outcome measures of this study include: amount of feedback, perceived benefit of written feedback, and student/faculty reflection on implementation.

Results: The survey response rate was 18% (57/312) for students and 39% (15/38) for faculty. Quantity of feedback was reported as "rare," with 47% of faculty using the QR codes only 1-3 times per semester. Of faculty who used the QR codes, 53% used the summary reports for mid-year and end-of-year feedback meetings with their students. The most valuable elements of the QR code system to students were the ability to quickly receive documented feedback and ease of use of the tool. Faculty most appreciated the ability to review past feedback given and the aggregate data available for review at the mid-year and end-of-year meetings. Overall, 72% of students and 53% of faculty reported that the QR codes did not change the quality of their feedback in comparison to the previous verbal feedback.

Conclusions: The QR code feedback system provides an opportunity for specific feedback, however, it requires willingness of faculty to complete it, streamlining of the form for ease of use, and education on best practices for QR code use. The primary challenges of the QR code feedback system, identified by students and faculty, were implementation and workflow feasibility. Limitations to this study included a low survey response rate, which could be due to timing of the survey (end of year), survey burnout given number of surveys received, and limited respondent interest in the survey topic.

Poster Title: Gut Check: Prebiotics and Probiotics May Reduce the Risk of Covid-19-Related Mortalities

Student: Jimshad Farooque-Wooden, Class of 2024
Faculty Mentor and Department: Hariom Yadav, PhD, Department of Internal Medicine – Molecular Medicine

Funding Source: National Institute of Diabetes and Digestive and Kidney Diseases, T35 Training Grant DK007400

ABSTRACT

Background: The COVID-19 pandemic has been a frightening time of uncertainty with the introduction of a highly infectious virus, SARS-CoV-2, and the tragic deaths of millions worldwide. Vaccines made to combat the virus have helped slow the spread and prevent the deaths of more people, but we aren't in the clear yet, especially with the Delta variant becoming more common. Due to the novelty of the virus, there is a lack of information surrounding it. Research has shown that co-morbidities are associated with increased risk of infection and death from COVID-19; however, there is a lack of knowledge in regards to how to decrease the risks associated with these co-morbidities for COVID-19-positive patients. For COVID-19 patients, and in general, we know that a healthy microbiome can contribute to more effective immune function which can thus help in the defense against SARS-Cov-2 and other infections. While the interaction between COVID-19 vaccines and the microbiome is not well known due to their complexity and relatively new introduction, we do know that microbiome modulators, such as prebiotics and probiotics, have been shown to regulate and improve immune function and health. Unfortunately, not much is known regarding the effectiveness of these microbiome modulators in increasing immune defense against COVID-19 and how they affects mortality related to COVID-19.

Hypothesis: The use of prebiotics and probiotics will reduce the risk of mortality caused by Covid-19.

Methods: We used the TriNetX database to compare mortality rates between more than 80 million US patients with and without Covid-19. We looked at how mortality rates changed when including or excluding factors including Diabetes, other co-morbidities, and the use of prebiotics and probiotics.

Results: Results are still being gathered and analyzed.

Conclusions: None yet because we are still gathering and analyzing results along with the statistical validity of our results.

Poster Title: Association of Antenatal Corticosteroids with Future Kidney Function in Adolescents Born Preterm with Very Low Birth Weight

Student: Whitney N. Floyd, Class of 2024
Faculty Mentor and Department: Andrew M. South, MD, MS, Pediatric Nephrology

Funding Source: National Institute of Diabetes and Digestive and Kidney Diseases, T35 Training Grant DK007400

ABSTRACT

Background: Antenatal corticosteroids (ANCS) are administered to pregnant women at risk of preterm delivery to accelerate fetal lung development. Animal studies suggest that ANCS lead to deleterious alterations to several cardiovascular and renal pathways in the offspring, though the persistent effects of ANCS exposure on long-term health remain undescribed.

Hypothesis: We hypothesized that ANCS are associated with unfavorable alterations to kidney function in adolescents born preterm.

Methods: In a prospective birth cohort of 14-year-old adolescents born preterm (<37 weeks' gestation) with very low birth weight (VLBW, <1500 g), we measured serum creatinine and first-morning urine samples for urine albumin standardized to urine creatinine in 95 participants. We estimated glomerular filtration rate (eGFR). We used generalized linear models to estimate the association of ANCS with the outcomes.

Results: The cohort consisted of 58% non-Black participants and 55% female participants; 53% were exposed to ANCS and 7% had albuminuria. In unadjusted analyses, ANCS was not associated with eGFR (β 3.2 ml/min/1.73 m^2, 95% CI -5.8 to 12.1), ACR (β -3.21 mg/g, 95% CI -13.93 to 7.52), or albuminuria (OR 0.78, 95% CI 0.24 to 2.48).

Conclusions: ANCS exposure was not associated with adverse kidney outcomes in adolescents born preterm with VLBW. Future analyses will include adjusting for potentially confounding factors in multivariable models, analyzing obesity as an effect modifier, and continuing to assess participants' long-term kidney function.

Source of mentor's funding or other support that funded this research: This study was funded by the National Institutes of Health (National Institute of Diabetes and Digestive and Kidney Diseases T35DK007400; National Heart, Lung, and Blood Institute K23HL148394, L40HL148910, and R01HL146818; Eunice Kennedy Shriver National Institute of Child Health and Human Development P01HD047584 and P01HD084227; National Center for Research Resources M01RR07122 to the Clinical Research Unit of Wake Forest Baptist Medical Center; National Center for Advancing Translational Sciences UL1TR001420 to the Wake Forest Clinical and Translational Science Award), the American Heart Association (14GRNT20480131 and 18TPA34170522), and the Forsyth Medical Center and Wake Forest School of Medicine Department of Pediatrics research funds.

Poster Title: Complications following posterior total hip arthroplasty utilizing a piriformis-sparing posterior approach

Student: Meckenzee Frank, Class of 2024
Faculty Mentor and Department: John Shields, MD, Orthopaedics

Funding Source: Department of Student Affairs, Wake Forest School of Medicine.

ABSTRACT

Background: Total hip arthroplasty (THA) is one of the most performed elective procedures worldwide and is only expected to increase as the demographic shifts toward older age, and technology is allowing younger patients to have surgery. Since its development in the mid-20th century, many advancements have been made in surgical technique. The most common techniques used by practicing Orthopedists include the direct anterior approach (DAA), direct lateral approach (DLA), and the posterior approach (PA). Of these traditional approaches, only the DAA is considered to be muscle sparing between inter-nervous planes, while the DLA and PA involve muscle dissection. Our study describes complications following a minimally invasive piriformis-sparing posterior approach with an anatomic capsular repair. Muscle sparing techniques are typically described as having better outcomes and less complications, however, there is still debate about which THA technique is superior.

Hypothesis: Total hip arthroplasty completed by the senior author using the MIS piriformis-sparing posterior approach will have lower complication rates, both overall and for the specific complications, when compared to complication rates described in the literature for the traditional posterior approach, direct lateral approach, and direct anterior approach.

Methods: 1072 charts of patients who underwent primary elective total hip arthroplasty for all causes were retrospectively reviewed. 84 patients were excluded due to arthroplasty done for fracture, and non-elective total hips. A total of 984 patient charts were analyzed using R Core Team (2013) software to determine the overall complication rate and the 90-day complication rates for superficial infection, deep infection, periprosthetic fractures, calcar fractures, non-calcar fractures, nerve injury, dislocation, and reoperation. We also determined the complication rates for infection and aseptic loosening occurring after the initial 90-day post-operative period. Data was analyzed by mean and count for continuous and count data, respectively. Age, body mass index, ASA score, and laterality were controlled for as confounders. Complication rates described in the literature for the DA, DLA and PA were obtained and directly compared to our calculated complication rates.

Results: Overall complication incidence proportion over the 90-day post-operative period was 4.2%. The individual incidence proportions over this 90-day period were 0.7% for superficial infections, 0.2% for deep infection, 0.5% for periprosthetic fracture, 2.0% for calcar fracture, 0.2% for non-calcar fracture, 0.1% for nerve injury, 0.3% for dislocation, and 1.2% for reoperation. Following the initial 90-day period, two patients, 0.2%, sustained aseptic loosening and three patients, 0.3%, sustained infection. 2 patients sustained post-operative death. Our complication rates for superficial infection, periprosthetic fractures, dislocations and reoperations were similar to complication rates reported in the literature for other techniques. Our rate of deep infection was lower than the reported rates for other techniques. Our rate of calcar fractures was slightly higher than rates reported for the DAA. Our nerve injury rate was similar to that reported for DAA, but lower than the reported rates for DLA and PA.

Conclusions: Overall, our complications rates were low using the minimally invasive piriformis-sparing poster approach to THA. Although we had lower rates of deep infection compared to other techniques, the rates of other complications were similar to those reported for other THA approaches. Although we are unable to draw concrete conclusions about which THA approach is truly superior, our findings support that the posterior approach to the hip has a comparable complication rate and should remain a tool in the armamentarium for total joint surgeons.

Poster Title: SBRT Versus Surgical Resection in Elderly Early-Stage Lung Cancer Patients: A Retrospective Review

Student: Sarah Friday, Class of 2024
Faculty Mentor and Department: Michael Farris, MD, Radiation Oncology, Cole Steber, MD, Radiation Oncology

Funding Source: Comprehensive Cancer Center, Wake Forest Baptist Health

ABSTRACT

Background: Surgical resection is the current standard of care for medically operable early-stage non-small-cell lung carcinoma (NSCLC). The median age of diagnosis for lung cancer is 71 years. Following surgical resection, elderly patients may potentially face an increased risk of complications. An alternative and less invasive treatment modality using radiation is Stereotactic Body Radiation Therapy (SBRT). Before the advent of SBRT, there were no alternatives that could provide similar levels of local control to surgery. In an elderly population, consideration of the risk versus benefit ratio of different treatments is of the utmost importance and SBRT may be preferred for elderly patients.

Hypothesis: (1) There is a significant difference in survival in early-stage NSCLC patients over the age of 65 that received definitive treatment with SBRT compared to surgical resection. (2) Any difference in time to definitive treatment has an impact on clinical outcomes.

Methods: We retrospectively reviewed the medical records of elderly (≥65 years old) early-stage NSCLC patients treated with SBRT at Wake Forest Baptist Health between the years 2015-2018 and surgical resection between the years 2018-2020. Outcomes such as overall survival (OS), progression-free-survival (PFS), local control (LC), and cancer-specific survival (CSS) were analyzed using the Kaplan-Meier method and compared between cohort groups using the log-rank test.

Results: Of the 384 patients identified, all were ≥65 years old with the average age at diagnosis of 73.1 years, 213 (55.6%) were male, 190 were treated with SBRT and 194 with surgical resection. The majority of patients (71.5%) had an initial diagnosis of a single lung lesion, were stage I (94.1%) at diagnosis (TNM 8th edition), and a majority (86.7%) had a histology of adenocarcinoma or squamous cell carcinoma. Time to treatment was significantly different between treatment modalities with average days between diagnosis and treatment of 63 for surgical resection and 38.5 for SBRT ($p<0.001$). Various fractionation regimens were used for patients receiving SBRT including 50 Gy in 10 fractions (8.6%), 50 Gy in 5 fractions (34.3%), and 54 Gy in 3 fractions (5.2%). Various surgical techniques were utilized for patients in the surgical cohort, including robotic-assisted thoracic surgery (94.3%) with 7 patients (3.6%) requiring open conversion. In the 2 years following treatment, 16 (15.59%) surgical patients and 63 (34.35%) SBRT patients died. The 2-year OS was 84.41% and 65.65% for surgery and SBRT, respectively ($p=0.001$), while 2-year CSS was 94.47% and 88.1% surgery and SBRT ($p=0.5$). The 2-year PFS was 70.74% and 58.19% for surgery and SBRT, respectively ($p=0.005$). The 2-year LC was similar between the treatment modalities.

Conclusions: Time between diagnosis and SBRT was significantly less than the time between diagnosis and thoracic surgery. Despite this difference, for elderly patients undergoing surgery there was better OS and PFS compared to those treated with SBRT, while CSS and LC were similar. The survival differences likely reflect selection bias based on the comorbid diagnoses of patients at time of work up. We plan to continue exploring upon these preliminary results by analyzing patients treated during the same time period and further explore treatment related toxicity related to these treatment modalities in this elderly cohort with early-stage lung cancer.

Source of mentor's funding or other support that funded this research: Department of Radiation Oncology.

Poster Title: Depressive symptoms score and risk for incident delirium: a prospective cohort study
Student: Arlen Gaba, Class of 2024
Faculty Mentor and Department: Lei Gao, MBBS, Clinical Director, Medical Biodynamics Program, Brigham and Women's Hospital, Assistant Professor, Harvard Medical School, Assistant Professor of Anesthesia, Massachusetts General Hospital
Funding Source: R03AG067985 and Foundations of Anesthesia and Education (FAER)

ABSTRACT

Background: Delirium is an acute neuropsychiatric disorder marked by impaired attention, awareness perception and memory. The relationship between depression and delirium could be related to shared comorbidities or the neurological disequilibrium that exists in both syndromal diagnoses. Numerous studies have highlighted depression as a risk factor for delirium and vice versa. Large scale studies focusing on long-term association of delirium with depression/depressive symptoms remain sparse. This study is a novel look at baseline association and trajectory of a depressive symptoms score with delirium.

Hypothesis: Here we tested the hypothesis that higher recent depressive symptoms score (RDSS) at baseline predicts increased incidence of delirium over time.

Methods: 372,893 UK biobank participants between 2006-2010 (mean [SD] age: 57.9 [8.0], range: 37.4 - 73.8 years; 201,774 [54.0%] female) reported baseline depressive symptoms (frequency of unenthusiasm/disinterest, tenseness/restlessness, tiredness/lethargy, and depressed mood in the last two weeks) followed by at least one hospitalization event during follow-up until 2020. All questions had options for (not at all, several days, more than half the days, and nearly every day), and were equal-weighted and assigned 0-3 points, respectively. A risk score of the sum (0-12) of the four variables was further assigned four categories, none (0), mild risk (1-2), modest risk (3-5), and severe risk (≥6). First time delirium was determined using ICD-10 coding F05 from hospitalization records. Cox proportional hazards models were performed to assess the predictive value of the RDSS and the categories within the score for incident delirium, adjusting for demographics, lifestyle factors, cardiovascular risk, morbidity burden, cognition, and depression diagnosis.

Results: In total 5,919 (16 per 1000) developed incident delirium with a median period of 12 years (IQR 11.2 – 12.7). Overall, all groups, mild, 14% (HR = 1.14, 95% CI: 0.98 – 1.41, p = 0.0002), modest, 25% (HR = 1.25, 95% CI: 1.14 – 1.37, p <0.001) and severe, 29% (HR = 1.29, 95% CI 1.15 – 1.45, p <0.0001) remain significantly associated with delirium in the fully adjusted model. This finding remained significant with postoperative delirium and non-dementia related delirium. In sensitivity analysis, the risk of delirium in the modest/severe groups is higher in those reporting older than 65 years (*p* for interaction <0.0001), but was not significantly affected by sex, physical activity, sleep duration, CVD risk, diagnosed depression/anxiety, morbidity risk, or mean reaction time (a proxy for cognition).

In the smaller follow up cohort 225 (4 per 1,000 from 56,847) developed incident delirium (median follow-up time: 3.8 years [range 11 months to 11.2 years; SD 2.7]). After adjusting for participant baseline RDSS, a worsening score (>1 point *increase*) compared to no change or improved score (≥ 0-point score *decrease*) RDSS, was associated with a 39% increased risk (HR = 1.39, 95% C: 1.03 – 1.99, p = 0.03).

Conclusions: Greater depression and anxiety severity scores, regardless of a formal clinical diagnosis, predicted incident delirium diagnosis during hospitalization over a decade. A more recent cohort showed that worsening trajectory of depression and anxiety conferred additional risk. Increased awareness for subclinical depression/anxiety symptoms is warranted for reducing the risk for delirium.

Source of mentor's funding or other support that funded this research: This work was supported by NIH grant R03AG067985 and Foundations of Anesthesia and Education (FAER).

Poster Title: Role of Tumor Mutational Burden Comparative with PD-L1 in HNSCC

Student: Elena Irina Gavrila, Class of 2023
Faculty Mentor and Department: Mercedes Porosnicu, MD, Department of Hematology/Oncology

ABSTRACT

Background: Immunotherapy with checkpoint inhibitors (ICI) prompted a dramatic progress in the management of head and neck squamous cell carcinoma (HNSCC), improving survival and raising hope for cure even in advanced stages. Disappointingly, the percentage of patients able to benefit from this progress remains limited to 20% or less. Development of Precision Oncology in HNSCC brings the prospect for emergency of biomarkers of response to immunotherapy that can help with the selection of the subset of patients that may benefit the most from treatment with ICI. As a result of these efforts, biomarkers such as TMB are currently under investigation in many solid tumors including HNSCC.

Methods: This is a single institution retrospective review of patients with HNSCC having tumor tissue evaluated for TMB by FoundationOne. PD-L1 expression determined using IHC 22C3 pharmDx kit and reported as TPS score (until 2018) and CPS score afterwards was collected. TMB and PD-L1 were analyzed for their individual association with demographics, risk factors, disease characteristics and survival, as well as for correlation with response to immunotherapy with ICI in a fraction of patients. Patients tested for TMB were grouped as TMB-low (1-5) and TMB-high (6+) and patients tested for PD-L1 were grouped as PD-L1 0, PD-L1 1-19 and PD-L1 20+. All patients included in this study had at least six months of follow up after the sample collection for TMB and/or PD-L1 testing.

Results: Our analysis included 139 patients, of whom 128 patients had TMB, 95 patients had PD-L1 and 92 patients had both variables reported. TMB-high was found associated with smoking, ($p=0.03$) and tumor location ($p < 0.01$) with larynx patients having significantly higher TMB ($p=0.006$) and oropharynx patients having lower TMB ($p=0.004$). African Americans and patients with BMI above 30 tended to have lower TMB scores, although not reaching statistical significance ($p=0.08$ and $p=0.07$ respectively). PD-L1 was statistically significant higher in African Americans ($p=0.02$) and in never smokers ($p=0.04$) and never drinkers ($p=0.01$), as well as in patients with earlier cancer stage ($p=0.03$) and lower tumor stage ($p=0.008$). There was no significant correlation of TMB or PD-L1 with HPV status, however it was noted that there were no HPV-positive patients vs 18.6% of HPV negative patients with PD-L1 0.TMB was associated with survival, with patients with high TMB scores faring better in univariate analysis ($p= 0.02$) and in in a Cox proportional hazards regression model when adjusted for age, tobacco use, tumor site, nodal stage at diagnosis, previous treatment with chemotherapy, radiation or combined chemoradiation therapy and PD-L1 level in a multivariate analysis model ($p = 0.0002$). No similar correlation was found between level of PD-L1 expression and prognosis. There was no correlation found between TMB and PD-L1 level. A total of 79 patients in this study received at least one treatment with an ICI. Treatment efficacy was able to be evaluated in 51 of these patients, of whom 40 patients had TMB reported and 36 patients had PD-L1 results available. There was a statistically significant association between the response to treatment with ICI and continuous TMB score with a mean TMB of 11.2 in responders and 4.9 in tumor progressors ($p=0.01$). Evaluation as a categorical variable demonstrated that 66.6% of the responders and 33.3% of the progressors were within the TMB-high category ($p=0.055$). There was no association found between response to treatment with ICI and PD-L1 level analyzed as a categorical ($p=0.89$) or continues variable (mean PD-L1 was 26.4 in responders versus 26.5 in progressors; $p=0.99$).

Conclusions: TMB rather than PD-L1, the currently utilized marker for recommendation of treatment with ICI in HNSCC, showed significant association with survival and response to treatment with immunotherapy. Further larger studies are needed to reshape the biomarkers utilization to select patients for treatment with ICI in HNSCC. Interestingly, PD-L1 level and TMB appear to be affected oppositely by demographics (such as race) and risk factors (such as smoking) suggesting consideration for researching congregated rather than individual biomarkers in future studies.

Poster Title: Perioperative Chemotherapy for Resectable Colorectal Liver Metastases: Analysis from the Colorectal Operative Liver Metastases International Collaborative

Student: Rohin Gawdi, Class of 2022
Faculty Mentor and Department: Perry Shen, MD, Surgical Oncology, WFBMC

Funding Source: Departmental Funding

ABSTRACT

Background: Perioperative chemotherapy has been increasingly used with surgery as multimodality treatment for resectable colorectal-liver metastases (CLM). There is paucity of clinical data addressing optimal timing of chemotherapy administration relative to surgery.

Hypothesis: We examined outcomes of patients undergoing neoadjuvant and adjuvant chemotherapy in an international multicenter database of surgically-managed CLM.

Methods: Data from 897 patients were obtained from a collaborative of CLM hepatectomy cases from five hepatobiliary institutions between 2000-2018. Overall survival (OS) was measured from time of hepatectomy for patients receiving: surgery alone, neoadjuvant chemotherapy, adjuvant chemotherapy, and neoadjuvant-plus-adjuvant chemotherapy. Kaplan-Meier analysis was performed to detect differences in OS between treatment groups. Single- and multi-variable analysis with Cox proportional hazards were run for OS between groups.

Results: 164 patients (18.28%) received surgery, 132 (14.72%) received neoadjuvant-only, 249 (27.76%) received adjuvant-only, and 352 (39.24%) received neoadjuvant-plus-adjuvant chemotherapy; with median OS of 40.1, 43.6, 56.0, and 49.1 months, respectively. Median OS for adjuvant-only was significantly longer compared to neoadjuvant-only (p=0.047) and surgery (p=0.004), and similar to neoadjuvant-plus-adjuvant (p=0.104). There were no significant differences in comorbidities between groups, based on Charlson-Deyo scores (p=0.941). There were significant differences in number of lesions ($p<0.0001$) and maximum tumor size (p =0.0008) between groups. On multivariate analysis, extrahepatic disease (p=0.0002), intraoperative transfusion ($p<0.0001$), number of lesions ($p<0.0001$), and treatment algorithm ($p<0.0001$) were independent predictors of OS.

Conclusions: Despite group differences, adjuvant chemotherapy for CLM was independently associated with improved OS compared to other chemotherapeutic approaches. For patients with resectable disease, upfront surgery should be considered.

Source of mentor's funding or other support that funded this research: Department of Surgery

Poster Title: Using foot radiography and serum markers to assess foot impairment risk across CKD-MBD stages

Student: Tyler George, Class of 2024
Faculty Mentor and Department: Michael Jones, DPM; Department of Orthopaedic Surgery – Podiatry Services

Funding Source: National Institute of Diabetes and Digestive and Kidney Diseases, T35 Training Grant DK007400

ABSTRACT

Background: Approximately 34.2 million Americans live with diabetes, which is the leading cause of end-stage renal disease (ESRD), and patients with ESRD from diabetes have the highest rates of non-traumatic lower extremity amputation (LEA). While bone disorders are well established in ESRD, it is less clear how earlier stages of chronic kidney disease (CKD) impact bone health. Chronic kidney disease – mineral bone disorders (CKD-MBD) is a syndrome describing the effect of kidney disease on bone health. CKD-MBD is defined by laboratory abnormalities (in calcium, phosphorus, parathyroid hormone (PTH), and vitamin D metabolism, as well as bone disease and calcification of vascular/soft tissue.

Hypothesis: We hypothesize that progression from early to late stages of CKD-MBD will reflect similar impairments in pedal buckling ratio, prior amputation, and vessel calcification as seen on radiography and in serum biomarkers.

Methods: This retrospective chart review assessed patients with diabetes mellitus, CKD-MBD, and at least one foot radiograph treated at Wake Forest University Baptist Hospital from 2012 to 2021. Patient demographics, serum biomarkers (e.g. calcium), and pedal radiograph measurements were extracted from the patient chart. Buckling ratio, an estimate of fracture risk, was calculated using diameter measurements of the 2nd and 5th metatarsal as seen on radiograph. Radiograph also allowed for pedal vessel calcification identification.

Results: A total of 152 patients were assessed with at least 25 patients in each stage of CKD-MBD. In higher stages of CKD-MBD there were increased odds of vessel calcification (Adjusted OR: 2.3 (95% CI: 1.7, 3.0), $p < 0.001$), increased odds of foot amputation (Adjusted OR: 2.3 (95% CI: 1.6, 4.5), $p < 0.001$), and increases in 2nd metatarsal buckling ratio (Adjusted OR: 2.1 (95% CI: 1.1, 3.2), $p < 0.001$) and 5th metatarsal buckling ratio (Adjusted OR: 1.1 (95% CI:1.0, 1.2)), even after controlling for age, gender, and BMI. Serum calcium levels were inversely related to buckling ratios of the 2nd (Adjusted OR: -1.9 (95% CI: -3.1,- 0.6), $p = 0.004$) and 5th metatarsal (Adjusted OR: -1.7 (95% CI: -2.9,- 0.4), $p = 0.010$,), after controlling for age, gender, and BMI.

Conclusions: Worsened CKD-MBD stage was associated with greater odds of radiographic evidence of pedal calcification and increased buckling ratio of the 2nd and 5th metatarsal, as well as increased risk of amputation. Lower serum calcium was associated with higher fracture risk. Earlier identification of low serum calcium and radiographic pedal disease in patients with CKD-MBD may help identify those at greater risk of vessel calcification, amputation, and fracture. In aggregate these findings suggest possible use of radiography and serum markers as a screening tool for poor outcomes in this population. Further analysis should assess the effects of other common serum metabolites on pedal bone health.

Poster Title: A Single Center Experience with Forearm Arteriovenous Loop Grafts for Hemodialysis
Student: Zachary German, Class of 2022
Faculty Mentor and Department: Matthew Goldman, MD, Department of Vascular Surgery
Funding Source: None

ABSTRACT

Background: Autogenous arteriovenous fistula (AVF) remains the standard of hemodialysis (HD) access, however it cannot be reasonably obtained in all patients. For patients with contraindications to AVFs, prosthetic arteriovenous graft (AVG) remains an alternative. AVGs are plagued by high failure rates, however there is a paucity of literature examining this.

Hypothesis: This study aims to examine a single-center review of outcomes of forearm loop AVGs in patients requiring HD access.

Methods: A single institution, retrospective chart review was completed from 2012-2019, including demographics, ESRD etiology, brachial vessel diameters, and comorbidities. Logistic regression and cox proportional hazard models were evaluated. Outcomes were defined as length of primary patency (time from graft placement to intervention to maintain patency) and secondary patency (time from first intervention until graft failure).

Results: 98 patients [mean age 61.8 (13.9) years, 42.9% female] were identified as having brachial artery to brachial vein AVG creation during the study period. Primary patency was 0.36 (SE 0.07) at six months, 0.12 (0.05) at one year. Secondary patency was 0.75 (0.07) at six months and 0.43 (0.09) at one year. No association between preoperative vessel diameters and primary or secondary patency was observed.

Conclusions: This study confirms, prosthetic AVGs remain hindered in their utility by high failure rates. Particularly, forearm loop grafts show high rates of graft failure within a year of creation. While this study replicated previous literature demonstrating poor patency rates, a statically significant factor leading to this was not clearly demonstrated. These results draw into question the utility of prosthetic forearm loop grafts in patients requiring long-term HD access.

Poster Title: Lumbopelvic Postural Differences in Adolescent Idiopathic Scoliosis: A Pilot Study
Student: Mark Glover, Class of 2024
Faculty Mentor and Department: Tadhg O'Gara, MD, Orthopaedic Surgery
Funding Source: Department of Orthopaedic Surgery, Wake Forest School of Medicine

ABSTRACT

Background: Adolescent idiopathic scoliosis (AIS) is the abnormal coronal plane curvature of the spine that does not have a congenital or neurologic cause. A primary etiology of AIS is currently unknown but environmental biomechanical factors are suspected. Poor postural control of the spinal extensor musculature has been identified as an AIS risk factor and many Physiotherapy Scoliosis Specific Exercise (PSSE) programs have been developed. There is debate regarding the precise postural behaviors that should be modified.

Hypothesis: AIS subjects will retain an anteverted lumbopelvic with less range of motion than controls subjects.

Methods: This prospective cohort pilot study consisted of 27 subjects with AIS and 26 controls aged 11-17 years. Subjects had their LP posture assessed and monitored using the ViMove DorsaVi sensor package. Both groups underwent a calibration live assessment to obtain initial lumbopelvic (LP) range of motion (ROM) measurements. Subjects were then monitored while continuing with normal activities of daily living (ADLs) for 12 hours.

Results: During the live assessment, all controls exhibited a significantly greater anterior pelvic tilt ROM in the sitting position than the AIS group ($p=0.0433$). When compared to just female controls, females with AIS had a sitting pelvic tilt ROM that was significantly more retroverted ($p=0.0232$) and less anteverted ($p=0.0010$). During ADLs, female controls exhibited a higher total number of extension events than their female AIS counterparts ($p=0.0263$). These associations did not strengthen with greater spinal deformity.

Conclusions: AIS patients do not antevert the pelvis as much as control patients, both during a live assessment and during a 12-monitoring period. Further study is needed to determine why AIS patients have a higher likelihood of adopting this postural and kinematic difference.

Source of mentor's funding or other support that funded this research: Department of Orthopaedic Surgery, Wake Forest School of Medicine

Poster Title: Machine Learning in Medicine: Predicting Total Hip Arthroplasty Surgical Outcomes
Student: Robert Glover, Class of 2023
Faculty Mentor and Department: John Shields, MD, Department of Orthopedic Surgery
Funding Source: None

ABSTRACT

Background: A total hip arthroplasty (THA) is a restorative surgery that greatly improves patients' quality of life. Facing rising surgical demand for THAs, proper patient selection is critical to minimize postoperative complications and resource utilization and to optimize patient outcomes. Machine learning offers a potential solution by analyzing vast amounts of patient data to produce outcome predictions and patient risk profiles, allowing physicians to use clinical informatics as a supplement to their existing workflows for risk stratification.

Hypothesis: The study utilized data from the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) to identify patient factors that predict the likelihood of postoperative infection, re-operation, and hospital readmission following THA. The proposed questions for each outcome of interest were:
1. What pre-surgical factors are the most predictive of a patient's negative surgical outcome?
2. Can a clinically helpful model be developed utilizing several different machine learning techniques?

Methods: The ACS NSQIP database was used to retrieve pre- and post-operative patient information from individuals who had undergone THA between 2008 and 2019. Data analysis included data categorization, outcome matching, multiple imputations for missing data, and categorical encoding. Data was randomized and scaled into a training, validation, and test data set via a 70-15-15 split. Logistic regression, Gaussian naïve Bayes, K nearest neighbor, and random forest machine learning models were developed. Models were trained and a hyper-parameter search was performed utilizing a cross-validation system. Negative outcome rate prevalence was low in the training data set, so a second analysis was performed on an oversampled data set created through a Synthetic Minority Oversampling Technique (SMOTE) and compared with original data results. Test data was never altered. The performance of a model was estimated by receiver operator characteristic (ROC) curve and area under the curve (AUC) value. An AUC of 0.7 was determined as the threshold of a clinical meaningful model based upon an initial literature search before model development. Confusion matrices were harvested for each model. Models performing significantly better than random were examined for the important pre-surgical qualities impacting predicted outcomes.

Results: A total of 217,379 patients who had undergone THA were identified in the database. During model evaluation, logistic regression models repeatedly performed the best while random forest models were also moderately useful for post-surgical outcome predictions. These models were more accurate for predicting safe surgical outcomes. Trends noted by predictive models showed BMI, race, assigned American Society of Anesthesiologist (ASA) physical status classification, pre-surgical hematocrit, albumin, and INR were most predictive of THA postoperative negative outcomes.

Conclusions: As more patient data becomes available, a machine learning prediction model becomes a more realistic risk stratification tool that allows targeted patient selection for THA operations, minimizing the risk of complications. Machine learning tools further offer the ability to provide potential cost benefits, as expensive revision THA surgeries are often matched with prolonged hospital stays. The outcomes from such tools can be utilized by healthcare administrators and physicians as fiscal and patient outcome goals align to create effective pre-surgical screening predictions. Current machine learning models remain dependent on the data used for its validation, potentially leading to an over-prediction or underestimation of the actual patient risk and other fallacies that accompany large data set analysis. Yet, machine learning algorithms, in their current state, remain as an opportunity to adjunct current clinical evaluation and risk stratification based on cohort studies.

Poster Title: The Impact of Dynamic Perfusion on Ex-Vivo 3-Dimensional Vasculogenesis: Lessons for the Future

Student: Joshua Grosser, Class of 2024
Faculty Mentor and Department: Adam Katz, MD, Department of Plastic and Reconstructive Surgery
Funding Source: Wake Forest Institute of Regenerative Medicine

ABSTRACT

Background: While regenerative medicine has the potential to revolutionize the treatment of tissue defects, nutrient delivery is a major hurdle to growing complex organs. To address this challenge, Dr. Katz has proposed a therapeutic platform which combines principles of perfusion bioreactors, negative pressure wound therapy, and "bottom-up" tissue regeneration (whereby cell-laden "modules" organize into higher order 'neo-tissues'). Negative pressure dressings, which are already used clinically to assist in would healing, would pull nutrients, growth factors, and other biomodulators through a void space packed with autologous stem cells, keeping them alive and guiding their differentiation. To gauge the ability of cells to grow and self-assemble under these conditions, adipose-derived cells (AdCs) and human umbilical vein endothelial cells (HUVECs) were co-cultured on microbeads and grown in a 3D printed bioreactor.

Hypothesis: Co-cultures grown under dynamic conditions will exhibit greater total cell proliferation than co-cultures grown under static conditions. This difference will be most apparent in the middle layer of the microbead packed mesh.

Methods: HUVECs (9.6 million) and AdCs (2.4 million) were combined with 0.25g Cultisphere gelatin microbeads in a low adhesion dish, rocked for 3 days at 37°C and 5% CO_2 with media changes daily, and placed in a 40 µm mesh. The mesh was then placed in either a 50 mL conical ("static") or the bioreactor ("dynamic"). Cells received 24 mL of fresh media daily in both conditions. Cells were harvested, frozen in OCT, sectioned at 16 µm, and DAPI stained at 0 and 2 weeks. Average DAPI+ cells per bead were compared using unpaired t-tests.

Results: There were an average of 17.36 ± 2.21 (SE) cells/bead at day 0. After 2 weeks, cells per bead in the top, middle, and bottom layers of the microbead section were 9.31 ± 1.19, 12.32 ± 1.58, and 10.5 ± 1.48 (static), and 3.71 ± 0.43, 2.63 ± 0.35, and 2.05 ± 0.29 (dynamic), respectively. The average bead diameter was 172.2 ± 8.5 µm and did not differ significantly between groups. The top layer of the dynamic experiment had significantly more cells/bead than the bottom layer ($p<0.05$), but cell densities did not otherwise differ within groups. All layers within the static and dynamic groups had statistically fewer cells than the week 0 control ($p<0.05$), except for the middle layer of the static experiment ($p=0.07$).

Conclusions: Cell density was greatest at the day zero control, indicating that the bioreactor was unsuccessful in facilitating cell proliferation. Cells did not grow better in the middle layer of the dynamic experiment, nor did they grow worse in the middle layer of the static experiment (relative to the outer layers). Lack of oxygen exchange might explain these findings (both conditions were closed to atmosphere), and future bioreactors should draw from a media jar exposed to filtered air. The bioreactor chamber diameter should also be reduced to match the diameter of the microbead-filled mesh, since space around the mesh in the dynamic experiment allowed media to flow around the microbeads as opposed to through them. Alternatively, beads may be cultured directly in the bioreactor well (without the mesh). Lastly, leaking from the sealed bioreactor chamber implied that pressures within the chamber were significant at times. Rather than using a sealed pump/vacuum system to simultaneously push/pull media through the bioreactor, preliminary experiments suggest that an IV pump, set at a constant infusion rate and connected downstream of the bioreactor, can be placed below the chamber, allowing gravity to pull media through the bioreactor at a constant rate without creating extreme pressures.

Source of mentor's funding or other support that funded this research: Department of Plastic Surgery

Poster Title: Emergency Stabilization of Pelvic Fractures: An Evaluation of Virginia EMS Training Protocols

Student: Tarek Haggy, Class of 2025
Faculty Mentor and Department: Susan Bodnar-Deren, PhD, Department of Sociology and Institute for Women's Health, Virginia Commonwealth University

Funding Source: The Baldacci Student Experiential Learning Fund

ABSTRACT

Background: Pelvic fractures are typically a result of high energy collisions, such as motor vehicle accidents (MVAs). For this reason, pelvic trauma is usually accompanied by a myriad of other injuries. Due to the potentially fatal nature of pelvic trauma, Emergency Medical Service (EMS) providers are often the first to administer treatment to patients with suspected pelvic fractures. While difficult to make a proper diagnosis in the field, it is essential to properly stabilize the pelvis whenever a fracture is suspected.

Hypothesis: 1) There will be a lack of emphasis on formal pelvic immobilization training among prehospital providers, especially in EMT-Basics. However, we believe some providers will feel confident in this skill simply due to the deceiving simplicity of pelvic binder application. 2) EMS providers with extensive experience, training beyond a basic EMT course, or those that practice in more rural localities will have had greater training and exposure to proper pelvic binding technique.

Methods: A survey was sent to prehospital providers throughout Virginia via their regional EMS district. This study included 258 EMS providers. Questions addressed sociodemographic characteristics, EMS experience, EMS locality, and the level of training exposure to pelvic binding.

Results: Of the EMS providers surveyed in this study, one quarter (25.2%) have never been trained in pelvic binding. A majority (70.5%) of providers in this study believed that not enough emphasis is currently placed on prehospital pelvic binding training. A majority (64.8%) of the providers trained in pelvic immobilization were certified at the paramedic level or above. Less than a quarter of respondents (19.2%) that were trained in pelvic binding had less than 7 years of experience in EMS. There was a significant correlation between geographic area and having been trained in pelvic binding, with only 10.9% of respondents that were trained in pelvic binding having a rural EMS background. There was a noticeable lack of racial diversity within the sample. The sample consisted of mainly white respondents (78.7%). Additionally, only 4.7% of respondents identified as African American.

Conclusions: Findings suggest a lack of emphasis in pelvic binding training for prehospital providers as well as a training deficit between rural and EMS providers. Further, there is a lack of racial representation within their workforce. Additional studies with a larger sample size must be conducted to evaluate the strength of these trends.

Poster Title: Mortality and visual and anatomic outcomes following pars plana vitrectomy for diabetic tractional retinal detachments

Student: Margaret Havunjian, Class of 2024
Faculty Mentor and Department: Margaret Greven, MD, Ophthalmology

Funding Source: National Institute of Diabetes and Digestive and Kidney Diseases, T35 Training Grant DK007400

ABSTRACT

Background: By 2020, an estimated 33% of Americans will have diabetes mellitus, making it one of the largest public health challenges we face today. Diabetic retinopathy is a common microvascular complication of DM and has emerged as the leading cause of irreversible blindness in the working-age population. Vision loss due to diabetic retinopathy occurs through two main mechanisms: increased vascular permeability resulting in accumulation of intraretinal fluid and lipid (diabetic macular edema), and microvascular damage resulting in neovascularization, vitreous hemorrhage or end-stage disease, tractional retinal detachment (TRD). Patients with progressive or macula-involving diabetic TRD require surgical intervention with pars plana vitrectomy to anatomically reattach the retina with the goal of improving or stabilizing the vision. The severe microvascular disease in these patients is not limited to the eye, as significant systemic comorbidities are often present, and reduced survival has been observed in these patients compared with age-matched controls. The purpose of this study was to identify factors that are associated with mortality in patients who have undergone PPV for diabetic TRD.

Hypothesis: We hypothesize that demographic factors, medical comorbidities, visual acuity (VA) outcomes, and single operation success rates are associated with mortality rates in patients who have undergone vitrectomy to repair diabetic TRD.

Methods: A retrospective chart review of patients with type 1 or type 2 diabetes who underwent vitrectomy for TRD repair at Wake Forest University Baptist Medical Center from 2013-2021 was performed. Patient demographics, baseline data, surgical data, and post-operative data were extracted for analysis.

Results: A total of 298 patients and 378 eyes were included. Preliminary data show that age (p=.0007), type 2 diabetes (p=*.0007*), history of myocardial infarction (p<.0001), and history of renal disease (p=.0004) are associated with higher mortality rates in this cohort. No differences in were found in race, gender, insurance status, pre-operative visual acuity, use of dialysis, insulin use, smoking status, and bilaterality of disease when comparing deceased and alive groups. Mean pre-operative VA was 1.66LogMar (Snellen) and mean post-operative VA was 1.44LogMAR (Snellen). Single operating success rate was 88.3%.

Conclusions: Age, type 2 diabetes, history of myocardial infarction, and history of renal disease are associated with mortality in patients who have undergone PPV for diabetic TRD. Further analysis of data is ongoing to determine differences in the surgical characteristics, final VA, and single operation success rate between deceased and alive patients in this cohort.

Poster Title: Incidence and Economic Evaluation of Pediatric Abusive Head Trauma with Retinal Hemorrhage During the COVID-19 Pandemic

Student: Jesse Heinen, Class of 2024
Faculty Mentor and Department: Jagger Koerner, MD, Ophthalmology

Funding Source: Clinical and Translational Science Institute of Wake Forest School of Medicine

ABSTRACT

Background: Pediatric abusive head trauma (AHT), is a subtype of domestic violence resulting from non-accidental shaking of the head or impact trauma.[1] AHT is commonly associated with retinal hemorrhages (RH), which are present in 75-90% of cases. While domestic violence generally has increased since the onset of the COVID-19 pandemic, no study has evaluated the incidence of pediatric AHT with retinal hemorrhages during the first 12 months of the pandemic.[2]

Hypothesis: We hypothesize that if WFBMC experienced an increase in AHT during the COVID-19 pandemic, the incidence of RH also increased relative to pre-pandemic levels.

Methods: Retrospective chart review

Results: At a single trauma center, the demographics, ocular findings, and associated non-ocular injuries were similar between pediatric AHT with RH patients seen over the first 12 months of the COVID-19 pandemic compared to those seen over the preceding three years. The incidence during the 12-month period immediately after COVID-19 induced social isolation was 0.92 cases/month, a 43.5% increase.

Conclusions: The incidence of AHT with RH may have increased over the study period. The impact to individual patients and society of such an increase is profound. Using a previously published vision centric economic model, the societal costs of such an increase range from $1,925,000-$3,795,000 in 12 months at a single trauma center.

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Poster Title: Twice-Weekly Hemodialysis with Adjuvant Pharmacotherapy and Conversion to Thrice-weekly Hemodialysis: A Pragmatic, Fully-Embedded, Individually-Randomized Pilot Clinical Trial

Student: Benjamin Highland, Class of 2024
Faculty Mentor and Department: Mariana Murea, MD, Nephrology

Funding Source: National Institute of Diabetes and Digestive and Kidney Diseases, T35 Training Grant DK007400

ABSTRACT

Background: Patients with new-onset dialysis-dependent kidney disease (DDKD) are treated identically, with "full-dose" thrice-weekly HD, seeming all are anuric at dialysis commencement. Thus, the conventional approach to thrice-weekly HD disregards the heterogeneous nature of DDKD, as a significant proportion of patients have ongoing levels of residual kidney function (RKF) which can complement an initial therapy of less intensive HD. Retrospective studies suggested incremental HD (initial twice-weekly HD, later changed to thrice-weekly HD as RKF erodes and/or as clinical status requires) is a safe alternative to conventional HD with potential benefit longer preservation of RKF which, in turn, can confer better quality of life and longer survival. A pilot clinical trial was conducted to assess the trajectory of RKF parameters between patients treated with incremental-start HD and conventional HD.

Hypothesis: Incremental-start HD (twice-weekly HD for six weeks followed by thrice-weekly HD) will result in better preservation of RKF compared to conventional HD (outright thrice-weekly HD).

Methods: This was an individually randomized, open-label parallel-group pilot controlled trial involving patients with new-onset DDKD who have been on HD for ≤2 weeks, with pre-dialysis baseline estimated glomerular filtration rate ≥5 mL/min/1.73m2 and urine volume ≥500 mL/day. Eligible participants were randomly assigned (1:1 ratio) to twice-weekly HD and adjuvant pharmacologic therapy (loop diuretics, sodium bicarbonate and/or patiromer) for 6 weeks followed by thrice-weekly HD (incremental HD group) or continued thrice-weekly HD (conventional HD group) at 14 outpatient dialysis units and 1 inpatient dialysis unit. Urine output (mL per 24 hours), and average urea and creatinine clearance (mL/min/1.73m^2) were recorded and analyzed for differences in baseline-adjusted changes between the two treatment groups.

Results: 48 patients were enrolled and randomized to incremental HD (n=23) vs conventional HD (n=25). All participants adhered to timed inter-dialytic urine collections performed at baseline, week 6, week 12 and week 24. At week 24, the between-group difference in percent change of estimated means showed 51.0 percentage points (95% CI, -0.7, 102.8; P=0.05) lower decline in urine volume (mL/day) and 57.9 percentage points (95% CI, -22.6, 138.4; P=0.15) lower decline in renal average urea and creatinine clearance (mL/min/1.73m2) in the incremental HD group. Changes in renal urea clearance did not differ between the groups while renal creatinine clearance had a lower decline in incremental HD group compared to conventional HD group.

Conclusions: The pilot trial suggests better preservation of certain components of RKF with incremental-start HD. Larger clinical trials are warranted to delineate the effect of different HD therapy models on RKF, clinical outcomes and patient-reported outcomes.

Source of mentor's funding or other support that funded this research: Funding was provided by Vifor Inc.

Poster Title: Effect of Repetitive Head Impacts on Neurocognition in Motor Sport Athletes
Student: Connor Hile, Class of 2024
Faculty Mentor and Department: Jillian Urban, PhD, MPH, and Joel Stitzel, PhD, Biomedical Engineering
Funding Source: The Harry O. Parker Neuroscience Research Fund

ABSTRACT

Background: With 1.6-3.8 million sports-related concussion (SRC) occurring annually, mild-traumatic brain injury (mTBI) has become both a growing health concern and public health issue. Concussion, often used interchangeably with mTBI, can result from a direct or indirect blow to the head resulting in a slew of symptoms – somatic, cognitive, mood, and sleep. Recent studies have investigated subconcussive hits – head impacts that do not present with traditional symptoms associated with a concussion – and found alterations to neuropathology and decreased cognitive scores. Historically, most concussive and subconcussive research focuses on contact sports (football, soccer, hockey, etc.). However, head injury in motor sport has not garnered as much attention until recently. Motor sport drivers are exposed to concussion during crash events while also experiencing intense driving conditions with various terrains that can result in vehicular vibrations that are transmitted to the head, both of which can result in subconcussive exposures throughout the duration of the event. The aim of this study was to evaluate the effect of repetitive head impacts on neurocognitive measures in motor sport athletes at preseason and postseason timepoints. This was a post-hoc analysis that analyzed motor sport drivers at three different timepoints using the ImPACT test, SCAT5, and Conners Continuous Performance Test (CPT3).

Hypothesis: It is hypothesized that over the course of the season, the motor sport drivers will show a decrease in cognitive function (executive function, reaction time, etc.) and an increase in total symptoms.

Methods: Before the season, 18 motor sport drivers completed the ImPACT test, NIH Toolbox, and CPT3. These tests were then repeated after the first quarter (n=15) and second quarter of the season (n=12). The ImPACT test gathered basic demographic information and provided a series of tests measuring verbal memory, visual memory, visual motor speed, reaction time, impulse control, and a total symptom score. The NIH Toolbox measured executive function, attention, episodic memory, language, processing speed, and working memory. The CPT3 measured attention-related problems (inattentiveness, impulsivity, sustained attention, and vigilance).

Results: Between the baseline and the first quarter, a significant difference was found in the NIH Toolbox List Sorting Working Memory ($p=0.0051$), ImPACT Composite Verbal Memory score ($p=0.03$), and CPT3 Hit Reaction Time Standard Deviation ($p=0.0018$). Between the baseline and the second quarter, a significant difference was found in the ImPACT Total Symptom Score ($p=0.04$) and NIH Toolbox List Sorting Working Memory Test (0.006). Between the first quarter and second quarter, a significant difference was found in the ImPACT Reaction Time ($p=0.03$)

Conclusions: The accumulation of subconcussive exposures experienced in motor sport drivers over the course of a season may negatively impact various neurocognitive domains, particularly working memory, as this functionality was hindered at two different timepoints. Future studies should incorporate a larger sample size and control for practice effects if repeating neurocognitive measurements.

Source of mentor's funding or other support that funded this research: Department of Biomedical Engineering, Childress Institute for Pediatric Trauma

Poster Title: The Role of Social Determinants in Post-Sepsis Readmission and Mortality: A systematic review

Student: Ryan Hilton, Class of 2024
Faculty Mentor and Department: Stephanie Taylor, MD, Internal Medicine, Carolinas Medical Center, Atrium Health Wake Forest Baptist

Funding Source: none

ABSTRACT

Background: Sepsis, life-threatening organ dysfunction caused by a dysregulated host response to infection, is responsible for significant acute and chronic morbidity and mortality. Sepsis survivors experience a 1-year rehospitalization rate of nearly 40% and a 1-year post-discharge mortality rate of more than 15%. Despite recent increased attention to recovery after sepsis, an important topic that remains unknown is the association of social determinants of health (SDH) with adverse outcomes. The clinical importance of SDH has been demonstrated in numerous other settings, and SDH may be a particularly salient contributor to the risk of hospital readmission. We found no systematic reviews to date that explore the relationship between SDH and risk for rehospitalization or mortality after sepsis in adults. The objective of this study was to systematically evaluate studies of risk factors for post-sepsis rehospitalization or mortality and synthesize the literature to reflect current knowledge and identify gaps in evidence for the role of SDH on these post-sepsis adverse events.

Hypothesis: SDH, such as race, insurance status, and neighborhood disadvantage, are associated with increased risk of rehospitalization and death among adult sepsis survivors.

Methods: We conducted a systematic search of MEDLINE, Cochrane Library, and EMBASE. Independent double-data extraction was following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Studies were included if 1) the primary cohort comprised patients hospitalized with sepsis, 2) the primary outcome was rehospitalization or mortality occurring after index hospitalization for sepsis, and 3) the study assessed risk factors for these outcomes. Out of eligible studies, we determined the proportion of studies that included SDH as potential risk factors for post-sepsis outcomes and evaluated the quality of measurement of SDH. We synthesized data to report which social determinants were found to be associated with post-sepsis rehospitalization or mortality.

Results: 2,073 articles were retrieved from databases. Of 99 that met screening criteria, 26 (26%) included SDH as a potential risk factor for adverse post-sepsis outcomes, whereas 73 (74%) failed to include SDH factors. Of studies that included any SDH, the most common SDH was race/ethnicity in 19 (73%) studies. 9 (35%) studies included insurance type, 6 (23%) included income or wealth, and 5 (19%) included neighborhood socioeconomic status. Most of SDH data were obtained from electronic health records or registry linkage with information about data validation and handling of missing data often not reported. Studies reported mixed findings regarding the association between various SDH and post-sepsis outcomes.

Conclusions: Despite the clinical importance of SDH in health outcomes, only 26 (26%) out of 99 studies evaluating risk factors for post-sepsis outcomes included any SDH, and only 7 (7%) evaluated SDH other than race/ethnicity. The quality of studies is limited by lack of reporting on measurement error and missing data for SDH. Improved understanding of the social determinants that impact adverse outcomes after sepsis is important to inform interventions that adequately address the whole-person needs of sepsis survivors.

Source of mentor's funding or other support that funded this research: NIH National Institute of Nursing Research (R01NR018434) and National Libraries of Medicine (R21LM013373)

Poster Title: Evaluating Long-term Outcome Trajectories of Selective Laser Amygdalohippocampectomy for Medically Intractable Mesial Temporal Lobe Epilepsy
Student: Alexander C. Horn, Class of 2024
Faculty Mentor and Department: Heidi M. Munger Clary, MD, MPH, FACNS
Funding Source: The Harry O. Parker Neuroscience Research Fund

ABSTRACT

Background: Magnetic resonance guided laser interstitial thermal therapy (LITT), also called laser ablation, is a novel, minimally invasive surgical treatment for medically intractable mesial temporal lobe epilepsy. There is a paucity of data on patterns of change in longitudinal seizure outcome (other than time to postoperative seizure recurrence) and limited to no data examining anti-seizure medication (ASM) outcomes following LITT. Thus, comprehensive long-term post-operative outcome analyses concerning Engel classification and ASM trajectories are warranted.

Hypothesis: (1) With respect to seizure frequency, we expected a portion of those who achieved Engel Class I to have experienced a period of delay or worsening following surgical intervention. Alternatively, we also expect to find patients who purely regress to worse Engel Classifications following periods of seizure freedom. (2) As for AED usage, we anticipated trajectories that reflect a progression towards drug independence, especially in patients who achieve Engel Class I.

Methods: This study utilized retrospective data from 44 patients evaluated by the Wake Forest Baptist Health Comprehensive Epilepsy Center, spanning the past decade. Qualifying patients had medically intractable mesial temporal lobe epilepsy (MTLE) and underwent mesial temporal laser ablation following surgical evaluation. At least 12 months of postoperative follow-up was required for inclusion. Seizure outcomes and ASM data were collected from clinical visits and entered into a REDCap database. Patterns of longitudinal seizure outcomes were plotted, and participants divided into four outcome trajectory patterns: Persistent Seizure Freedom (PSF – continuous Engel I), Persistent Poor Outcome (PPO – continuous Engel III/IV), Relapse Remitting (RR – decline to Engel II), Improvement Group (IG - from Engel III/IV to Engel II or Better).

Results: Patient demographics featured a mean age at surgery of 36.9 years, 28/44 (63.6%) female, 28/44 (63.6%) left sided surgery, and a mean total follow-up length of 39.2 months. Of the 44 patients, 25 were Engel I at their last visit (56.8%), 23 experienced PSF since surgery (52.3%), 8 were IG, 6 were RR and 7 PPO. Twenty-five patients had periods of seizure freedom greater than 1 year at any point, 23 of which were PSF, 1 in the RR group, and 1 in the improvement group. Twenty-four had MRI confirmed mesial temporal sclerosis (MTS), 18 of which were Engel I at their last visit (78.2%). Seven of the 20 non-MTS patients were seizure free at their last visit (35.0%). Those in IG had mean 19.7 months until said delayed benefits, and those in the RR group had mean 14.3 months until first relapse. Within PSF, 6 (26.1%) had successfully tapered off all ASMs by their last follow-up. No patients in the other groups were ASM free. Twenty-four out of 44 patients (54.5%) were taking lower ASM doses at last visit compared to surgery, 17 of which were in the PSF group, 4 in IG, 2 in RR, and 1 in PPO. Three patients in the improvement group had medication added or dose increase prior to improvement. Conversely, 2 patients in the RR group had medication reduction before relapse.

Conclusions: In this long-term follow up study of mesial temporal laser ablation, while only 52.3% had persistent seizure freedom, nearly one-third had either initial poor outcome followed by improvement (IG), or intermittent seizures with Engel II outcome (RR). Medication reduction or taper was common only in the PSF group. These outcomes merit further study and are of clinical relevance for preoperative counseling.

Source of mentor's funding or other support that funded this research: Wake Forest Baptist Health Department of Neurology

Poster Title: SGLT Inhibition: A Novel Approach to Reducing Hypoglycemia in T1D
Student: Daniel Ines, Class of 2025
Faculty Mentor and Department: Schafer Boeder, MD, Division of Endocrinology, Diabetes, and Metabolism
Funding Source: None

ABSTRACT

Background: Individuals with T1D have an ineffective glucagon response to low glucose levels which predisposes them to episodes of hypoglycemia. SGLT-2 inhibitors (SGLT2i) do not increase and may even reduce hypoglycemia in clinical trials, yet the mechanism is unknown.

Hypothesis: This trial was conducted to determine if SGLT2i improve the counterregulatory response (CR) to hypoglycemia.

Methods: Subjects with T1D (n=22) received 4 weeks of SGLT2i (dapagliflozin 5 mg daily) and 4 weeks of placebo in a double-blind, random-order, cross-over study. After each phase, subjects underwent a hypoglycemic clamp. During 40 min of hypoglycemia (mean serum glucose 49 mg/dL) CR hormones were serially measured.

Results: There was no difference between treatment phases in glucagon or other CR hormones during hypoglycemia. Mean ± SE (paired two-tailed t-test) during hypoglycemia for SGLT2i vs Placebo were: Glucagon (15.4 ± 1.8 vs 14.8 ± 2.1 pg/mL; P = 0.77), Epinephrine (216 ± 34 vs 200 ± 28 pg/mL; P = 0.46), Norepinephrine (402 ± 39 vs 381 ± 25 pg/mL; P = 0.51), GH (9.1 ± 1.3 vs 8.4 ± 1.8 ng/mL; P = 0.60), and Cortisol (11.4 ± 1.1 vs 10.3 ± 0.9 mcg/dL; P = 0.18).

Conclusions: SGLT2i treatment has no effect on the CR hormone response to hypoglycemia in T1D. These data suggest that any reduction in hypoglycemia that occurs with these agents may be due to behavioral changes (e.g., lower insulin doses, less frequent bolusing), rather than a physiologic mechanism.

Source of mentor's funding or other support that funded this research: JDRF Grant, Dexcom Inc, REMD Biotherapeutics

Poster Title: Characterizing Safety and Efficiency of Umbilical Hernia Repair on the Resident Run Surgical Service

Student: Stephanie Ira, Class of 2024
Faculty Mentor and Department: Reese Randle, MD, Department of Surgery

Funding Source: Department of Medical Education, Wake Forest School of Medicine

ABSTRACT

Background: The chief resident service provides final-year surgical trainees with a supervised experience in independence, responsibility and decision-making like they will face after graduation. Residents are entrusted to determine their personal preferred operative techniques while being supervised by an attending physician. The graduated independence this service provides is reliant on if it is safe for patients and cost effective for the institution.

Hypothesis: We hypothesized outcomes and operative cost of umbilical hernia repairs to be equivalent between the chief resident service and the standard academic service.

Methods: We matched each adult undergoing umbilical hernia repair from 07/2016-06/2019 on the chief resident service to two standard academic service patients based on operative indication, sex, and age. We compared demographics, surgical complications, operative time, 30-d complications and operative costs.

Results: This study included 90 patients undergoing open umbilical hernia repair (30 chief service patients and 60 standard academic service patients). Chief service patients had less comorbidities on average (Charlson Comorbidity Index 0.5 vs 1, P = 0.05), but mean body mass index (31.8 vs 31.6, P = .55) and fascial defect size (1.6cm vs 1.8cm, P = 0.85) were similar between the chief resident and standard academic services, respectively.

The overall complication rate was similar (10.0% chief resident, 10.0% standard, P= 1.0) Additionally, there were no significant differences in recurrence (6.7% chief resident and 1.7% standard, P = 0.23) infection (0.0% chief resident versus 5.0% standard, P= 0.12), seroma (3.3% chief resident versus 1.7% standard, P= 0.62) or hematoma (0.0% chief resident, 1.7% standard, P= 0.37) between services. Procedure-related ED visits were similar (10.0% chief resident versus 5.0% standard, P= 0.38) and no patients on either service required readmission or reoperation within 30 days.

The chief resident service averaged longer operating times (38±22 vs 26±16 min, P < 0.01) as well as more time spent in the operating room (88±34 vs 70±21 min, P <0.01) versus the standard academic service, respectively. More time in the operating room translated into higher time-based cost for chief resident's service ($763vs $609, P < 0.01), but mean cost for materials was similar ($203vs $231, P= 0.52) between the chief resident and standard service, respectively.

Conclusions: The chief resident service provides safe operations for patients undergoing umbilical hernia repair with outcomes similar to those on the standard academic service. Although operative times are longer on the chief resident service, residents spend no more on materials than faculty when operating according to their preferences.

Poster Title: Validation of Swallowing-related Organs at Risk in Patients Treated with Radiotherapy for Oropharyngeal Squamous Cell Carcinoma

Student: Ankitha Iyer, Class of 2024
Faculty Mentor and Department: Ryan Hughes, MD, Radiation Oncology

Funding Source: Laura Scales Student Research Fellowship Fund

ABSTRACT

Background: Patients treated with chemoradiotherapy (CRT) for HPV-related oropharyngeal cancer may suffer long term swallowing impairments. Dysphagia-optimized IMRT (Do-IMRT) can be used to spare dysphagia-aspiration related structures (DARS) to minimize the post-treatment dysphagia. Identifying the most accurate radiation dosimetric predictor of post-treatment dysphagia would provide insight into which structures are highest yield to spare during RT planning, and to what radiation dose level these structures should be constrained.

Hypothesis: CRT dose to DARS is associated with long-term swallowing dysfunction, and various doses to multiple structures may differentially predict toxicity.

Methods: Patients treated with CRT for oropharynx cancer were identified and DARS were delineated for each patient using CRT treatment planning software to obtain CRT dose to these structures. The primary endpoint is the 1-year Functional Oral Intake Scale (FOIS), a 7-point scale used to document subjective swallowing function based on the level of solid and liquid intake. Dosimetric variables were summarized, relationships between dose to DARS and GT-dependence at 1-year (yes v. no) were evaluated using the Kruskall-Wallis test. The association between FOIS at 1-year and dose to DARS on a continuous scale was assessed using Spearman's correlation.

Results: 25 patients treated with CRT were included in the analysis. ECOG performance status was 0-1, 60% were current/former smokers, and 19 (76%) had Stage I-II disease. Prophylactic gastrostomy tube (GT) was placed in 19 patients. Median baseline FOIS was 6 (IQR 6-7). CRT dose was 70 Gy (n=24) or 66 Gy (n=1). Median of the mean pharynx dose was 57.8 Gy (IQR 54.4-59.8); median pharynx V50 and V60 were 79.7% (72.1-83.8) and 52.0 (36.9-60.1). Median of the mean GSL dose was 59.5 Gy (51.6-62.8) and median of the mean cricopharyngeus dose was 48.8 Gy (45.8-51.0). Three (12%) patients were GT-dependent at 1-year post CRT (1 with FOIS=1 and 2 with FOIS=3) and FOIS was 6-7 in the remaining 22. Dose to DARS was numerically but not statistically significantly higher in GT-dependent patients. There were no statistically significant ($p > 0.05$) correlations between 1-year FOIS score and DARS RT dose parameters: pharynx mean (r=-0.19), pharynx V50 (r=-0.21), pharynx V60 (r=-0.11), GSL mean (r=-0.11), and cricopharyngeus mean (r=-0.24) dose.

Conclusions: Definitive CRT for patients with oropharyngeal SCC is associated with pharyngeal dysfunction in approximately 12% of patients at 1-year. RT dose to DARS was high, and doses to DARS were non-significantly inversely associated with swallowing function. Further research is warranted to determine the optimal safety parameters to which the dose to DARS could be constrained to prevent long-term dysphagia or GT-dependence.

Poster Title: COVID-19-related knowledge, attitudes, practices, and vaccine intention among North Carolina medical students

Student: Samantha Kline, Class of 2024
Faculty Mentor and Department: Avinash Shetty, MD, Pediatric Infectious Disease
Funding Source: Department of Medical Education, Wake Forest School of Medicine

ABSTRACT

Background: There have been over 225 million global cases of COVID-19, resulting in over 4.5 million deaths across the world. The US bears the brunt of the pandemic accounting for over 85 million of these cases.[1] COVID-19 cases continue to rise each day, and vaccination rates across the US vary, with less than 47% of NC adults currently fully vaccinated against COVID-19.[2] As the US continues to face the unprecedented challenges of the pandemic, it is vital to prepare the next generation of medical professionals to recognize and treat the signs and symptoms of COVID-19, as well as educate their patients regarding the realities of COVID-19 vaccination.

Hypothesis: We hypothesized that students at Wake Forest School of Medicine (WFSOM) would have good overall knowledge about COVID-19 disease and would display positive attitudes about vaccination. It was also expected that students would not feel well prepared to care for patients with COVID-19 or educate them on vaccination and demonstrate stigmatized attitudes toward COVID-19 infection due to its high infectivity and potentially severe clinical consequences.

Methods: We conducted a descriptive, cross-sectional study to assess the knowledge, attitudes, practices, and vaccine intention among medical, PA, and CRNA students at WFSOM in Winston-Salem, NC. Using convenient sampling, a total of 235 consenting participants completed a 110-item structured survey questionnaire.

Results: The majority of respondents were Wake Forest medical students (73.9%), followed by PA students (23.9%) and CRNA students (2.1%). Majority of our participants recognized COVID-19 as a serious disease (96.6%) and received 2 doses of the COVID-19 vaccine (99.1%). Minority reported (14.9%) reported prior infection withCOVID-19. Majority had knowledge of key symptoms including fever (99.6%), dry cough (93.6%), myalgia (85%) and shortness of breath (99.1%). A large majority also identified respiratory droplets (97.4%) as the main source of COVID-19 transmission. However, only 44.8% reported avoiding crowded places and 55.6% avoid touching or shaking hands. A high amount of stigma was associated with COVID-19 infection as 53.7% of participants either agreed or strongly agreed they would be treated differently if they were to be infected and 39.6% said they believed people would think badly of them. Only 28.2% of participants believed that their country would be able to control the COVID-19 situation soon and a majority agreed (45.9%) or strongly agreed (16.6%) that parts of their medical education would be negatively impacted by COVID-19 restrictions. A small majority said they felt either confident (41%) or very confident (19.7%) explaining vaccine efficacy and safety data to future patients and 88.3% reported they would recommend the vaccine to patients when it is available to them, yet over 30% of participants either agreed or were unsure about vaccine safety.

Conclusions: Future educational strategies to enhance preparedness, reduce stigma, and address vaccine misconceptions may be accomplished through continued education efforts to ensure medical students are equipped to effectively educate their patients and work to help end the pandemic.

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2.Mayo Foundation for Medical Education and Research. *U.S. COVID-19 vaccine tracker: See your State's progress*. Mayo Clinic. Retrieved September 18, 2021, from https://www.mayoclinic.org/coronavirus-covid-19/vaccine-tracker.

Poster Title: Novel Magnetic Resonance 3D Reconstruction and Modeling of the Acetabular Labrum: A Pilot, Translational Study in Biomedical Engineering, Advanced Musculoskeletal Imaging, and Orthopaedic Hip Joint Preservation

Student: Sasha Kondrasov, Class of 2024
Faculty Mentor and Department: Allston Stubbs, MD, Orthopaedic Surgery

Funding Source: Department of Medical Education, Wake Forest School of Medicine

ABSTRACT

Background: The acetabular labrum is a fibrocartilaginous structure surrounding the rim of the acetabulum, which articulates with the femoral head in the hip joint. The labrum can be torn or detached; such pathology is often a result of femoroacetabular impingement (FAI). FAI has a significant impact on young patients and the rate of total hip replacement surgeries is projected to increase to 4 million in the U.S. by the end of the decade. Current diagnostic evaluations of the chondrolabral junction using methods ranging from arthroscopy to MRI are limited. There has been a marked increase of interest in 3D models for pre-operative hip joint assessments; however, 3D reconstruction of the chondrolabral junction is yet to be seen. Development of a reliable and accurate 3D computer-based, patient-specific model of the acetabular labrum would provide an excellent, non-invasive tool for evaluating and diagnosing chondrolabral injury, as well as improving understanding of the pathophysiology of FAI. This tool would improve clinicians' ability to identify and treat patients presenting with FAI, as well as make informed decisions regarding the most efficacious treatment for hip joint preservation. The early detection and treatment of chondrolabral damage with this 3D model could prevent early osteoarthritis and the need for hip replacement surgery.

Hypothesis: A patient-specific 3D computer-based model of the chondrolabral junction will allow clinicians to more effectively evaluate acetabular labral pathology prior to surgical interventions and will serve as an invaluable diagnostic tool with refined specificity, sensitivity, and reliability.

Methods: (1) Research and identify optimal MRI characteristics that allow for enhanced visualization of the acetabular chondrolabral junction for evaluations of pathology such as a labral tear. (2) Using the MRI protocol, develop a systematic method of producing patient-specific, computer-based 3D models to serve as a morphological reconstruction of the chondrolabrum with diagnostic capabilities. (3) Assess the specificity, sensitivity, predictive value, and reliability of the 3D model by comparing diagnostic evaluations made using the 3D model and the labral abnormalities found intraoperatively.

Results: Results are pending. We are currently in the first phase of the project, which is identifying an optimal MRI protocol.

Conclusions: It is our hope that with a patient-specific 3D model of the chondrolabral junction, clinicians will be able to more accurately and effectively assess the acetabular labrum in patients presenting with FAI and other hip joint injuries so that appropriate treatment can be determined. If the hypothesis is supported, potential next steps will be to evaluate whether this diagnostic tool can be applied to other osteoarthritic pathologies aside from those of the hip joint.

Poster Title: Prognostic Significance of Focal and Multifocal Positive Surgical Margins Following Robotic-Assisted Radical Prostatectomy among African American Men

Student: Bridget Krol, Class of 2023
Faculty Mentor and Department: Ram Pathak, MD, Urology

Funding Source: none

ABSTRACT

Background: Prostate cancer is the second leading cause of death in men and this disease disproportionately impacts African American (AA) males. Compared to Caucasian males, AA men are 1.6-1.8 times more susceptible to prostate cancer and have a twice as high mortality rate. The racial disparities seen in prostate cancer are likely due to cultural and socioeconomic factors, inequality in healthcare access, and differences in preventative health factors - such as awareness and motivation for prostate cancer screening. A growing body of evidence now suggests that differences at the genetic and molecular level could be more crucial than previously thought as AA men have been shown to have more aggressive tumor biology. In this era of robotic-assisted radical prostatectomy (RARP), margin status remains an important measure of the quality of disease clearance with treatment failure defined by biochemical recurrence (BCR). Unfortunately, historical series have shown that AA men tend to fare worse in this metric comparing to other ethnicities. Furthermore, the prognostic potential of margin multifocality in this population is not clear. Our study aims to investigate the potential risk factors for PSM in this patient group and the prognostic significance of focal and multifocal PSM in regards to its impact on biochemical recurrence-free survival (BCRFS).

Hypothesis: It is hypothesized that multifocal positive surgical margins will further reduce BCRFS when compared to unifocal margins in African American men.

Methods: 246 AA men underwent RARP between 2009 and 2019 at our institution. Patients who had received neoadjuvant androgen deprivation therapy, less than 6 months of postsurgical follow-up, or who underwent cytoreductive and salvage prostatectomy were excluded from the final cohort. Data were retrospectively collected from medical records and preoperative patient and disease characteristics, perioperative variables, and postoperative and pathological outcomes were recorded and compared according to final margin status. Margin focality was determined by the number of sites that cancer cells had been found at the inked margin of resection, irrespective of length.

Results: Adverse pathology (pathological stage > T3, pathological ISUP > 3, or positive nodal disease) was seen in 111 AA men (45.1%). Unifocal PSM status was observed in 52 men (21.1%) and multifocal PSM in 28 men (11.4%). PSM was associated with reduction in BCRFS (log-rank $p < 0.001$). Margin multifocality did not further increase disease recurrence. Patients with PSM had higher preoperative PSA ($p < 0.001$), higher clinical risk category ($p = 0.007$), higher pathological grade ($p = 0.002$) and incidences of perineural invasion (PNI) ($p < 0.001$), as well as higher percentages of clinical and pathological T3 disease. When looking specifically at pT2 disease, overall PSM rate was 22.7%. Unifocal PSM status was observed in 29 men (16.4%) and multifocal PSM in 11 men (6.25%). The multifocality of the surgical margins did not impact BCRFS in pT2 disease ($p = 0.267$).

Conclusions: PSM rate in AA men remained high in the era of robot-assisted surgery and significantly affected BCRFS. A number of factors have been found to correlate with PSM including, preoperative PSA and PSA density, clinical stage and risk category, and final pathological grade and stage. These patients were also more likely to have other adverse pathological features. Margin multifocality did not appear to further reduce BCRFS.

Poster Title: Examining Peripheral, Mixed Nerve Reconstruction Failures Using Processed Nerve Allografts

Student: Joey S. Kurtzman, Class of 2025
Faculty Mentor and Department: Steven M. Koehler, MD, Director of Hand and Microsurgery, SUNY Downstate Medical Center

Funding Source: none

ABSTRACT

Background: Favorable rates of meaningful recovery (defined as >M3/S3 or >M3/S4) of processed nerve allografts (PNA) for mixed and motor nerve injuries have been reported, ranging from 36-88% depending on nerve location and reconstruction size. There have been very few reports, however, of patients having complete PNA failure (defined as M0/S0).

Hypothesis: The purpose of this study was to provide a case series of patients who suffered a complete failure after PNA for a mixed peripheral nerve.

Methods: This is a retrospective review of outcomes between May 1, 2018, and September 1, 2020. Consecutive patients who underwent nerve repair with PNA to a peripheral, mixed nerve injury of the upper or lower extremity that was >15 mm with a minimum of 6-months postoperative follow-up were included in this study. Patients who were under 18 or those who underwent a pure sensory or motor nerve reconstruction with PNA were excluded. All patients were directly operated on by a fellowship-trained hand surgeon with a clinical practice focusing on microsurgery and peripheral nerve. The primary outcome was whether the patient was defined as a complete failure (M0/S0) at a minimum of 6-months.

Results: A total of 19 patients underwent peripheral mixed nerve PNA and met our inclusion and exclusion criteria; of these, 9 were included in analysis (47% compliance) (age: 42.33±16.71 years, 7 females/2 males) with a mean follow-up of 9.67±4.15 months. Four patients underwent PNA to the median nerve, 3 to the ulnar nerve, and 2 to the common peroneal nerve. There was a range of indications for the PNA: 3 patients were indicated for PNA due to the presence of a neuroma in continuity (due to a subacute laceration confirmed on MRI and/or US ([less than 1 month from injury in all cases]), 3 had a laceration with a gap, 2 sustained injuries due to a fracture, and 1 sustained iatrogenic injury from a carpal tunnel release. The average gap length was 46.44 mm (range 15-110 mm). At a minimum of 6-months postoperative, no patients had any motor or sensory improvement; all patients were deemed complete failures. Five patients underwent subsequent revision reconstruction surgery: four autograft reconstructions and one distal nerve transfer.

Conclusions: In this study, we demonstrated a high number of complete failures (n=9, 100% failure) at minimum 6-months follow-up. Failure in this case series was not observed to affect one nerve type, location, or be related to preoperative injury size. Intraoperative assessment of patients who underwent subsequent revision surgery demonstrated the presence of significant neural adhesions surrounding the PNA, associated with large neuromas. Based upon this study's results, caution should be employed when utilizing PNAs for large (> 15 mm), mixed peripheral nerve repairs.

Poster Title: Cost Consciousness of General Surgery Residents During Laparoscopic Cholecystectomy and Open Inguinal Hernia Repair

Student: Alexa L. Lacy, Class of 2024
Faculty Mentor and Department: Reese W. Randle, MD, Department Surgery

Funding Source: Wake Forest Institute of Regenerative Medicine

ABSTRACT

Background: General surgical chief residents are entrusted with the task of choosing the necessary equipment to perform common core operations according to their preferences on the chief resident service. To determine if residents are cost conscious when selecting the materials needed to perform these operations, we aimed to compare operative costs between the chief resident service and standard academic service (SAS) for two common procedures, laparoscopic cholecystectomy and open inguinal hernia repair.

Hypothesis: We hypothesized that chief residents will not incur higher material costs than general surgery faculty on standard academic services when they are entrusted to direct laparoscopic cholecystectomies and open inguinal hernia repairs according to their preferences.

Methods: We matched adults undergoing laparoscopic cholecystectomy and unilateral open inguinal hernia repair without additional procedures from 07/2016-06/2019 on the chief resident service to the SAS (1:1) by CPT, age, and sex. We compared material and time-based operative costs between the services.

Results: For laparoscopic cholecystectomy (n=120), body mass index (mean 31.9 versus 32.6, P=0.42), Charlson comorbidity index (mean 0.78 versus 0.98, P=0.69), and previous abdominal surgery (55% versus 63.3%, P=0.35) were similar between the chief service and SAS, respectively. Time in the operating room was greater for the chief service versus SAS (158.55 versus 134.70 minutes, P=0.001), and consequently time-based costs were greater on the chief service ($1380.97 versus $1173.24, P=0.001). However, material-based costs were lower on the chief service by an average difference of $70.33 ($490.69 versus $561.02, P=0.063). Relatedly, residents used less disposable clip appliers (3 clip appliers on the chief service versus 13 clip appliers on the SAS, P=0.006), for an average cost savings of $26.68 per case (P=0.007). The total operative cost (material and time-based costs) difference per laparoscopic cholecystectomy was only $137.40 ($1871.66 for the chief service versus $1734.26 for the SAS, P=0.04).

For open inguinal hernia repair (n=100), body mass index (mean 27.4 versus 25.8, P=0.24), Charlson comorbidity index (mean 1.3 versus 1.5, P=0.35), and previous abdominal surgery (44% versus 56%, P=0.23) were similar between the chief service and SAS, respectively. Use of mesh was almost unanimous between services (100% on chief service versus 98% on SAS, P=0.24); however, the residents used less costly mesh on average ($155.40 versus $199.30, P=0.01). The chief service had greater operating room time (163.80 versus 99.72 minutes, P=<0.001), time-based costs ($1426.7 versus $868.56, P=<0.001), and total cost ($1709.56 versus $1205.69, P=<0.001), respectively. However, chief residents spent significantly less ($282.86 versus $337.13, P=<0.001) on materials.

Conclusions: Chief residents are seemingly cost conscious as evidenced by their relatively low material-based operative costs for common general surgery operations like laparoscopic cholecystectomy and open inguinal hernia repair. Differences in time-based costs between the chief service and the SAS are offset by lower material-based costs on the chief resident service.

Poster Title: Identifying Faculty Motivators and Barriers to Participation as a Scholarly Mentor for Pediatric Residents: A Qualitative Approach

Student: Virginia Lane, Class of 2024
Faculty Mentor and Department: Elizabeth Halvorson MD, MS, Laurie Albertini, MD, Jeanna Auriemma, MD, John Darby, MD, Shannon Hanson, PhD, MPH, Kimberly Montez, MD, MPH, Thomas Russell, MD, Department of Pediatrics

Funding Source: None

ABSTRACT

Background: Faculty mentorship is an important component of medical training. Participation in scholarship is a required component of pediatric residency training according to the Accreditation Council for Graduate Medical Education (ACGME); however, many programs identify a lack of faculty mentors as a significant barrier to meeting this requirement. Participation in scholarship increases competitiveness in the fellowship programs, as well as informing their career beyond residency. Therefore, it is paramount to understand and address the shortage of faculty mentors. While existing literature has focused on the barriers to participation, studies have not evaluated potential benefits to participation. The objective of this project is to investigate barriers and motivators affecting participation as a faculty scholarly mentor in the Wake Forest School of Medicine's pediatric residency program.

Hypothesis: It is hypothesized that Self-Determination Theory, the idea that a combination of competence, relatedness, and autonomy motivates one's decision-making process, plays a critical role in the motivation to participate as a faculty mentor. It is believed that this theory will correlate with the themes identified in the completed interviews.

Methods: A series of twenty semi-structured key informant interviews were conducted with pediatric faculty involved in Wake Forest's pediatric residency program. For triangulation, faculty were purposively sampled based on past participation in mentorship, career length, and scholarship productivity. The interview guide contains was developed on Self-Determination Theory and explored experiences mentoring residents, and the benefits of and the barriers to their participation or lack of participation in mentorship. The interviews were transcribed verbatim, and then coded with a common coding system and data dictionary by two research members. Development of themes was based on a grounded theory approach. Interviews were conducted until thematic saturation was achieved.

Results: The themes arising from this study suggest that motivators and barriers of pediatric faculty in mentoring residents in scholarship are impacted by self-determination theory's central tenant, that motivation comes from an individual's sense of competence, relatedness, and autonomy. The themes that arose are as follows: 1) Roles of mentor and mentee vary based on experiences, backgrounds, and skillsets; 2) Failings, feelings, and fulfillment affect the mentor-mentee dyad; 3) Residency scholarship programs are one of many institutional/third-party factors affecting mentor-mentee dyads; 4) Mentor and mentee autonomy are impacted by clinical and training demands; and 5) Multiple relationship and communication styles contribute to a sense of relatedness for the mentor and mentee.

Conclusions: It is suggested that the combination of competence, relatedness, and autonomy impacts the relationship of mentor-mentee dyads. Pediatric residency programs could benefit from the use of self-determination theory in providing resources and infrastructure to support mentee-mentor dyads. Future research could study quantitative aspect's, such as dissemination to further determine benefits to faculty participation in resident scholarly mentorship.

Source of mentor's funding or other support that funded this research: Pediatrics' Department at Wake Forest Baptist Health.

Poster Title: Morphology of the Occipital Bones and Foramen Magnum resulting from Premature Minor Suture Fusion in Crouzon Syndrome.

Student: Ryan Layton, Class of 2024
Faculty Mentor and Department: Christopher M. Runyan, MD, PhD

Funding Source: Department of Plastic and Reconstructive Surgery, Wake Forest School of Medicine

ABSTRACT

Background: Nearly all skull sutures fuse prematurely in Crouzon syndrome, resulting in foramen magnum dysmorphology. Although previously suggested, no direct evidence demonstrates minor suture fusion causes occipital bone and foramen magnum dysmorphology.

Hypothesis: We hypothesize minor suture fusion directly restricts occipital bone development in the Crouzon skull base.

Methods: 60 pre-operative patients with Crouzon syndrome younger than 12 (years) were selected from the Wake Forest Craniofacial Imaging Database (WFCID) and retrospectively studied. Each patient was age- and sex-matched to obtain a 60-patient normal control group. No participant had prior craniofacial surgery. Skull-base suture closure degree and cephalometric measurements were obtained using preoperative CT scans. Multiple linear regression models were used to evaluate whether premature minor suture fusion in Crouzon syndrome correlates with occipital bone and foramen magnum cephalometric outcomes.

Results: A causal relationship between minor suture fusion and linear skull base cephalometric measures was not established using regression analysis. However, 3D volumetric evaluation of the basioccipital, exo-occipital, and supra-occipital bones revealed decreased growth in Crouzon patients which could be attributed solely to premature minor suture fusion. Spheno-occipital and petrous-occipital suture fusion reduced growth of the basiocciput; lambdoid arch, occipitomastoid and posterior intraoccipital synchondrosis fusion reduced growth of the supra-occiput; and petrous-occipital suture and anterior intraoccipital synchondrosis fusion reduced growth of the exo-occiput. Foramen magnum morphology is restricted in Crouzon patients, relating to premature fusion of the posterior intraoccipital synchondrosis.

Conclusions: Premature minor fusion directly restricts the volume of the developing occipital bone in Crouzon patients, mediating foramen magnum morphology.

Poster Title: High-Risk Breast Cancer Screening in Patients Under 40
Student: Gregory Lombana, Class of 2024
Faculty Mentor and Department: Akiko Chiba, MD, Department of Surgical Oncology
Funding Source: The Dubie H. Holleman Fund for Cancer and Heart Research

ABSTRACT

Background: Annual screening mammography is recommended to begin at age 40 for women who are at average risk of developing breast cancer. For high-risk women, earlier screening with the addition of breast MRI is preferred. Although this recommendation is well-supported, many women under the age of 40 are diagnosed with breast cancer without having undergone appropriate early screening. The actual rate of adherence to these guidelines is unclear. This study investigates our institutional utilization of appropriate screening efforts in high-risk women diagnosed with breast cancer under age 40.

Methods: A retrospective review of patients with breast cancer diagnosed before age 40 between 2013-2018 was conducted. Demographics, obstetric history, personal/family histories, biopsy/surgical details, radiologic information, and preoperative variables were collected. Patients were identified as being at increased risk of breast cancer as defined by the National Comprehensive Cancer Network (NCCN) guidelines and the Tyrer-Cuzick (TC) model (≥ 20% lifetime risk).

Results: The study included 92 women with a mean age of 34.5 years and a median follow-up period 29.5 months. Most subjects self-identified as non-Hispanic White women (66.3%). The most common presenting symptom was a palpable mass (n = 74, 80.4%), and the vast minority of cancers were diagnosed by screening (n = 3, 3.3%). The most common histology was invasive ductal carcinoma (IDC) (n = 69, 75%), followed by ductal carcinoma in situ (DCIS) (n = 10, 10.8%), and inflammatory breast cancer (IBC) (n = 8, 8.7%). The majority of women were found to have early-stage breast cancer, with more than 50% being diagnosed at Stage I or Stage II disease. ER/PR+ cancers (57.6%) were more common than ER/PR- cancers (37.6%), and both were more common than triple-negative breast cancer (TNBC) (22.8%). Although 35.9% of the women included met criteria for early screening per NCCN guidelines, only 3.3% (n = 3) were appropriately screened prior to their diagnosis. Almost all patients (98.9%) were offered genetic testing by their surgeon during initial consultation, and among those tested, 15.3% were found to be positive for BRCA1 or BRCA2, and 21.2% carried other pathogenic mutations.

Conclusions: Despite over one-third of this patient population qualifying as high-risk at the time of diagnosis, only 3 of them were diagnosed through implementation of high-risk screening. This discrepancy presents an opportunity to improve awareness among providers regarding how breast cancer risk is evaluated in the primary care setting. Earlier risk evaluation and identification of high-risk patients may facilitate the use of appropriate screening measures for this population, and this may translate to earlier breast cancer diagnosis.

Poster Title: Catastrophic Events Related to Tuberous Sclerosis Complex Are Unlikely in those Undergoing Routine Surveillance
Student: Vanessa Lukas, Class of 2022
Faculty Mentor and Department: Ram Pathak, MD, Department of Urology
Funding Source: Internal funding source

ABSTRACT

Background: Tuberous Sclerosis Complex (TSC) is multi-system disorder characterized by epilepsy, cognitive dysfunction, and benign tumors of the eye, brain, heart, lung, and kidneys. TSC varies greatly in its severity and surveillance is necessary to monitor disease progression.

Hypothesis: We sought to characterize the prevalence of TSC-related catastrophic events as they relate to renal disease and determine the impact of distance of the patient's residence to the site of operative services.

Methods: A retrospective analysis of patients afflicted with TSC was performed. Qualitative data for demographics, clinical manifestations of TSC, and renal specific characteristics were compiled. Only complete datasets were incorporated in the analysis.

Results: Complete data was available for 44 patients with mean age 35.6 years ± 13.8 (39% male, 82% urban). Distance traveled to clinic based on residential zip code was 30%, 41%, and 29% for >60 miles, 30-60 miles, and <30 miles, respectively. Frequency of TSC clinical manifestations included 86% with epilepsy, 84% with skin involvement, 80% with renal involvement, 80% with neurological involvement, 45% with pulmonary and/or cardiac involvement, 18% with lymphangioleiomyomatosis, and 14% with retinal hamartomas. Of those with renal manifestations, 77% had >10 angiomyolipomas (AML) at baseline imaging. The number of AMLs and estimated GFR did not change significantly over the median follow-up of 38 months. However, a median increase of 4mm (largest diameter) was observed for the dominant lesion (p-value = 0.032). For those with renal manifestations, rural vs. urban status and distance from clinic did not influence adherence to surveillance (p-values > 0.05). Catastrophic events related to renal manifestation of TSC were uncommon with 1 case of renal hemorrhage and 1 case of renal cell carcinoma.

Conclusions: In this representative cohort of adult TSC patients, the most common manifestations include epilepsy, dermatologic, neurological, and renal manifestations. Increasing distance from clinic did not influence surveillance adherence. Catastrophic events occurred rarely and as such living near to emergency operative services is not likely to be necessary.

Source of mentor's funding or other support that funded this research: Internal funding source

Poster Title: Development of a Foam Delivery Syringe (FDS) & Medication Canister Connector and Foam Creation Syringe (FCS) Tip for Dispensing Medication into the Ear as a Foam

Student: Brianna Maniscalco, Class of 2024
Faculty Mentor and Department: Eric M. Kraus, MD, ENT Head and Neck Surgery

Funding Source: Department of Medical Education, Wake Forest School of Medicine

ABSTRACT

Background: Acute mastoiditis is a common clinical problem which follows acute suppurative otitis media with beta-hemolytic streptococcus being the most causal organism. Treatment options include systemic antibiotics and topical otic drops through a tympanic membrane perforation or tympanostomy tube. Recurrent infections within the ear canal and mastoid cavity can have catastrophic affects for the patient, such as sensorineural and conductive hearing loss, facial paresis/paralysis, and intra-cranial complications. When current antibiotic medication that is used to treat acute and chronic suppurative otitis media and mastoiditis proves unsuccessful, or if patients develop acute neurologic complications, surgical treatment consisting of mastoidectomy is employed. Following a modified or radical mastoidectomy, liquid medications delivered to the mastoid cavity via the ear canal have difficulty reaching the entirety of the surface area of the surgically created mastoid cavity. Our foamer syringe prototype would be predicted to expand and facilitate the delivery of various medications to the cavity as a foam, and would be able to reach all the small spaces and irregular crevices in the mastoid cavity that are unreachable by conventional liquid medications. Effective delivery of medication to all surfaces of the mastoid cavity and ear canal by foam should lead to enhanced treatment and more complete recovery for the patient.

Hypothesis: Administration of medication as a foam increases the reachable surface area of the mastoid cavity compared to liquid medication delivery.

Methods: In order to evaluate the total surface area reached by both a foam solution and liquid drops, we measured the volumes of 18 cadaver mastoid cavities from the ENT temporal bone lab at Wake Forest Baptist. All 18 temporal bones were used in each of our groups: the controlled group in which we tested liquid drops, and the experimental group in which we tested foam delivery. Pliable plastic was molded into each of the mastoid cavities, and 4 drops of dyed liquid solution (0.15 mL) were placed at a 45-degree angle from the opening of the external auditory ear canal. The temporal bones with the dyed liquid solution were rotated 180 degrees, to mimic a patient rotating their head after placement of liquid drops. The plastic was then removed from the mastoid cavity and the surface area that the dyed liquid drops reached in each of the 18 mastoid cavities was measured on a 1mm grid. The steps of this process were repeated for our experimental group, using 0.15 mL of dyed foam solution instead of liquid drops.

Results: The average surface area reached in the experimental group was 121.2 mm with a standard deviation of 10.5 mm, while the average surface area reached in the control group was 68.2 mm with a standard deviation of 7.14 mm. Foam delivery reached almost double the surface area of the mastoid cavity compared to liquid drops ($p<0.0001$).

Conclusions: Our results support the hypothesis that administration of foam medication reaches a greater area of a mastoid cavity than the standard liquid drops. This has important indications for the use of foam medication in the treatment of mastoiditis to prevent recurrent infections and to achieve quicker recovery time for patients.

Poster Title: Trabeculectomy Revision via Needling Augmented with Sub-conjunctival Mitomycin
Student: Alexandria Marshall, Class of 2023
Faculty Mentor and Department: J. Brent Bond, MD, Ophthalmology
Funding Source: none

ABSTRACT

Background: Glaucoma, of which primary open-angle being the leading etiology, is one of the leading causes of vision loss in the United States and is caused by an increase in intraocular pressure. Various medications and surgeries are the standards of care for treating glaucoma. Trabeculectomy is one of the main surgical techniques to treat severe glaucoma. While this surgical procedure boosts a high success rate, scarring is a frequent complication, requiring further surgery. The subsequent surgery, sub-conjunctival needling, while also successful faces the same challenges as the initial trabeculectomy. Mitomycin, a chemotherapeutic, has been used in various ophthalmic procedures such as repeat LASIK to prevent scarring. This study looks at one surgeon's success using sub-conjunctival mitomycin intra-operatively during needling.

Hypothesis: Trabeculectomy revision via needling with the use of sub-conjunctival mitomycin will lead to improved post-operative intraocular pressure readings and fewer glaucoma drops.

Methods: Data was collected from the electronic medical record on patients who had previously undergone trabeculectomy revision with needling and sub-conjunctival mitomycin during the years 2018-2020. Patients who had this procedure as well as a phaco-emulsification during the same operative visit were excluded. Each patient's intraocular pressure (IOP) and glaucoma drop count were found for their pre-operative visit, post-operative day 1, week 1, month 1, month 3, and month 6. Data on whether this was a repeat needling procedure, the need for additional surgery within the 6-month time frame, prior incisional eye surgery, bleb status, lens status, and trabeculectomy surgeon was collected. If a patient required an additional surgery during the immediate 6-month post-operative period, their data was collected up to the point of their second surgery with their subsequent IOP readings being excluded. Lastly, demographic data such age, race, etiology, and year were taken.

Results: The records of 74 surgical procedures (from 59 patients) were taken across this 3-year period. The average pre-operative IOP (n=59) was 23.8 with 3 glaucoma drops. On post-operative day 1, the average IOP (n=58) was 11.8 with 0.5 glaucoma drops. On post-operative week 1 (n=58), month 1 (n=56), month 3 (n=53), and month 6 (n=48), the average IOPs were 13.0, 13.4, 15.0, and 13.7 respectively with the average number of glaucoma drops were 0.7, 0.7, 1.0, and 1.1 respectively. A Wilcoxon-ranked signed test showed the difference between pre-operative IOP and post-operative IOP at post-operative month 1, 3, and 6 to be significant (Z=-6.1, p <0.001; Z=-5.6, p <0.001; Z=-5.4, p <0.001). Additionally, the decrease in the number of post-operative glaucoma medications was also significant at post-operative month 1, 3, and 6 (Z=-5.7, p <0.001; Z=-5.1, p <0.001; Z=-5.2, p <0.001).

Conclusions: This study shows the success of trabeculectomy revision via needling using sub-conjunctival mitomycin across a 6-month period. The decrease in the average IOP and number of glaucoma drops shows that this procedure is largely effective in lowering intraocular and number of glaucoma drops. Overall, this study offers an alternative management option for patients with worsening glaucoma with a failed trabeculectomy.

Poster Title: Unmasking the Confounder- Inherent Physiological Variability in Swine During Automated Ischemia-Reperfusion Injury
Student: Symonne Martin, Class of 2024
Faculty Mentor and Department: Lucas Neff, MD, Surgery - Pediatric
Funding Source: The Dubie H. Holleman Fund for Cancer and Heart Research

ABSTRACT

Background: Swine are often used in translational research of shock and resuscitation. To fully understand the effects of a given intervention, external variability must be minimized. The purpose of this study was to determine the magnitude of the inherent inter animal variability when external factors are minimized by automating a porcine experimental protocol of shock.

Hypothesis: It is hypothesized that, as physiologic impact increases, the inherent variability between animals will be uncovered and magnified.

Methods: Swine underwent a 30-minute controlled hemorrhage of 30% blood volume, followed by 30 minutes of complete REBOA to create an ischemic insult (ischemic phase). Automated reperfusion (REBOA modulated to maintain target proximal MAP of 65mmHg) occurred over five minutes and shed blood was transfused to produce the ischemia-reperfusion shock state. Physiologic parameters were collected and plasma was stored for later analysis. The variance between time points was analyzed retrospectively using an F-test ($p<.001$) and differences between gender or weights were measured with a t-test ($p<.05$).

Results: There was no difference in baseline physiology. Proximal blood pressure trends showed that variability within groups increased slightly from baseline to the hemorrhagic phase, followed by a large increase in inter animal variability from the hemorrhagic phase to the ischemic phase and a drastic decrease from the time points after the balloon wean within the reperfusion phase. Variability in distal pressures generated by the automated REBOA catheter increased slightly from baseline to the hemorrhagic phase, followed by a steep decline during the ischemic phase, and a sudden increase and plateau after balloon weaning.

Conclusions: Despite leveraging automation to minimal external variability, we noted that the greater the physiologic derangement, the greater the inter-animal hemodynamic variability. Given the significant role of swine in resuscitation research, the increasing inter-animal variability increasing physiologic compromise that we observed warrants further investigation.

Source of mentor's funding or other support that funded this research: Department of Defense

Poster Title: The relationship between zinc use and COVID-19 clinical outcomes
Student: Miles Mayberry, Class of 2024
Faculty Mentor and Department: Ashish Khanna, MD, FCCM, FCCP, Department of Anesthesiology
Funding Source: The Dubie H. Holleman Fund for Cancer and Heart Research

ABSTRACT

Background: Zinc is an essential trace element that plays an important role in the immune system and protein synthesis. It has been shown to help fight viral infections, and a beneficial use for SARS-CoV-2 treatment has been postulated in multiple papers. Previous work has also shown correlations between zinc deficiency and poor outcomes in COVID-19 patients. Little is known, however, about the use of zinc supplementation and its potential benefits in COVID-19 positive individuals. We sought to determine the association between the use of zinc and clinical outcomes in patients with COVID-19.

Hypothesis: Zinc administration within 1 week prior to, or 48 hours after, hospital admission will result in lower 28-day mortality, ARDS, ICU admission, and need for mechanical ventilation.

Methods: COVID-19 patient data between March 2020 and April 2021 was abstracted from the multicenter collaborative CRUSH COVID registry. Zinc use was defined as at least one dose one week prior to hospital admission or within 48 hours of admission. A multivariate regression analysis was used controlling for the following confounders: month of admission, gender, ethnicity, qSOFA at hospital admission, hydroxychloroquine, azithromycin, tocilizumab, remdesivir, and dexamethasone.

Results: Out of 1781 COVID-19 positive subjects, 794 (44.6%) were administered zinc one week prior to, or within 48 hours of, hospital admission while 987 (55.4%) did not receive zinc. Among patients that received zinc, the odds to meet the primary outcome of 28-day mortality was 0.654 (CI 95%, 0.456—0.938, P = .021) compared to the non-zinc group with OR = .021 (95% CI, 1.07—2.19, P = .021). Odds of mechanical ventilation, ICU admission, or progression to ARDS in the zinc group were individually 3.06 (95% CI, 2.23—4.18, P < .001), 3.17 (95% CI, 2.37—4.24, P < .001), and 6.01 (95% CI, 3.91—9.23).

Conclusions: Zinc use was associated with increased need for ICU admission, mechanical ventilation, and progression to ARDS. Curiously, the risk of mortality was reduced by nearly 40%. These pathophysiologically contradictory results may be a depiction of several unaccounted-for confounders including the balance of patients associated between different hospital systems. Further directions of this study include narrowing down the patient population to subjects from one hospital system. We plan to further analyze these data while accounting for critical confounders to obtain a more accurate description of the potential benefits of zinc for the treatment of COVID-19.

Poster Title: Incidence of Symptomatic Lacrimal System Obstruction Following Maxillectomy
Student: Glen McKinney, Class of 2024
Faculty Mentor and Department: J. Dale Browne, Otolaryngology – Head and Neck Surgery
Funding Source: Department of Biomedical Engineering, Wake Forest School of Medicine

ABSTRACT

Background: The most common head and neck malignancy is Squamous Cell Carcinoma (SSC); many such tumors arise within or invade the maxilla and commonly involve pre/post-operative radiation therapy in addition to a maxillectomy to achieve complete tumor removal and clear margins. Many maxillectomy surgeries, given the maxilla's proximity to the lateral nasal wall and nasolacrimal duct, have the potential to damage the nasolacrimal drainage system during surgical resection. The resultant changes often manifest as lacrimal obstruction which typically presents as epiphora or lacrimal infection; it can also result in myriad ophthalmological complications for the patient including vision change, periorbital edema, ptosis, and diplopia. Intraoperatively, surgeons can attempt to prevent lacrimal obstruction by placing lacrimal stents during the maxillectomy to preserve the drainage pathway and/or can surgically repair an obstructed lacrimal duct through a dacryocystorhinostomy (DCR) procedure. The aim of this study was to examine the incidence of lacrimal system obstruction following maxillectomy surgeries. Additionally, we sought to explore the effectiveness of intraoperative lacrimal stents, whether preoperative or postoperative radiation has effects on lacrimal obstruction, and the effectiveness of DCR surgery on relieving lacrimal system obstruction.

Hypothesis: We hypothesized that the incidence of lacrimal system obstruction would be between 1.9% and 29%, in line with what previous research suggests. Additionally, it was hypothesized that lacrimal stent placement decreases the incidence of lacrimal obstruction, that DCR is an effective means of lacrimal repair, and that post-op radiation would result in less lacrimal obstruction than pre-op radiation.

Methods: An IRB approved retrospective study was performed containing 128 study patients who underwent maxillectomy surgery involving the lacrimal duct between the years of 2012 and 2021. We examined the patients' electronic medical records to obtain information regarding the management of their cancer. We gathered information from the preoperative consultation notes, surgical notes, hospital stay notes, and postoperative follow-up notes to gather the data pertinent to our study. The data collected included information on their cancer pathology, specific surgery, intraoperative stent placement, radiation treatment plan, post-op lacrimal obstruction and ophthalmological symptoms, and how the symptoms were resolved.

Results: Analysis of the data revealed that out of 128 study patients, 17.18% experienced symptoms of lacrimal obstruction and 32.81% of patients experienced ophthalmological complications. Among the patients who received an intraoperative stent (n=10), 60% experienced zero lacrimal obstruction symptoms following surgery whereas 85% percent of patients who did not receive a stent (n=118) experienced zero lacrimal obstruction symptoms (p=0.0179). Among the patients who required corrective DCR surgery, 100% experienced relief of symptoms. Lastly, 55.55% of patients who received pre-operative radiation therapy experienced lacrimal obstruction symptoms while only 27.77% of patients who received post-operative radiation therapy experienced lacrimal obstruction symptoms (p=0.0019).

Conclusions: The data confirmed our hypothesis regarding the incidence of lacrimal obstruction symptoms as 17.18% is roughly in line with numbers reported in previous studies. Additionally, our study surprisingly revealed that intraoperative stent placement resulted in a higher incidence of lacrimal obstruction than not placing a stent, suggesting stent placement is an ineffective measure at preventing lacrimal obstruction. This conclusion however is limited by the small sample size of stented patients (n=10). The study also suggests that patients who received pre-op radiation were more likely to experience lacrimal obstruction symptoms following surgery. The data also reinforces the effectiveness of DCR as a mean of lacrimal system repair although this conclusion is also limited by a small sample of DCR patients (n=3).

Poster Title: Serum IL-1β and IL-12 measurements in transgenic (mRen2)27 rats: an animal model of cardiometabolic dysfunction

Student: Nathan McMullen, Class of 2023
Faculty Mentor and Department: Stacey Wolfe, MD, Neurosurgery
Funding Source: Wake Forest Cardiovascular Sciences Center

ABSTRACT

Background: Spontaneous intracerebral hemorrhage (ICH) accounts for 10-15% of strokes and carries a 40% mortality rate within one month. Neuroinflammation plays a key role in secondary brain injury after ICH and inflammatory pathways may represent important therapeutic targets. A major obstacle in developing novel therapeutics is the lack of a translatable animal model that recapitulates the comorbidities of patients that suffer from ICH. Hypertension, diabetes, and obesity are components of the metabolic syndrome often seen in ICH patients, and may modulate the neuroinflammatory response to ICH. Thus, we aimed to characterize peripheral markers of systemic inflammation in a transgenic hypertensive (mRen2)27 rat model of metabolic syndrome.

Hypothesis: Given the association between metabolic syndrome and elevated levels of pro-inflammatory cytokines observed in humans, we hypothesize that hypertensive (mRen2)27 rats will exhibit similar elevations in the pro-inflammatory cytokines IL-1β and IL-12 compared to control SD rats.

Methods: Serum pro-inflammatory cytokines IL-1β and IL-12 were measured using ELISA (Thermo Fisher Scientific) in naïve male and female (mRen2)27 and healthy SD rats at 32 weeks of age (n=29). Systolic blood pressure (SBP) was measured by tail-cuff plethysmography.

Results: SBP (mmHg) was significantly higher in the mRen2 versus SD rats, in both males (195±4, n=8 vs. 125±4, n=6; $p<0.05$) and females (183±7, n=7 vs. 114±10, n=7; $p<0.05$). Female mRen rats had significantly higher levels of IL-12 (pg/mL) (1073±47, n=7 vs. 438±101, n=8; $p<0.05$) and IL-1β (pg/mL) (11±3, n=7 vs. 4±1, n=8; $p<0.05$). Hypertensive mRen male rats had higher levels of IL-12 than SD males (825±58, n=8 vs. 582±90, n=6; $p<0.05$). IL-12 levels were higher in mRen female rats compared with males (1073±47, n=7 vs. 825±58, n=8; $p<0.05$).

Conclusions: Compared to healthy SD rats, the pro-inflammatory cytokines IL-1β and IL12 are elevated in a clinically-relevant animal model of spontaneous hypertension. These findings simulate human studies that have linked cardiometabolic disease with elevated levels of pro-inflammatory cytokines. Future studies using this animal model will seek to further characterize changes in perihematomal and peripheral levels of pro-inflammatory and inflammation-resolving cytokines following ICH.

Source of mentor's funding or other support that funded this research: Wake Forest Cardiovascular Sciences Center

Poster Title: The impact of a ketogenic-based diet on circulating metabolomics in patients with glioma: a bedside to bench study.

Student: Rebecca Merrill, Class of 2024
Faculty Mentor and Department: Roy Strowd, MEd, MD, Neurology

Funding Source: Kulynych Family Funds for Medical Research in Honor of Timothy C. Pennell, MD

ABSTRACT

Background: Malignant gliomas are a type of primary brain tumor that have limited treatment options and high rates of morbidity and mortality. The GLAD trial was a single arm phase II study (NCT02286167) designed to test the activity, safety, and tolerability of a Modified Atkins Diet (MAD) with intermittent fasting in adult patients with astrocytoma who had completed adjuvant chemotherapy. The multi-institutional study evaluated feasibility in participants by monitoring dietary compliance, systemic markers of dietary activity, and cerebral activity with MR spectroscopy. The study completed enrollment in 2019 and results of initial MR spectroscopy studies as well as results of the primary and key secondary outcomes have been published[1,2]. The focus of the current study was to evaluate systemic metabolic changes that occurred in a subset of patients by analyzing metabolomics, proteomics, and lipidomics from blood and urine samples.

Hypothesis: We hypothesized that (1) metabolite profiles would differ between baseline and end of study blood and urine samples, (2) there would be higher concentrations of ketone bodies (β-hydroxybutyrate, acetoacetate, and acetone) at end of the study compared to baseline and (3) metabolite changes would be more pronounced in patients who achieved higher ketonuria (a marker of systemic dietary activity).

Methods: The GLAD study consisted of an 8-week intervention with each consisting of 5 MAD days interspersed with 2 days of intermittent fasting. At the WFSM site, a subset of patients (n=6) underwent metabolomic profiling. Urine, plasma, and serum samples were collected at baseline and at Week 8, the end of the dietary intervention. Plasma (4-5mL) and urine (5mL) were collected at each time point Samples were stored frozen in the Clinical Research Unit until testing. The Metabolomics and Proteomics Core at Atrium Health Wake Forest Baptist conducted metabolomic, proteomic, and lipidomics testing and provided data analysis using MetaboAnalyst 5.0.

Results: The total cohort consisted of 25 patients; mean age 50.1 years, 48% female, 48% grade 3, 48% grade 4, and 100% completed concurrent chemotherapy. The metabolomics subset included 6 patients with similar mean age 51.8 years, 50% female, 33% grade 3, 50% grade 4, and 100% completing concurrent therapy. In this subset, 3 achieved consistent ketonuria ≥moderate/40 mg/dL and 3 achieved average ketonuria <40 mg/dL. Proteomic profiling at baseline and Week 8 revealed similar concentrations of plasma branched chain amino acids including isoleucine (p=0.35), leucine (0.53), and valine (0.09) which did not differ for patients who achieved higher ketonuria. Similar findings were observed for urine BCAA (p>0.16 for all). Metabolomic profiling showed the greatest fold changes in amino acid, organic acid, methylation and transsulfuration cycle, and dopamine derivative metabolites. Those identified with the smallest fold change- 3-propanoate/benzaldehyde, theobromine, paraxanthine, and D-glucuronolactone- are all components found in flavorings and foods. Hypoxanthine (p=0.09, fold change threshold 3.68) and 5'-methylthioadenosine (p=0.09, fold change threshold 3.33) were identified by volcano plot as important features by fold change threshold. Heat map analysis of metabolomics profiling showed a grouping of similarities for 3 patients at week 8 with further investigation into groupings ongoing.

Conclusions: Metabolomic profiling of glioma patients undergoing a ketogenic-based dietary intervention revealed biologic changes between baseline and week 8 samples with amino acid, organic acids, methylation, dopamine, and food derivatives being identified as important features. These changes warrant pursuing further data analysis to determine clinical significance of these identified metabolites.

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(2) Schreck KC, Hsu F, Berrington A, Henry-Barron B, Blair L, Hartman A, Kossoff E, Easter L, Self M, Whitlow CT, Barker PB, Cervenka MC, Blakeley JO, Strowd RE. Feasibility and biologic activity of a ketogenic/intermittent fasting diet in glioma patients. 2020

Poster Title: Perspectives from the Field: A Qualitative Analysis of a Depression Management Pilot-Program within HIV Clinics in Malawi

Student: Caroline Minnick, Class of 2025
Faculty Mentor and Department: Brian Pence, PhD, Department of Epidemiology, UNC Gillings School of Global Public Health

Funding Source: President's Emergency Plan for AIDS Relief (PEPFAR) and United States Agency for International Development (USAID) under the Cooperative Agreement Project SOAR (Supporting Operational AIDS Research), number AID-OAA-14-00060

ABSTRACT

Background: Depression is underdiagnosed, undertreated, and a significant comorbidity for people living with HIV (PLWH) in Sub-Saharan Africa (SSA). Though strides have been made to improve health outcomes for PLWH in SSA, depression remains a cause for unreliable adherence to HIV treatment and retention in care. To address this concern, the Malawi Ministry of Health (MOH) introduced a depression management program in 2 public HIV clinics in Lilongwe, Malawi, drawing from two evidence-based interventions tailored for SSA. Existing providers were trained to screen patients initiating HIV treatment for depression using the Patient Health Questionnaire-9 (PHQ-9) and refer depressed patients for appropriate intervention. The program utilized a measurement-based care (MBC) protocol for prescribing antidepressants (AD) for those with moderate to severe depression (PHQ-9 ≥ 10) and an adaptation of the Friendship Bench (FB) problem-solving therapy for those with mild depression (PHQ-9 5-9).

Hypothesis: (1) The program will be implemented successfully with minimal deviations given its basis in 2 evidence-based interventions. (2) Both patients and providers will find that the program is beneficial, as it will reduce depressive symptoms and improve HIV care outcomes. (3) Utilization of existing clinic staff through a task-shifting protocol will allow the program to continue beyond the study period, given the infrequent and limited role study staff will play.

Methods: Our team designed and conducted semi-structured, comprehensive interviews with patients, providers, and leadership staff from both clinics. Interviewees shared their experiences receiving or providing care and with the pilot-program's implementation. Interviews were recorded, transcribed, and coded to assess 3 key implementation science outcomes: fidelity, acceptability, and sustainability. Assessment of the interviews involved recognizing emerging themes, categorizing themes into one of our 3 key outcomes, and comparing these themes across interviews.

Results: While the program was acceptable to both patients and clinic staff, challenges of fidelity and sustainability clearly emerged. Interviews with providers and clinic leadership revealed protocol deviations related to AD selection, FB appointment scheduling, and follow-up PHQ-9 screening, often citing supply chain, time-constraints, and staffing challenges as causal. Many clinic staff shared concerns about the minimal training and high staff-turnover, both of which contributed to staffing challenges. FB counselors and patients alike appreciated the openness and intimacy of the FB but were concerned privacy was not always guaranteed. In general, patients found that the intervention positively impacted their lives. Finally, when addressing the sustainability of the program, most providers voiced concerns, highlighting their reliance upon study staff, limited bandwidth, and variable motivation in light of competing priorities. Moving forward, addressing program oversight, integration into existing clinic workflow, and improved and recurrent training may yield a more successful, sustainable initiative.

Conclusions: Though patients and providers reflected on the program's intent and impact positively, continuation of the program beyond the given study period will be limited by personnel, resource, and leadership constraints. The addition of depression care to HIV clinics offers great promise in its ability to positively care for and improve outcomes of PHWH in SSA, but future programming should consider how to better interlace follow-up depression care with ART care to minimize additional time and resources needed from both patients and clinic staff.

Source of mentor's funding or other support that funded this research: PEPFAR and USAID

Poster Title: The Association Between Vitamin D and Hypertension-Related Heart Changes in Youth Referred for Hypertensive Disorders

Student: Neema Moeini-Rastegar, Class of 2024
Faculty Mentor and Department: Andrew Michael South, MD, MS, Pediatric Nephrology
Funding Source: none

ABSTRACT

Background: Pediatric patients with hypertension have an increased risk of developing left ventricular hypertrophy (LVH), which could lead to cardiovascular diseases (CVD) later in adulthood. While the exact mechanisms contributing to LVH development are not fully understood, vitamin D (VD) dysregulation, including 25-hydroxyvitamin D (25-OH), may contribute to increased left ventricular mass in youth with hypertensive disorders, but this relationship has not been properly explored. The objective was to investigate whether low VD levels are associated with a higher risk of LVH in youth referred for hypertensive disorders.

Hypothesis: Lower VD 25-OH levels will be associated with the presence of LVH and an increase in left ventricular mass as shown on echocardiograms in youth referred for hypertensive disorders.

Methods: This is a pilot analysis of baseline data from participants enrolled in the Study of the Epidemiology of Pediatric Hypertension (SUPERHERO) Registry, a retrospective and prospective cohort study of youth referred for hypertensive disorders to the Brenner Children's Hypertension Clinic. Study inclusion criteria were age <19 years at initial visit and initial visit since January 1, 2013. Patients with kidney failure on dialysis, kidney transplantation, or active pregnancy at the baseline visit were excluded; for this analysis, we additionally excluded participants who were missing exposure or outcome measure data. We recorded VD 25-OH and echocardiogram data if obtained +/- 3 months from date of first clinic visit. VD 25-OH must have been obtained prior to or on the same day as the echocardiograms. VD status was classified as sufficient (≥20 ng/ml), insufficient (12 to <20 ng/ml), or deficient (<12 ng/ml). Left ventricular mass was indexed to height (LVMI by height) and to body surface area (LVMI by BSA) to standardize left ventricular mass to body size. We used generalized linear models to estimate the associations of VD levels with the outcomes and reported β coefficients with 95% CI.

Results: Our study population was 65.2% male, 55.9% non-White, 59.3% had obesity, and the mean age was 14.0 years (SD 2.9). The mean VD 25-OH was 22.4 ng/ml (SD 9.8); 28.0% had insufficiency and 14.4% had deficiency. The mean LVMI by height and BSA were 31.4 (SD 8.1) ng/ml and 63.4 ng/ml (SD 14.9), respectively, and only 3 participants (2.5%) had LVH. A one-ng/ml lower VD level was associated with both a 0.11 g/m^2.7 (95% CI -0.26 to 0.04) higher LVMI by height and a 0.08 g/bsa (95% CI -0.35 to 0.2 95% CI) higher LVMI by BSA, though these were not statistically significant. Compared to being VD sufficient, individuals who were insufficient had a 1.78 g/m^2.7 (95% CI -1.54 to 5.09) higher LVMI by height and a 1.11 g/bsa (95% CI -5.04 to 7.26) higher LVMI by BSA, while those who were deficient had a 3.93 g/m^2.7 (95% CI -0.3 to 8.17) higher LVMI by height and a 4.06 g/bsa (95% CI -3.8 to 11.92) higher by BSA. However, these results were not statistically significant.

Conclusions: In this retrospective and prospective cohort study of youth with hypertensive disorders, we did not observe a significant association between low VD 25-OH and adverse changes in the heart on echocardiograms in youth referred for hypertensive disorders. Future steps include working on the multivariable models to adjust for potentially confounding factors, as well as evaluating how sex, race, and obesity may impact heart outcomes in hypertensive youth.

Source of mentor's funding or other support that funded this research:
NIH NHLBI K23 HL148394, L40 HL148910, HL146818; WFSM pilot award (NIH NCATS UL1TR001420)

Poster Title: Rapid Outpatient Follow-up Reduces Emergency Department Re-admission for Patients with Acute Chest Pain

Student: Ryan Morgan MS; Class of 2024
Faculty Mentor and Department: Nicklaus P. Ashburn MD[1]; Anna C. Snavely PhD[1,2]; Brennan E. Paradee MS[1]; Simon A. Mahler MD, MS[1,3,4]; Jason Stopyra MD, MS[1]
[1] Department of Emergency Medicine, [2] Department of Biostatistics and Data Science, [3] Department of Epidemiology and Prevention, [4] Department of Implementation Science, Wake Forest School of Medicine, Winston-Salem, NC
Funding Source: The Dubie H. Holleman Fund for Cancer and Heart Research

ABSTRACT

Background: Acute chest pain accounts for 7-10 million emergency department (ED) encounters each year. Less than 10% of chest pain patients who present to the ED are diagnosed with acute coronary syndrome (ACS), and nearly 1 in 10 patients return to the hospital within 7 days of discharge. The subsequent re-evaluation of these patients in the ED is inefficient, costly, and contributes to crowding.

Hypothesis: Patients who follow-up with a primary care physician or cardiologist within 15 days of ED discharge will have fewer 30-day ED re-admissions than patients who do not.

Methods: A retrospective cohort study was used to evaluate whether non-low-risk HEART Pathway patients in the Wake Forest Baptist Medical Center Emergency Department's Clinical Decision Unit (ED CDU) had fewer 30-day ED re-admissions if they received rapid follow-up care than patients without follow-up. Non-low-risk adult patients (≥ 18 years old) with non-traumatic chest pain and no evidence of ST-elevation myocardial infarction who were being evaluated for ACS in the CDU from 3/1/2019-3/1/2020 were included. Non-low-risk was defined as patients with a HEAR score of 4 or more, a history of known coronary artery disease, or electrocardiogram findings concerning for possible ischemia. Descriptive statistics were performed. Fishers exact test was used to assess the association between 30-day readmissions and outpatient follow-up.

Results: There were 433 non-low-risk patients evaluated in the ED CDU. The cohort was 36% male, 55% white, and had a mean age of 60.2 years (SD ± 11.6). Among the 20.1% (87/433) of patients who followed-up with a provider within 15 days of their index ED visit, 4.6% (4/87) were re-admitted to the ED within 30 days for a cardiovascular complaint compared to 11.9% (41/346) of patients who did not follow-up (p=0.0497).

Conclusions: Rapid outpatient follow-up for non-low-risk chest pain patients who are discharged from the ED CDU was associated with decreased 15-day ED readmission.

Source of mentor's funding or other support that funded this research: Atrium Health Wake Forest Baptist Department of Emergency Medicine

Poster Title: The Effects of Mechanical Tissue Resuscitation (MTR) for Treatment of Ischemia Reperfusion Injury in a Swine Model of Acute Myocardial Infarction

Student: Nicholas Mouser, Class of 2024
Faculty Mentor and Department: James E. Jordan, PhD, Department of Cardiothoracic Surgery

Funding Source: Groskort (Lois I.) Heart Research

ABSTRACT

Background: Heart disease is the leading cause of death in the US and worldwide. For those who suffer from heart attack, reperfusion of ischemic cardiac tissue is the primary objective. While necessary, reperfusion promotes various inflammatory processes that may ultimately lead to cardiomyocyte injury and death, otherwise called ischemia-reperfusion injury (IRI). Modern pharmacological interventions attempt to reduce the extent of damage by targeting specific and selective biochemical pathways. Yet due to the broad spectrum of mediators that contribute to IRI, these therapies have proven unsuccessful. Presently, no treatment effectively attenuates IRI. Mechanobiology is an alternative intervention that involves physical manipulation of living tissues to elicit a biological change. Specifically, prior research directed toward reducing IRI has demonstrated that application of a uniform, negatively pressurized vacuum to ischemic tissue, or area at risk (AAR), mitigates inflammatory processes and the amount of necrosis within the AAR. This study aims to find the most effective length of MTR treatment – 60min (MTR-60), 120min (MTR-120), or 180min (MTR-180) – at a pressure of -125mmHg.

Hypothesis: Preliminary work with MTR has indicated that moderation is necessary for effective treatment. In other words, balancing vacuum pressure and duration of treatment is essential for reducing IRI. For this reason, it is hypothesized that MTR-120 will provide the best therapeutic effect.

Methods: A cohort of 34 Yorkshire swine were randomized to one of four groups: control (no treatment), MTR-60, MTR-120, or MTR-180. Each animal was placed under general anesthesia before instrumentation. Pressure catheters were inserted into the right femoral artery and left femoral artery for pressure monitoring. The right external jugular was isolated, and a catheter was placed for fluid administration. Next, a sternotomy was performed, and monofilament sutures were placed, but not secured, around several branches of the LAD. The left atrium was canulated for microsphere administration to allow for measurements of regional myocardial blood flow. Ischemia was induced by securing rubber tourniquets around the selected LAD branches. The tourniquets were removed to allow for reperfusion after 70min, and the MTR device was applied to the AAR for the designated time. Hemodynamic, blood gas, and blood flow data were collected at regular time intervals throughout the five-hour study. After completion of the reperfusion phase, differential staining of the heart was performed to discriminate ischemic from non-ischemic tissue. The animal was then euthanized, the heart extracted, and further staining completed to help quantify non-necrotic ischemic tissue from necrotic tissue.

Results: There were no statistically significant differences in the AAR among the control group, MTR-60, MTR-120, and MTR-180 (16.86±2.0%, 15.86±1.9%, 16.40±1.2%,14.29±1.6% respectively). MTR-60 (41.90±16.7%) and MTR-120 (44.20±14.2%) reduced the AN relative to the control (56.72±10.1), though neither group reached statistical significance. However, infarct size was significantly reduced in MTR-180 (37.90±12.76; $p<0.05$).

Conclusions: Based on these findings, MTR-180 is the most effective option for reducing infarct size in the setting of IRI. This suggests that longer treatment times are necessary to obtain optimal benefits. It is suspected that over the course of reperfusion, the sustained vacuum helps clear edema and eliminate inflammatory mediators. While these results support MTR as a viable treatment for IRI, it will be crucial to perform survival studies in the future to further characterize long term therapeutic benefits of MTR.

Source of mentor's funding or other support that funded this research: Cheek Foundation Endowment of the Department of Plastic & Reconstructive Surgery, Wake Forest Department of Cardiothoracic Surgery

Poster Title: Active Resilience Training- The Cure for Physician Burnout?!
Student: Hannah Mugford, Class of 2023
Faculty Mentor and Department: David Popoli, MD, Orthopedics
Funding Source: none

ABSTRACT

Background: Physician burnout is recognized as a ubiquitous obstacle. Medical students face difficult transitions throughout their training that increase their risk of burnout. Resiliency training may prepare students to better face the demands of their medical careers. This project is an initial investigation into medical students' long-term utilization of learned resiliency skills.

Hypothesis: (1) Participation in Active Resilience Training (A.R.T.) will increase student awareness of the importance of resiliency for success in their medical careers. (2) A.R.T. will provide students with long-term usable skills to improve their resiliency. Subsequent utilization of these skills will result in decreased rates of burnout as these trainees progress through residency and their subsequent medical careers.

Methods: Medical students were surveyed 1-18 months after completing Active Resiliency Training (A.R.T.). The computerized survey assessed the program's success in meeting its stated objectives and how often students used the skills they had learned during the training.

Results: A.R.T. is highly effective in increasing awareness of the benefits of resiliency training. The majority of participants would recommend the course to their peers. Students continued to utilize the skills learned for more than 18 months after completing the training. These skills included planned breaks, prioritizing sleep, building support systems, and mindfulness techniques.

Conclusions: This work adds to the existing literature regarding participants' valuation of novel resilience curricula. Students utilize the skills learned in A.R.T. as long as 18 months after completing the program. More study evaluating the specific effects of A.R.T. on traditional measures of resilience such as the Brief Resilience Scale (BRS) is needed.

Source of mentor's funding or other support that funded this research: Funding was provided in part by Wake Forest School of Medicine.

Poster Title: Examining the Impact of Cholecystectomy and the Microbiota in Breast Cancer Tissues in Breast Cancer Patients at Wake Forest Baptist Medical Center

Student: Meghan Nelson, Class of 2024
Faculty Mentor and Department: Akiko Chiba, MD, Surgical Oncology

Funding Source: T35 Training Grant DK007400, National Institute of Diabetes and Digestive and Kidney Diseases

ABSTRACT

Background: A healthy microbiome Is associated with high species diversity and richness promoting an anti-inflammatory environment. Changes in this microbiome, particularly pro-inflammatory, have been studied as a risk factor for local and systemic disease and cancer development through promoting tumor growth and spread. There have been published findings that the microbiome in breast tissue and the gastrointestinal tract may contribute to breast cancer development, progression, and recurrence. Studies show that changes in bile acid concentrations may influence the growth of breast cancer in vitro, suggesting that naturally occurring bile acids may also influence the growth of human breast cancer cells through alterations in the microbiome. Therefore, women who have undergone a cholecystectomy could be at higher risk of breast cancer development, progression, and recurrence due to altered modulation of bile acid metabolites. This study aims to evaluate the rate of cholecystectomy in breast cancer patients and their outcomes through retrospective data analysis. The microbiome of breast tumor tissue and blood samples in patients with ER/PR+ HER2- breast cancer collected since 2014 will also be examined to determine discrepancies between the breast microbiota of women who have had a distal recurrence within ten years of diagnosis and those who have not. With an estimated one in eight women in the United States being diagnosed with breast cancer during their lifespan, the results of this study in potentially reducing their risk of recurrence is crucial.

Hypothesis: Women with breast cancer and history of cholecystectomy will have increased rates of breast cancer recurrence over a 5-year period compared to women with breast cancer and intact gallbladders. The breast tumor microbiome varies amongst women who have had a recurrence within 10 years of diagnosis in ER/PR+ HER2- breast cancer.

Methods: An IRB approved retrospective review of patients with invasive breast cancer diagnosis between 2014-2015 was conducted with data from over 300 patients. Demographics, preoperative variables, surgical history, treatment, and clinical outcome data was collected. Breast tumor samples of thirty patients with ER/PR+ HER2- breast cancer, fifteen of which had recurrence in ten years and fifteen patients with no recurrence, will be evaluated for microorganisms and inflammatory properties.

Results: Results are expected to conclude that women with breast cancer who had a history of cholecystectomy had increased rates of breast cancer recurrence over a 5-year period compared to women with breast cancer and intact gallbladders. Significant differences in the microbiome of patients with and without ER/PR+ HER2- recurrences are expected to be found.

Conclusions: Further studies with larger patient sample may lead to greater statistical significance and more conclusively support existing studies demonstrating that bile acids influence the growth of breast cancer cells. This makes women with a history of cholecystectomy at higher risk of breast cancer recurrence and may warrant closer follow-up of these patients. More extensive understanding of the breast tumor microbiome may aid physicians further in identifying patients at higher risk of recurrence.

Poster Title: Readability Analysis of Spanish Language Patient-Reported Outcome Measures in Laryngology

Student: Joseph C Nickel BA, Class of 2024
Faculty Mentor and Department: Lyndsay L. Madden, DO, Department of Otolaryngology- Head and Neck Surgery

Funding Source: None

ABSTRACT

Background: Laryngologists use patient-reported outcome measures (PROM) to determine the efficacy of an intervention or to evaluate a patient's symptomatology. PROMs should be developed for a diverse target audience, including patients of all literacy levels. The American Medical Association (AMA) recommends that PROMs are written at or below the sixth grade level. In recent studies, readability scores for otolaryngology PROMs in English were above the recommended reading level. To date, there is limited data regarding the readability of Spanish PROMs. Thus, this study aims to report the readability of Spanish language PROMs in laryngology.

Hypothesis: We hypothesize that many Spanish-language laryngology PROMs will be above the recommended sizth grade reading level.

Methods: This study analyzed nine Spanish language laryngology PROMs. The authors queried PROMs from PubMed and Google scholar based upon English language laryngology PROM systematic reviews. Common categories included voice, airway, dysphagia, and other laryngology PROMs. Only nine laryngology PROMs were translated and validated in the Spanish language and publically available. The readability of Spanish PROMs was determined using a multi-lingual readability software by two readability indices: Fernández Huerta and INFLESZ.

Results: The mean and standard deviation (SD) Fernández-Huerta was 75.25 (27.12) and INFLESZ was 71.25 (26.98). The average readability score per PROM in Spanish was: DI (84.19), EAT-10 (11.54), MDADI (64.92), RSI (57.22), SWAL-QoL (70.98), TVQ (87.64), VFI (99.46), VHI-10 (95.04), and VRQoL (88.28).

Conclusions: The mean readability of Spanish language laryngology PROMs was above the recommended reading level. Patient readability should be considered when developing laryngology PROMs translations and validations. Robust development and testing of novel PROMs are important to address the persistent, pervasive risks for Spanish speaking patients.

Poster Title: Mitochondrial motility: assessing its role following chemotherapy treatment
Student: Saadia Nur, Class of 2024
Faculty Mentor and Department: Timothy Pardee, MD, PhD, Hematology/Oncology
Funding Source: Laura Scales Student Research Fellowship Fund

ABSTRACT

Background: Acute Myeloid Leukemia (AML) is the most common acute leukemia in adults; it is primarily a disease of the elderly with a median age at diagnosis of 68. 70% of all AML patients are 60 or older and patients in this age group have a 5 year survival of less than 10%. This low survival rate within this demographic is attributable to treatment-related toxicities, poor cytogenetic profiles and decreased responses to chemotherapy. The latter of these has remained a target of extensive research indicating that chemoresistance can be gained through increased oxidative phosphorylation in leukemic cells. Thus, by studying the extent to which mitochondrial motility is associated with modulation of ATP availability and subsequent avoidance of apoptosis and continued growth, further research can expand on possible therapeutic strategies to combat this resistance.

Hypothesis: The first proposed hypothesis is that AML cells that have been treated with increasing concentrations of chemotherapy will demonstrate a significant reduction in nuclear-mitochondrial distance. The second proposed hypothesis, in this project is that knocking out syntaphilin, an outer mitochondrial membrane protein, will significantly reduce mitochondrial motility in AML cell lines and increase response to chemotherapy.

Methods: 5 x 10^6 cells per plate from the murine AML cell line MFL2 were treated with Doxorubicin concentrations of 100 ng/mL and 200 ng/mL. These treatment groups, in addition to vehicles, were then prepared for viewing on a transmission electron microscope (TEM) 16 hours following chemo administration. On the TEM, approximately 60 cells were viewed per treatment group, and nuclear-mitochondrial distances were measured for all mitochondria that presented with a defined mitochondrial border and distinguishable cristae. This was performed in three independent experiments.

Results: Compiled data and analysis via an ANOVA test report a significant decrease in nuclear-mitochondrial distance between vehicle and 100 ng/mL Dox as well as vehicle and 200 ng/mL Dox. A dose-dependent significant distance was also observed between 100 ng/mL Dox and 200 ng/mL Dox. These results were consistent among the three repetitions of treatment and TEM.

Conclusions: The observed data supports the idea that leukemic cells that have been exposed to DNA damaging chemotherapy will utilize the mitochondria, aided by its motility, in order to take advantage of mitochondrial bioenergetics to provide ATP and other resources to facilitate DNA repair and become resistant to chemotherapy. This data provides a salient stepping point for the latter part of this project, which will examine a specific membrane protein of mitochondria, syntaphilin, and observe differences in nuclear-mitochondrial distances if this protein were to be knocked out.

Source of mentor's funding or other support that funded this research: TSP is supported by NCI 1R01CA197991-01A1.

Poster Title: HSV Central Nervous System Infections and Immune Compromise
Student: Chiagoziem Ogbonna, Class of 2024
Faculty Mentor and Department: Marina Nunez, MD PhD, Infectious Diseases
Funding Source: National Institute of Diabetes and Digestive and Kidney Diseases, T35 Training Grant DK007400

ABSTRACT

Background: HSV-1 is the primary causal agent of fatal encephalitis in the United States. HSV-2 encephalitis is much less common and is typically associated with some form of immune compromise. Data on risk factors for HSV encephalitis and other CNS infections remains limited for a wide range of immunologic conditions. The aim of this study was to evaluate the epidemiology of HSV CNS infections at our hospital and to identify novel associations within specific groups of immunocompromised hosts.

Hypothesis: We hypothesized that the expanding use of immunosuppressive medications for a variety of disease processes is changing the spectrum of underlying conditions associated with HSV-1 and -2 encephalitis and other CNS infections.

Methods: From the Microbiology laboratory information system (Beaker®) we identified all positive CSF PCR tests obtained at WFBH-WS from 1/1/2015 to 12/31/2021. PCR results had been obtained using the BioFire® FilmArray® meningitis/encephalitis panel and the HSV PCR developed at the institutional laboratory. We then reviewed case data from Epic® electronic health records (EHR). A positive CSF PCR, being ≥18 y-old and sufficient information in the EHR to confirm a diagnosis of encephalitis were all required for inclusion in the study. Cases of encephalitis were defined based on criteria outlined by the International Encephalitis Consortium, with two categories, 'probable/confirmed' and 'possible'. Other data collected included demographics, laboratory tests, underlying diseases and comorbidities, and deaths. We used mean (range) and absolute numbers (proportions) to report results, and compared quantitative and qualitative variables using Student's t-test and Chi-squared, respectively.

Results: Out of 33 patients with a positive CSF HSV PCR during the study period, 26 met the inclusion criteria. Their mean age was 56 years (range 31-81), 13 (50%) were male, and 14/26 (54%) Caucasian, 10/26 (38%) Black, and 2/26 (8%) Hispanic. HSV-2 predominated (18/26, 69%) over HSV-1 infections (8/26, 31%). Demographics were comparable for patients with HSV-1 and -2 infections. Ten out of the 26 (38%) had solid or hematologic cancer, 8 (31%) an autoimmune disorder, and 1 (4%) HIV infection, while 7 (27%) were not immunocompromised. None had a history of organ transplantation. Underlying conditions were comparable for patients with HSV-1 and -2 infections. Most patients had received corticosteroid therapy: 5/8 (63%) of those with HSV-1 and 12/18 (67%) of those with HSV-2 infections. Among the 12 patients with HSV-2 CNS infection and corticosteroid use, 3 (17% of all HSV-2 infections) were also on treatment with immunosuppressive monoclonal antibodies (2 on rituximab, and 1 on adalimumab). Criteria for probable/confirmed encephalitis were met by 6/8 (75%) patients with HSV-1 and by 1/18 (6%) with HSV-2, while possible encephalitis criteria were met by none with HSV-1 and 2/18 (11%) with HSV-2. The remaining 15 (83%) with HSV-2 did not meet the minimum criteria for either category. None of the 3 patients on treatment with corticosteroids and immunosuppressive monoclonal antibodies met the criteria for a clinical diagnosis of encephalitis. Mean (range) length of stay was significantly longer for patients with HSV-1 (17 (8-34) days) than for those with HSV-2 (7 (1-17) days); p=0.003. Death occurred in 3/8 (38%) of HSV-1 positive vs. 3/18 (17%) of HSV-2 positive subjects; p=.2.

Conclusions: While HSV-2 was present in the majority of HSV CNS infections, HSV-1 was the most frequent culprit among cases of encephalitis and resulted in higher morbidity and mortality. Corticosteroid use was frequently associated with both HSV-1 and -2 CNS infections. Rituximab and adalimumab were associated with HSV-2 but not with HSV-1 infection or a diagnosis of encephalitis. Organ transplant patients appear not to be at higher risk for HSV CNS infections, likely due to their antiviral prophylaxis. Further studies would help to determine the relative risk of HSV-1 and -2 CNS infections associated with the use of corticosteroids and some monoclonal antibodies, and to design preventative strategies.

Poster Title: Social Determinant Predictors of Outcomes in Intracerebral Hemorrhage
Student: Tiffany Ong, Class of 2024
Faculty Mentor and Department: Aarti Sarwal, MD, Neurology
Funding Source: None

ABSTRACT

Background: Intracerebral hemorrhage (ICH) is one of the most debilitating forms of stroke with significant morbidity and mortality, disproportionately affecting patients from rural areas more than their urban counterpart despite adjusting for comorbidities. These patients often experience delay in their care as they require inter-hospital transfers for specialized care. Using three machine learning prognostic models to predict 30-day mortality, modified Rankin scale upon discharge, and discharge disposition in ICH patients, we explored social determinants of health factors driving the disparities we see within our tertiary center.

Hypothesis: Social determinants like distance from tertiary care center during inter-hospital transfers for patients with ICH are associated with adverse outcomes as calculated by mRS, discharge status, and 30-day mortality despite correcting for confounders including age, gender, and disease comorbidities.

Methods: Preprocessing and model construction were performed on Python 3.8. Preprocessing functions and ML models were imported from the Python library scikit-learn. The dataset contained 138 samples with 13 useable features: 8 categorical features, 4 numeric features, and 1 ordinal feature. Missing values were imputed using the SimpleImputer library. All categorical variables were one-hot-encoded and ordinal variables were integer encoded. Three machine learning models were trained on the data provided to predict three different labels: 30 Day Mortality (Class 0: Alive, Class 1: Dead/Hospice), modified Rankin Score upon discharge (7 classes), and Discharge Disposition (Class 0: Home/Inpatient Rehabilitation Facility, Class 1: Hospice/Acute Care Facility Skilled Nursing Facility/Other Health Care Facility/Expired/Left Against Medical Advice/AMA/Long Term Care Hospital). Data was split 60/40 for training and testing sets respectively. Mean and standard deviation of F1 score, recall, and precision were calculated over 10 trials. Feature importance was determined using permutation feature importance.

Results: 138 ICH patients admitted in calendar in 2019 were used as initial sample. For all of these models the five most important features were the patient's GCS on admission, the patient's ICH Score, the patient's age, the patient's smoking status, and the patient's maximum distance from our hospital. The Multinomial Naive Bayes model showed F1 score of 0.8129 for 30-day mortality. Random forest performed lower but better than chance for mRS at discharge, F1 score 0.68 and discharge disposition 0.34.

Conclusions: Distance travelled by an ICH patient from our tertiary medical center with shown to be indeterminant in patients' outcome in our predictive model. Factors including rural urban status defined by rural-urban commuting area (RUCA) codes, time traveled to specialized care from point of origin, and payer status are currently being evaluated in this sample to create a prognostic model accounting for social determinants affecting ICH outcomes.

Poster Title: Closing Time: One Last Call for Patient Preference
Student: Nihir Parikh, Class of 2024
Faculty Mentor and Department: Maxwell Langfitt, MD, Orthopedics
Funding Source: Department of Student Affairs, Wake Forest School of Medicine

ABSTRACT

Background: Wound closure methods in total hip and knee arthroplasties are a controversial topic in which surgeons achieve effective closures with no differences in infection rates through surgical staples (SS) and subcutaneous sutures with Dermabond (SCD). The use of SS or SCD for closure is based on physician tendencies, availability of materials, and time of application, but should also integrate a patient-centered approach. This study aimed to collect patient preference prevalence in wound closure methods with either (SS) or (SCD) and analyze differences in preference based on gender.

Hypothesis: It is hypothesized that most patients will prefer closure with SCD over SS and the preference prevalence will be insignificant of patient gender and previous surgical history.

Methods: Patients were surveyed on their wound closure preferences prior to surgery. The handout given to patients collected closure preference of the surgical wound site, patient demographics such as age, sex, and laterality of the upcoming procedure. Previous surgical history was recorded along with the wound closure method associated with that operation. Risk ratios (RR) and risk difference (RD) with 95% confidence intervals (95% CI) were calculated. Firth corrected logistic regressions were performed, confounders controlled for included previous surgical wound closure history and orthopedic procedure.

Results: A total of 163 participants were analyzed (53% female) (average age = 63.8 years old), in which 12 participants selected surgical staples as their preferred method of wound closure following THA/TKA. Males demonstrated no difference compared to females in relative risk (RR: 2.3 (95% CI: 0.7, 7.3), p =0.150) or absolute risk (RD: 5.9 (-2.2, 14.1), p = 0.156) in choosing staples over sutures with Dermabond for surgical wound closure. Patients that previously sustained SS for surgical wound closure demonstrated no difference in adjusted odds (Adjusted: 0.9 (95% CI: 0.2, 3.2), p = 0.839) in choosing SS over SCD for surgical wound closure.

Conclusions: More patients in the study favored SCD over SS. There was no difference in preferences based on gender or previous surgical history. Current literature shows that successful wound closure is achieved with minimized risks for infection and other complications using both SS and SCD. Therefore, surgeons should adopt a patient-centric approach and perform the closure method that most patients prefer.

Poster Title: Social and Functional Needs of Frail Older Adults: a qualitative analysis of patients' voices

Student: Haley Park, Class of 2024
Faculty Mentor and Department: Kathryn E. Callahan, MD, MS, Internal Medicine: Gerontology and Geriatric Medicine

Funding Source: Department of Gerontology and Geriatric Medicine and Center for Healthy Aging and Alzheimer's Prevention, Wake Forest School of Medicine

ABSTRACT

Background: Unmet social needs among frail older adults are associated with functional decline and an increased number of poor health outcomes. Yet, little is known about the most prevalent social needs and the barriers and facilitators to engaging with available community resources in the older adult population. We conducted this qualitative study to better characterize the social needs and perceived facilitators and barriers to social, community, and healthcare support for older adults with frailty and at risk for unmet social needs.

Hypothesis: We anticipate that older adults with frailty will describe social needs and facilitators/barriers to community resources that will differ from other age groups, health statuses, and functional levels.

Methods: This qualitative study used semi-structured, telephone-based interviews with frail older adults. Using electronic health record data, we included adults aged 65+ registered in one of the WFBH-associated accountable care organizations (ACOs) with both frailty (defined as an electronic frailty index (eFI) >0.21) and an increased geographic risk of unmet social needs (defined as an Area Deprivation Index >75th percentile). Those eligible were contacted by phone. Interviews were digitally recorded and transcribed using Ubiqus Reporting. We developed a coding scheme and analyzed narrative data using the constant comparative method to identify themes of potential unmet needs.

Results: We contacted 160 qualifying older adults, of whom 23 (14%) participated in interviews. Of those interviewed, 73.9% were Black and 78.3% were female, with a mean age of 75 (SD=8.8). We identified 4 primary themes for both social and functional needs. Social needs included themes of unreliable transportation, barriers to food access, competing financial demands, and social isolation/loneliness. Functional needs included themes of mobility challenges, insufficient in-home aide, hesitancy to be screened for social/functional needs, and reluctance to be connected with community resources.

Conclusions: Frail older adults experience a wide array of unmet social and functional needs. Although healthcare and community resources that address these needs do exist, they are often underutilized due to financial, transportation, and communication-related challenges. An opportunity exists to bridge community and healthcare resources so as to better address the unique social and functional needs of frail older adults.

Source of mentor's funding or other support that funded this research: Dr. Callahan is supported by the National Institute of Aging of the National Institutes of Health through the K76 "Beeson" Award. Dr. Palakshappa is supported by the National Heart, Lung, and Blood Institute of the National Institutes of Health under Award Number K23HL146902.

Poster Title: Validation of the FUNC Score for predicting rehabilitation outcomes and eventual disposition for patients admitted with non-traumatic ICH in the inpatient rehabilitation setting

Student: Zackary T. Park, Class of 2024
Faculty Mentor and Department: Gregory Robbins, MD, Physical Medicine & Rehabilitation

Funding Source: Clinical and Translational Science Institute of Wake Forest School of Medicine

ABSTRACT

Background: The Functional Outcome in Patients with Primary Intracerebral Hemorrhage (FUNC) score is a validated clinical assessment tool developed for the acute hospital setting to predict functional independence 90 days after a non-traumatic intracranial hemorrhage (ICH). Rather than predicting mortality, the FUNC score predicts functional outcome, which can be beneficial for patients, family members, and decision-makers whose primary concern is not the probability of survival, but the probability of survival with recovery of function. The FUNC score has been validated to accurately identify patients with ICH at hospital admission who are likely to achieve long-term functional independence at 90 days and have an ultra-low chance of functional neurological recovery at discharge. However, there is no literature that has validated the FUNC score in an inpatient rehabilitation setting. The validation of the FUNC score in an inpatient rehabilitation setting could allow medical teams to provide a more accurate prediction of functional independence and eventual disposition in patients with ICH on a much shorter time scale than previously validated, which could facilitate decreased treatment costs and increased efficiency in treatments.

Hypothesis: The objective of this study was to determine if the FUNC score can predict rehabilitation outcomes and eventual disposition for patients admitted with non-traumatic ICH in the inpatient rehabilitation setting on a much shorter time scale than previously validated.

Methods: We retrospectively reviewed discharges of patients with ICH from two inpatient rehabilitation centers from 2017 to 2021. FUNC score was calculated using ICH volume measured by two independent examiners, age, ICH location, Glasgow Coma Scale (GCS) score, and pre-ICH cognitive impairment. Demographic information, initial NIHSS, and comorbidities were also recorded. Logistic regressions with 95% confidence intervals and Receiver operating characteristic (AUC) curves examining the associations of combined admission AM-PAC (BM+DA) and FUNC on discharge status were performed.

Results: 115 patients met the inclusion criteria. The percentages of patients who had hemorrhage sizes between <30cc, 30-60cc, and >60cc were 89.4%, 8.0%, and 2.7% respectively. The percentages of patients who had lobar, deep, and infratentorial hemorrhages were 25.7%, 58.4%, and 15.9% respectively. Differences in hemorrhage volume recorded by the two examiners averaged 0.29ml with a standard deviation of 3.64ml and maximum difference of 21.9ml. Every point increase in AM-PAC demonstrated greater odds of discharge to home (1.1 (1.0, 1.2), p=0.009), but no association was observed with FUNC score (1.3 (0.9, 2.0), p=0.178). AM-PAC and FUNC demonstrated AUC of 0.692 and 0.614, respectively, for predicting discharge to home.

Conclusions: The FUNC score appears to be a less powerful predictor of discharge to home than combined admission AM-PAC score for patients with ICH in the inpatient rehabilitation setting. However, these results should be interpreted with caution due to the wide confidence intervals.

Poster Title: Exploring addiction and addictive tendencies among adult tanning bed users
Student: Arsh Patel, Class of 2022
Faculty Mentor and Department: Steven R. Feldman MD, PhD, Department of Dermatology
Funding Source: Wake Forest University Center for Dermatology Research

ABSTRACT

Background: Despite awareness of the negative long-term health related consequences of chronic ultraviolet-radiation exposure such as skin cancer and premature signs of aging, indoor tanning is popular. Tanning behavior may be driven by both appearance-related reasons and by physical addiction to UV exposure. Understanding the preventable behavior from the patient perspective may provide avenues to better educate those impacted in preventing the development future complications.

Hypothesis: We hypothesize differences in the demographic features, beliefs, and motivations while screening individuals for tanning addiction or addictive tendencies (AorAT).

Methods: The study utilized Amazon Mechanical Turk (MTurk) to recruit 300 subjects electronically. To meet inclusion criteria, individuals were required to be between 18-80 years of age and have a working knowledge of the English language. Following recruitment, included subjects completed the modified CAGE (Cut down, Annoyed, Guilty, Eye-opener) and modified DSM-IV-TR (Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition) questionnaires to assess for the presence of addiction or addictive tendencies. Additionally, survey responses were collected to isolate demographic factors and information regarding individual subjects' beliefs on the addictive properties of indoor tanning bed use. Following quantification of retrieved responses, differences of statistical significance within subgroup analyses were assessed by way of Chi-squared and two-sample T-testing.

Results: In total, 289 respondent responses were collected, with 64 and 225 screening positive and negative for AorAT, respectively. Within the entire study cohort, the mean age was 38.7 years (SD: 12.0) and there was a slightly higher female predominance (56.7%, n=164). Individuals reporting previous, but not current, tanning in the subgroups with a positive screen were older (33.1, SD: 9.5) than those with a negative screen (40.1, SD: 11.7, p=0.02). Among the same subgroup, a greater proportion of respondents with a positive screen (72.22%, n=13) had an educational attainment of a bachelor's degree or higher, compared to those with a negative screen (90.22%, n=83, p=0.04). Study participants with a positive screen (34.4%, n=22) were also more likely to be current tobacco-product users, compared to those with a negative screen (17.8%, n=40, p=0.004). While exploring possible reasons for tanning bed use, individuals with a positive screen (17.19%, n= 11) were more likely to list the mood and relaxation related benefits as contributing factors, compared to those with a negative screen (2.22%, n=5, $p < 0.0001$). Interestingly, individuals with a negative screen (77.78%, n=175) were more likely to list appearance related reasons as a reason for tanning, compared to those with a positive screen (56.25%, n=36, p=0.01). While assessing reasons for tanning discontinuation, a greater proportion of individuals with a positive screen (16.67%, n=3) listed health concerns as a motivator, compared to those with a negative screen (56.04%, n=51, p=0.002).

Conclusions: We report previous, but not current, tanners with a negative screen for AorAT had a higher mean age and greater overall educational attainment compared to those with a positive screen. Respondents with a positive screen were more likely to concurrently smoke tobacco products, list appearance and mood/relaxation related benefits as reasons for sustained tanning, and less likely to list health-related concerns as a reason for tanning discontinuation. This study reports important differences in the demographics and beliefs among tanners following AorAT screening. For specific patient-cohorts, shifting the conversation from stressing the health-related consequences to more empathetic dialogue about the role of addiction and providing behavioral-health resources, where appropriate, may be a useful strategy.

Poster Title: Twice-Weekly Hemodialysis with Adjuvant Pharmacotherapy and Conversion to Thrice-weekly Hemodialysis: A Pragmatic, Fully-Embedded, Individually-Randomized Pilot Clinical Trial

Student: Ashish Patel, Class of 2024
Faculty Mentor and Department: Mariana Murea, MD, Nephrology

Funding Source: National Institute of Diabetes and Digestive and Kidney Diseases, T35 Training Grant DK007400

ABSTRACT

Background: Almost all Americans with dialysis-dependent kidney disease (DDKD) initiated on treatment with maintenance hemodialysis (HD) are prescribed standard dialytic therapy of fixed frequency (thrice-weekly HD) and dose (dialysis single-pool Kt/V urea [spKt/V] ≥ 1.2, corresponding to standard Kt/V urea [stdKt/V] ≥ 2.1). However, this standard HD therapy disregards individual levels of residual kidney function, and a significant proportion of patients with DDKD who retain some level of residual kidney function (RKF) can likely be treated safely and effectively with twice-weekly HD at initiation until their RKF declines to such a level that thrice weekly HD becomes necessary. Previous retrospective studies suggest that this twice-weekly (incremental) approach to HD conferred similar or better patient outcomes and longer survival. The aim of this study was to access the feasibility of individual randomization to incremental vs conventional HD; and incorporation of participant clinical management and procedures related to serial measurement of residual kidney function into usual workflow at outpatient dialysis units. Preliminary evidence concerning intervention safety and clinical effectiveness was also obtained and is reported here.

Hypothesis: It is hypothesized that twice-weekly HD with adjuvant pharmacologic therapy will demonstrate differences from the standard thrice-weekly HD regime, yielding insight into the feasibility of a larger clinical trial.

Methods: An individually randomized, open-label parallel-group pilot clinical trial was conducted with the primary objective of assessing the feasibility of a strategy of incremental HD in patients with incident DDKD and residual kidney function. Eligibility criteria included baseline estimated glomerular filtration rate ≥5 mL/min/1.73m2 and urine volume ≥500 mL/day. Participants were randomly assigned (1:1 ratio) to twice-weekly HD and adjuvant pharmacologic therapy (loop diuretics, sodium bicarbonate and/or patiromer) for 6 weeks followed by thrice-weekly HD (incremental HD group) or continued thrice-weekly HD (conventional HD group) at 14 outpatient dialysis units and 1 inpatient dialysis unit. The annual cumulative hospitalization rate, deaths, and adherence to study-specific assessments were recorded and analyzed for feasibility and safety.

Results: 48 patients were enrolled (consent rate, 66%) and randomized to incremental HD (n=23) vs conventional HD (n=25). At mean follow-up of 284.9 days, adherence to the assigned HD schedule and serial timed urine collections was 96% and 100%, respectively, in both groups. Of those included in incremental-start HD, all received loop diuretics, 17% received patiromer, and 39% received sodium bicarbonate during the period of twice-weekly HD. The annual cumulative hospitalization rate was 1.06 and 1.84, respectively (P=0.05); and 7 deaths were recorded (1 in incremental HD group and 6 in conventional HD group). There were no events of urgent, unscheduled HD treatments in the incremental-start HD group. No significant differences were noted in pre-dialysis serum chemistry parameters related to metabolic and acid-base balance.

Conclusions: The pilot trial demonstrates incremental-start HD is feasible and safe in a subpopulation of patients with incident DDKD. Larger multicenter clinical trials should be conducted to conclusively determine clinical effectiveness and safety of incremental HD.

Source of mentor's funding or other support that funded this research: Funding was provided by Vifor Inc.

Poster Title: Efficacy of strabismus surgery training models: comparing the enucleated pig eye model to the anesthetized porcine model

Student: Palak Patel, Class of 2024
Faculty Mentor and Department: Jagger Koerner, MBA, MD, Department of Ophthalmology

Funding Source: Wake Forest School of Medicine Dept. of Ophthalmology

ABSTRACT

Background: Teaching strabismus surgery to residents is a challenging task, posing technical and practical problems. Current biologic and nonbiologic models (e.g. enucleated pig eyes, web curricula) can teach the steps of surgery, but do not faithfully simulate extraocular muscle surgery. Live porcine models are used for resident training in surgical specialties, and imitate the tissue movement, tactile feedback, and complications that can arise. However, porcine models have not previously been utilized in strabismus surgery training. This study compares the benefits and limitations of teaching strabismus surgery using a live anesthetized porcine model with a previously established, widely accessible biologic model (enucleating pig eyes and bacon for extraocular muscles).

Hypothesis: We predict that both the enucleated pig eye and live porcine model will improve resident comfort with strabismus surgery equipment, key steps, and technique, but that the latter model will be more effective. The live porcine model will also better mimic human tissue, orbit, and surgery conditions. We anticipate that residents will deem the live porcine model more time-effective and be more likely to recommend it to junior residents.

Methods: Nine ophthalmology residents completed a pretest assessing their comfort with strabismus surgery techniques and equipment. They then participated in a strabismus training workshop using the enucleated pig eye model and completed workshop evaluation forms. In October, these residents will complete the live porcine model workshop and evaluate it. Afterwards, they will submit evaluations comparing the two strabismus training models. This data analysis focuses on the effectiveness of the enucleated pig eyes and bacon model.

Results: The number of strabismus surgeries observed varied by as many as ten between residents in the same stage of training, and there was no significant relationship between stage of training and number of strabismus surgeries observed ($p=0.15$). Upper-level residents performed significantly better on the pretest than lower-level residents ($r=0.84$, $p=0.000066$). Residents who performed better on the pretest rated the workshop more highly ($r=0.21$, $p=2.0 \times 10^{-10}$). Residents who had observed more strabismus surgeries rated the workshop more highly ($r=0.129$, $p=4.6 \times 10^{-8}$). The workshop was rated most poorly on its ability to realistically mimic human tissue (avg. = 3.78) and improve the residents' ability to hook a muscle (avg. score=3.78). The workshop was rated most highly for its ability to improve comfort with strabismus surgery tools (avg. score=4.67). The workshop was deemed 77% successful at realistically mimicking human strabismus surgery conditions (range: 60%-93%), and 87% successful at demonstrating key surgical tools and techniques (range: 80%-96%).

Conclusions: Exposure to strabismus surgeries varies greatly, even between residents at the same stage of training. Foundational understanding of strabismus surgeries, as measured by performance on the pretest and number of previously observed strabismus surgeries, made participants more likely to find the workshop useful. The enucleated pig eyes and bacon model was better at demonstrating key surgical tools and techniques than it was at realistically mimicking strabismus surgery conditions.

Source of mentor's funding or other support that funded this research: Wake Forest Department of Ophthalmology

Poster Title: Validation of the FUNC Score for predicting functional outcomes and eventual disposition for patients admitted with non-traumatic ICH in the inpatient rehabilitation setting

Student: Zackary Park, Class of 2024
Faculty Mentor and Department: Gregory Robbins, MD, Physical Medicine & Rehabilitation
Funding Source: none
Authors: Zackary Park, BS; Garrett Bullock, PhD, PT; Tyler Owens, DO; Gregory Robbins, MD
Funding Source: Clinical and Translational Science Institute of Wake Forest School of Medicine

ABSTRACT

Background: The Functional Outcome in Patients with Primary Intracerebral Hemorrhage (FUNC) score is a validated clinical assessment tool developed for the acute hospital setting to predict functional independence 90 days after a non-traumatic intracranial hemorrhage (ICH). Rather than predicting mortality, the FUNC score predicts functional outcome, which can be beneficial for patients, family members, and decision-makers whose primary concern is not the probability of survival, but the probability of survival with recovery of function. The FUNC score has been validated to accurately identify patients with ICH at hospital admission who are likely to achieve long-term functional independence at 90 days and those who have an ultra-low chance of functional neurological recovery at discharge. However, there is no literature that has validated the FUNC score in an inpatient rehabilitation setting. Validation of the FUNC score in an inpatient rehabilitation setting could allow medical teams to provide a more accurate prediction of functional independence and eventual disposition in patients with ICH on a much shorter time scale, which could help to guide discharge planning.

Hypothesis: We hypothesized that FUNC score should predict functional outcomes and discharge disposition for patients admitted to inpatient rehabilitation facilities after a non-traumatic intra-parenchymal hemorrhage.

Methods: We retrospectively reviewed discharges of patients with ICH from two inpatient rehabilitation centers from 2017 to 2021. FUNC score was calculated using ICH volume measured by two independent examiners, age, ICH location, Glasgow Coma Scale (GCS) score, and pre-ICH cognitive impairment. Demographic information, initial NIHSS, and comorbidities were also recorded. Logistic regressions with 95% confidence intervals and Receiver operating characteristic (AUC) curves examining the associations of combined admission AM-PAC (BM+DA) and FUNC on discharge status were performed.

Results: 115 patients met the inclusion criteria. The percentages of patients who had hemorrhage sizes <30cc, 30-60cc, and >60cc were 89.4%, 8.0%, and 2.7% respectively. The percentages of patients who had lobar, deep, and infratentorial hemorrhages were 25.7%, 58.4%, and 15.9% respectively. Comparison of hemorrhage volumes recorded by the two examiners showed a bias of 0.29ml, a standard deviation of 3.64ml, and maximum difference of 21.9ml. Every point increase in AM-PAC demonstrated greater odds of discharge to home (1.1 (1.0, 1.2), p=0.009), but a statistically significant association was not observed with FUNC score (1.3 (0.9, 2.0), p=0.178). AM-PAC and FUNC demonstrated AUC of 0.692 and 0.614, respectively, for predicting discharge to home.

Conclusions: The FUNC score appears to be a less powerful predictor of discharge to home than combined admission AM-PAC score for patients with ICH in the inpatient rehabilitation setting. However, these results should be interpreted with caution due to the wide confidence intervals.

Poster Title: Administration of a biased kappa opioid receptor agonist as a non-addictive analgesic in mice

Student: Tallia Pearson, Class of 2024
Faculty Mentor and Department: Sara Jones Physiology and Pharmacology

Funding Source: Department of Physiology and Pharmacology, Wake Forest School of Medicine

ABSTRACT

Background: Morphine activates the mu opioid receptor, which provides desired effects such as analgesia, but also leads to detrimental, undesired effects such as misuse, development of addiction, and overdose liability, primarily through its dopamine-elevating properties. Another class of opioid receptors, kappa opioid receptors (KORs), when activated provide analgesic effects without abuse potential, making the KOR a potential therapeutic target for non-addictive pain medications. However, most KOR agonists are aversive due to negative emotional effects, making them less attractive for clinical use. Recently, a new category of non-aversive, "biased" KOR agonists has been suggested for analgesia, but their potential for producing addiction on their own and possible interactions with mu agonists such as morphine have not been explored.

Hypothesis: Because addictive effects of morphine involve increasing dopamine levels in the nucleus accumbens, and pain is known to decrease dopamine levels, we will test the hypothesis that a biased KOR agonist, Triazole 1.1, will exert dopamine-normalizing effects and block both pain-induced reductions and morphine-induced increases in dopamine levels within the nucleus accumbens.

Methods: Dopamine levels in the nucleus accumbens were measured via microdialysis subsequent to administration of the biased kappa opioid receptor (KOR) agonist Triazole 1.1, alone and in combination with acute morphine, in mice experiencing pain induced by intraperitoneal administration of lactic acid.

Results: Triazole 1.1 prevented the decrease of dopamine levels in the nucleus accumbens associated with mild pain induced by ip injections of lactic acid and blocked the typical increase in dopamine levels induced by morphine.

Conclusions: These findings suggest future use of Triazole 1.1 in combination opioid analgesic treatment to work towards a method of analgesic medication without addictive properties. Such a treatment is particularly important as it could aid thousands of people suffering from chronic pain and work towards combatting the opioid epidemic.

Source of mentor's funding or other support that funded this research:
National Institutes of Health, National Institute on Drug Abuse grant R01 DA048490-01 (Sara Jones, PI) "Biased Kappa Opioid Agonists as Non-addictive Analgesics"

Poster Title: Establishing Probiotic Biofilm on Organic Wound Matrices: A Potential Step Towards Innovative Treatment of Pathogenic Biofilm

Student: Abigail Peoples, Class of 2023
Faculty Mentor and Department: Nicole Levi, PhD, Adam Katz, MD

Funding Source: Department of Plastic and Reconstructive Surgery

ABSTRACT

Background: Development of biofilm involves the aggregation of microorganisms into a cohesive community that protects them and facilitates their adherence to materials. Pathogenic biofilm can adhere to chronic wounds and implantable surgical devices. Infections due to pathogenic biofilms are difficult to treat because they make antibiotics less effective. Understanding and treating pathogenic biofilm is important for developing innovative treatments for chronic wounds and surgical site infections. Probiotic species of bacteria and their cellular products may be clinically useful for the prevention and treatment of pathogenic biofilm. Our goal is to establish probiotic biofilm on organic materials as an initial step towards investigating the localized delivery of probiotic benefits to sites at risk of infection.

Hypothesis: Probiotic biofilms of *Lactobacillus rhamnosus* and *Lactobacillus plantarum* can be established on ACell® Gentrix® Surgical Matrix and Drawtex LevaFiber™.

Methods: ACell® Gentrix® Surgical Matrix is a biologic material utilized for reinforcement of soft tissues. It is a two-layer acellular porcine bladder derived matrix that contains a basement membrane layer and a lamina propria layer. Drawtex LevaFiber™ Dressing is a highly absorbent alginate dressing that purports to absorb wound exudate via capillary, hydrostatic, and electrostatic action.

ACell® and LevaFiber™ materials were cut into uniform 5mm discs via punch biopsy. Discs were submerged in nutrient broth containing either *L. rhamnosus* or *L. plantarum* (OD_{600} = 0.1), and statically incubated for 48hrs. Supernatant was removed and discs were washed with sterile water and mechanically agitated to disrupt adherent biofilm. The disrupted biofilm solution was serially diluted, plated onto De Man, Rogosa and Sharpe (MRS) agar, incubated for 48hrs and then the colony forming units (CFUs) were counted.

Results: ACell® incubated with *L. rhamnosus* grew 3.1 x 10^7 CFUs/mL and ACell® incubated with *L. plantarum* grew 2.1 x 10^7 CFUs/mL. LevaFiber™ incubated in *L. rhamnosus* grew 1.1 x 10^8 CFUs/mL and LevaFiber™ incubated with *L. plantarum* grew 2.5 x 10^7 CFUs/mL.

Conclusions: Probiotic biofilms of *L. rhamnosus* and *L. plantarum* can be established on ACell® Gentrix® Surgical Matrix and Drawtex LevaFiber™ Wound Dressing. Futures studies will evaluate the potential of probiotic biofilms grown on ACell® or LevaFiber™ as a means to prevent and/or disrupt pathogenic biofilm formation and bacterial proliferation.

Source of mentor's funding or other support that funded this research: Department of Plastic and Reconstructive Surgery

Poster Title: Utilization of Platelet-Rich Plasma in the Treatment of Hair Loss
Student: John Petela, Class of 2024
Faculty Mentor and Department: Amy McMichael, MD, Dermatology
Funding Source: Department of Dermatology, Wake Forest School of Medicine

ABSTRACT

Background: PRP is an autologous serum consisting of high concentrations of platelets and growth factors obtained through gradient density centrifugation. It has been used in many medical fields, beginning with hematology and orthopedic surgery. PRP use in dermatology has grown rapidly in recent years for indications such as tissue regeneration, skin rejuvenation, wound healing, scar revision, and alopecia. PRP is thought to exert its effects in the treatment of alopecia specifically by delivering growth factors directly to the hair follicle, thus upregulating genes associated with angiogenesis, cell survival, and proliferation. Several studies have reported positive outcomes with the use of platelet rich plasma (PRP) in treatment of androgenetic alopecia (AGA) and other non-scarring alopecia. However, utilization of PRP in scarring alopecia, specifically in central centrifugal cicatricial alopecia (CCCA) has not yet been studied extensively. We conducted a patient-centered survey targeting patients with AGA and CCCA and their resultant hair growth following the treatment.

Hypothesis: It is hypothesized that patients with AGA and CCCA will benefit from treatment with PRP despite the difference in etiology of hair loss.

Methods: An anonymous survey targeting overall assessment of hair growth from both the provider and patient as well as patient satisfaction with the PRP treatment was administered in an outpatient dermatology clinic. The stage of each patient's alopecia was scored by a clinician based on the standard scale for that patient's condition. Survey results were analyzed and compared according to the cause of each patient's alopecia. Each patient was subjected to a regimen of three separate PRP treatments, each six weeks apart, with optional maintenance treatments every six months. Data was collected at various points throughout the PRP treatment cycle.

Results: A total of 49 patients were enrolled in this study. Of these, 34 patients with AGA and 10 women with CCCA were followed. AGA patients had an average disease stage of 3.8 on twelve and nine-point scales for men and women with AGA respectively. In comparison, CCCA patients had a mean disease stage of 2.5 on a 4-point scale. The mean patient reported improvement score on a 1-10 scale was 5.6 for AGA patients and 5.7 for CCCA patients. The mean clinician reported score on the same 1-10 scale was 6.3 for AGA patients and 5.4 for CCCA patients. The patient satisfaction assessment based on a separate 1-10 scale showed a mean score of 7.4 for AGA patients and 8.4 for CCCA patients.

Conclusions: Although treatment with PRP is currently recommended for non-scarring forms of alopecia, patient satisfaction and clinical evaluation suggests it is effective in the treatment of CCCA as well. The clinician scores and average stage differences between indications showed that our cohort of CCCA patients generally had more advanced disease than AGA patients. Despite more progressed disease, the study findings show that patients with CCCA rated their own hair regrowth higher than patients with AGA. Additionally, average patient satisfaction in CCCA was higher than in AGA per the mean patient recommendation score. Although CCCA as a scarring form of alopecia would not be expected to improve from treatment with PRP, our study indicates it may be a worthwhile option for patients as a possible rescue treatment for the follicles that are not completely destroyed. PRP treatment in conjunction with other alopecia medications such as minoxidil and the avoidance of hair-damaging styles with excessive traction or heat can greatly improve the outcome of patients with CCCA.

Source of mentor's funding or other support that funded this research: The project described was part of a multi-center study directed by Murad Alam, MD, from Northwestern University.

Poster Title: Inhibition of ferroptosis using UAMC-3203 in the post stroke period does not impact cognitive outcomes in diabetic rats.

Student: Ashley Phoenix, Class of 2025
Faculty Mentor and Department: Adviye Ergul, MD, PhD, Pathology and Laboratory Medicine, Medical University of South Carolina

Funding Source: Administrative supplement for Ashley Phoenix NIH RF1 NS083559-S1

ABSTRACT

Background: Post-stroke cognitive impairment (PCSI) contributes to significant long-term disability in stroke victims. 30% of ischemic stroke victims in the United States also have diabetes, a disease that disproportionately effects African Americans, Native Indians, and Hispanics. Diabetes increases the risk of hemorrhagic transformation as well as PCSI. Ferroptosis, an iron-induced cell death can instigate increased oxidative stress and contribute to impaired neurovascular repair leading to PSCI in diabetic patients.

Hypothesis: Inhibiting ferroptosis in the post-stroke period will improve cognitive recovery in diabetic animals.

Methods: 8 weeks after diabetes onset, male rats underwent 60 min middle cerebral artery occlusion (MCAO). On Day 3, after stroke injury was confirmed by MRI, animals were randomized to UAMC-3 (2mg/kg) or vehicle treatment for 2 weeks. Sensorimotor and cognitive behavioral tests were performed after 8 weeks of MCAO

Results: (Table 1): 60 min occlusion caused significant acute neurological deficits. There were no differences in indices measured by novel object recognition (NOR), Y-maze and sucrose preference tests. Interestingly, step through latency in passive avoidance test (PAT) was lower in the UAMC-3203 group.

Conclusions: Treatment with a ferroptosis inhibitor for 2 weeks after stroke did not impact recognition and working memory but worsened aversive learning in diabetic male rats. Further evaluation of tissue markers of neurovascular degeneration, inflammation and ferroptosis are required to better understand whether ferroptosis contributes to poor stroke recovery in diabetes.

Source of mentor's funding or other support that funded this research: VA Merit Review (BX000347), VA Senior Research Career Scientist Award (IK6 BX004471), NIH RF1 NS083559 (formerly R01 NS083559) and R01 NS104573 (multi-PI, SCF as co-PI) to AE

Poster Title: Acceptability of Telehealth for Adolescent Healthcare Delivery During the COVID-19 Pandemic

Student: Julia Pickel, Class of 2024
Faculty Mentor and Department: Sarah Wood, MD, MSHP, Craig Dalsimer Division of Adolescent Medicine, Children's Hospital of Philadelphia, Philadelphia, PA
Funding Source: 5K23MH119976-02 (National Institute of Mental Health)

ABSTRACT

Background: Prior to the COVID-19 pandemic, telehealth was rarely used for adolescent healthcare due to geographic restrictions and limited reimbursement. Due to COVID-19, health systems rapidly shifted to telehealth to ensure patient safety and conserve personal protective equipment. While the switch was largely successful, data on acceptability of telehealth among adolescents and their caregivers has lagged. Previous frameworks emphasize the need for patient, caregiver, and provider perspectives when evaluating telehealth in the pediatric setting. Providers have raised concerns regarding the confidentiality, privacy, equity, and quality of care provided by telehealth. Assessing the acceptability of telehealth among patients and their caregivers will allow for better understanding of their concerns and help inform future use of telehealth for adolescent healthcare delivery.

Hypothesis: We hypothesized that telehealth would be non-inferior to in-person clinical care with respect to acceptability, feasibility, and quality.

Methods: Cross-sectional web-based survey sent to adolescent patients and their caregivers seen in an Adolescent Medicine subspecialty clinic within a large academic pediatric hospital network. Adolescent patients ≥13 and caregivers of patients <18 who attended a video visit between May and July 2020 were eligible. Surveys included items addressing acceptability, feasibility (technical difficulties), and privacy of telehealth, as well as three open-ended questions. Responses to items comparing telehealth and in-person care were dichotomized into two categories: telehealth non-inferior to in-person care or telehealth inferior to in-person care; the proportions of adolescents and caregivers who rated telehealth as non-inferior were compared using chi-squared tests. Deductive thematic analysis using the Institute of Medicine dimensions of healthcare quality was used to code responses to open-ended items.

Results: Surveys were sent to n=268 adolescents and n=563 caregivers, with response rates of 20.5% (n=55) and 21.8% (n=123), respectively. Most survey respondents were white, cis-gender females. The majority of respondents reported high feasibility and rated telehealth as non-inferior compared to in-person care with respect to confidentiality, communication, medication management, and mental health. A significantly higher proportion of adolescents rated telehealth as inferior to in-person care with respect to privacy (22% vs 3%, $p<0.01$); no other significant differences in adolescent versus caregiver acceptability ratings were found. For open-ended items, most frequently cited themes regarding advantages of telehealth were Timeliness and Equity; the most frequently cited themes regarding disadvantages of telehealth were Effectiveness and Patient-Centeredness.

Conclusions: High acceptability and feasibility of telehealth during the COVID-19 pandemic was found among both adolescents and caregivers. Future evaluation of telehealth should include assessment of privacy, effectiveness, and patient-centeredness.

Source of mentor's funding or other support that funded this research: 5K23MH119976-02 (National Institute of Mental Health)

Poster Title: COVID-19 in older adults with and without pre-infection neurocognitive impairment
Student: Bryce Polascik, Class of 2025
Faculty Mentor and Department: Andrew J. Liu, MD, Duke Department of Neurology
Funding Source: None

ABSTRACT

Background: Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection has been associated with significant morbidity and mortality, including central nervous system (CNS) involvement that ranges from acute delirium to meningoencephalitis during acute infection. While acute neurological manifestations have been well-described, long-term cognitive and neurobehavioral outcomes remain poorly characterized in convalescent COVID-19 patients, particularly in older adult patients with pre-existing cognitive impairment. Characterizing any neurologic, neurobehavioral, and cognitive phenotypes of COVID-19 during their convalescence is important since 80% recover, yet the relationship between exacerbated cognitive and neurobehavioral dysfunction and SARS-CoV-2 infection remains unclear. We describe shared and differing clinical characteristics of 3 older adults (aged > 65 years) who reported worsening of cognitive and neurobehavioral symptoms in the convalescent period following COVID-19.

Hypothesis: COVID-19 infection in older adults contributes to worsening of pre-existing neurocognitive impairment.

Methods: Three adults aged > 65 evaluated in the Memory Clinic of the Duke Neurological Disorders Clinic noted worsening neurocognitive difficulties after COVID-19. Electronic medical records were retrospectively reviewed. Exam included a comprehensive neurological evaluation and neuroimaging. Prior history was collected for comparison.

Results: Patient 1 is a 69-year-old diabetic, hypertensive male with depression and a maternal aunt with late-onset Alzheimer's disease who presented for evaluation of memory loss first noted 1 year prior but had significantly worsened in the 5 months since recovery from COVID-19, prior to vaccine availability. He had SARS-CoV-2 antibodies. Prior to COVID-19 infection, head CT without contrast showed mild bilateral hippocampal atrophy. He has since reported forgetting when he had eaten and now evinced navigation issues when driving on familiar roads. MoCA was 20. A diagnosis of late-onset AD was made. Patient 2 is a 68-year-old male with anxiety, depression, and attention deficit disorder who presented with poor memory, inability to "visually map," daily "senior moments," and confusion while driving 4 months after recovering from COVID-19, prior to vaccine availability. He had SARS-CoV-2 antibodies. He had transient memory problems 2 years ago that improved after changing his bupropion dosage. After recovering from COVID-19, he misplaced objects and stopped a task midway through, thinking he completed it. MRI showed mild hippocampal atrophy. MoCA was 27. A diagnosis of dementia was made. Patient 3 is a 73-year-old male with apolipoprotein E genotype ε3/ε3 and sleep apnea, multinodular goiter, aortic aneurysm, and hypercholesterolemia. He has 2 brothers, each with an unspecified dementia. Prior to developing COVID-19, he presented to the Duke Memory Disorders clinic with memory difficulties, episodes of confusion, misplacement of belongings, and difficulty remembering driving routes. He received a pre-SARS-CoV-2-infection diagnosis of MCI. After recovering from COVID-19, he noted increased subjective memory difficulties over the ensuing months. MoCA score was 23. MRI showed hippocampal volume at 95% for age. A diagnosis of amnestic MCI was made.

Conclusions: This case series documents the potential exacerbation and progression of pre-existing neurocognitive conditions after COVID-19 recovery in 3 older adults. Differing clinical characteristics elucidate that long-term neurocognitive and psychiatric effects after COVID-19 are likely multifactorial, reflecting a combination of residual neurological involvement with possible direct and/or indirect cognitive, neurobehavioral, or psychiatric consequences.

Poster Title: Characterization of Injection Drug Use-Associated Endogenous Endophthalmitis
Student: Jeff Powell, Class of 2022
Faculty Mentor and Department: Margaret A. Greven, MD, Department of Ophthalmology
Funding Source: none

ABSTRACT

Background: In 2017, the opioid epidemic was declared a public health emergency, yet injection drug use (IDU) continues to increase, particularly during the COVID-19 pandemic. As IDU has increased nationwide, so has the rate of secondary infectious diseases, including endogenous endophthalmitis. We compare characteristics among persons with IDU-associated endogenous endophthalmitis to those with endogenous endophthalmitis due to other etiologies.

Hypothesis: We expect IDU-associated endogenous endophthalmitis to have distinct characteristics compared to endogenous endophthalmitis due to other etiologies

Methods: A multicenter retrospective chart review of all patients at Wake Forest Baptist Health, Duke University Medical Center, and University of North Carolina Medical Center who were diagnosed and treated for endogenous endophthalmitis from February 2012 to January 2021. Baseline characteristics, treatment characteristics, culture results, and final visual acuity (VA) were recorded.

Results: 123 eyes of 104 patients were included in the study, 37 cases (36%) were IDU-associated. Patients with IDU-associated endogenous endophthalmitis were significantly younger (36 vs 57 years, $p<0.00001$), had a longer duration of symptoms prior to diagnosis (22 vs 7 days, $p=0.012$), and were less likely to present with bilateral disease (5% vs. 25%, $p=0.012$). There was no significant difference in mean presenting VA (logMAR 1.69 vs 1.64, $p=0.74$) or final VA between the two groups (logMAR 1.27 vs 1.52, $p = 0.20$). Both groups had similar rates of intraocular culture positivity (22% vs 33%, $p=0.23$), but IDU-associated cases were less likely to have growth on systemic cultures (46% vs 82%, $p=0.00013$). IDU-associated cases were less likely to have an identifiable systemic infection (30% vs 75% $p<0.00001$), and more likely to have presumed or confirmed fungal infection (38% vs 10%, $p=0.00087$). Both groups had similar average number of intravitreal injections (2.23 vs 1.74, $p=0.12$), rate of pars plana vitrectomy (49% vs 39%, $p=0.32$) and rate of enucleation or evisceration (2.6% vs 6.0%, $p=0.42$).

Conclusions: IDU-associated endogenous endophthalmitis has clinically distinct features from endogenous endophthalmitis due to other etiologies. In many cases, patients with IDU-associated endogenous endophthalmitis had ophthalmic findings only, therefore a high index of suspicion is needed to identify these patients in order to initiate prompt treatment.

Poster Title: Effect of Weight Loss on Lumbar Bone Marrow Adipose Tissue in Older Males and Females

Student: Quinn Powell, Class of 2024
Faculty Mentor and Department: Ashley Weaver, PhD, Department of Biomedical Engineering
Funding Source: Clinical and Translational Science Institute of Wake Forest School of Medicine

ABSTRACT

Background: Older adults (65+ years) have an increased risk for age-related osteoporosis and fracture. This could be attributed to the loss of bone mineral density and increase in bone marrow adipose tissue (BMAT) seen in normal aging, as osteoblasts and adipocytes share a common stem cell progenitor line. BMAT infiltrates medullary cavity spaces that would otherwise be filled by bone, decreasing bone integrity. Bone marrow adipocytes display a different lipid metabolism from white adipocytes and increase in size during caloric restriction rather than decrease, meaning BMAT levels increase in response to typical weight loss (WL) interventions. This study aims to provide further data on BMAT variation during WL intervention in obese older adults, as well as evaluate for sex specific changes in BMAT with WL.

Hypotheses: (1) At baseline, participants with a higher BMI will have higher %BMAT in lumbar vertebrae. (2) After 6-months of weight loss, a greater decrease in BMI will be associated with a larger increase in %BMAT in the lumbar vertebrae. (3) There will be sex specific differences in BMAT associations when accounting for BMI.

Methods: The study sample included 52 obese, older adults (27 females, 25 males). Using a Siemens SOMATOM Definition Flash dual source CT scanner, dual-energy (80 kV and 140 kV) helical CT scans were obtained of the L1-L5 vertebrae at baseline and after 6-months of weight loss. A Mindways Model 3 CT calibration phantom was positioned under each participant and imaged in each scan to calibrate BMAT measures. For each scan, a region of interest (ROI) was placed consistently in the trabecular region of each lumbar vertebra and in three adjacent mid-vertebral slices. These ROIs were used to derive basis material compositions and compute an average %BMAT for each lumbar vertebra for each participant. The three slices of each vertebra were then used to calculate an average %BMAT at each vertebral level. Both absolute and percent changes in %BMAT were used in analysis to account for baseline differences. Linear correlations were obtained to analyze relationships between baseline %BMAT vs BMI and Δ%BMAT vs ΔBMI for each lumbar vertebra (L1, L2, etc). Data were also stratified by sex.

Results: Higher baseline BMI was associated with lower %BMAT in all lumbar vertebrae [negative correlations, R = -0.55 (L1), -0.41 (L2), -0.61 (L3), -0.53 (L4) and -0.57 (L5)]. Greater increases in L2-L5 %BMAT were seen with more WL (ΔBMI) [negative correlations, R = -0.18 (L2), -0.22 (L3), -0.11 (L4) and -0.22 (L5)], although not at L1 [slight positive correlation, R = 0.02]. A Mixed Model analysis in JMP found no significant difference in percent change in %BMAT between the sexes (p = 0.84), nor a significant difference in %BMAT between lumbar vertebral level (p = 0.59).

Conclusions: Higher baseline BMI was associated with lower %BMAT. Larger increases in %BMAT were seen with greater WL (ΔBMI). No significant difference in Δ%BMAT was found between male and female participants.

Source of mentor's funding or other support that funded this research: My role in analyzing and comparing BMAT levels *in vivo* is part of a larger ongoing clinical trial, UPLIFT: *Utilizing Protein During Weight Loss to Impact Physical Function.* UPLIFT funding source: K25AG058804 and R01AG050656

Poster Title: Characterizing Blood Transfusion on Distal Aortic Blood Flow during Supraceliac Complete Aortic Occlusion in Swine Animal Model

Student: Hisham Qadri, Class of 2024
Faculty Mentor and Department: Lucas P. Neff, MD, Department of Pediatric Surgery

Funding Source: Dubie H. Holleman Fund for Cancer and Heart Research

ABSTRACT

Background: Resuscitative endovascular balloon occlusion of the aorta (REBOA) is an endovascular procedure that can be used to provide hemodynamic support to hemorrhagic shock patients with non-compressible truncal hemorrhage. During REBOA, patients often receive blood transfusions to improve hemodynamics and correct hypovolemia before definitive surgical hemostasis. As cardiac output and aortic pressure increase in response to aortic occlusion and fluid and blood transfusion, aortic diameter will increase as a function of aortic compliance. This may result in unintended flow around the aortic balloon. To date, this leakage phenomenon has not been fully characterized and must be mitigated by progressive balloon inflation to maintain complete occlusion and to avoid ongoing hemorrhage.

Hypothesis: We hypothesized that unintended blood flow around the REBOA balloon would occur following the initial establishment of aortic occlusion and during resuscitation, requiring continued inflation of the balloon to maintain complete aortic occlusion (AO).

Methods: Yorkshire swine were anesthetized and instrumented to collect proximal mean arterial blood pressure (pMAP), distal MAP (dMAP), balloon pressure (bP), balloon volume (bV), and aortic flow (AF). A 7 Fr compliant aortic balloon was positioned in the supra-celiac aorta via femoral arterial access. Animals underwent 30% total blood volume hemorrhage over 30-min (T0-T30). At T30, the balloon was inflated to complete AO, defined by distal aortic flow of <100ml/min. Automated balloon inflation occurred from T30-T60 when downstream flow was detected. At T55, blood was transfused over 18-min (T55-T73). At T60, automated balloon deflation ensued to maintain a pMAP >65 mmHg over 15 minutes. P values were calculated using a Mann-Whitney U test.

Results: Hemodynamics were analyzed for 10 animals (weight 72.94±5.36 kg). At T30, T50, T55, and T60 the mean pMAP was 31.29±7.86 mmHg, 91.10±21.20 mmHg, 89.20±19.60 mmHg, and 129.54±15.08 mmHg. During complete AO and ongoing blood transfusion (T55-T60), mean pMAP was 108.5±16.17 mmHg and mean dMAP was 12.44±2.79 mmHg. The mean AF at T30, T50, T55, and T60 was 15.53±7.53 mL/min/kg, 0.90±0.79 mL/min/kg, 0.95±0.71 mL/min/kg, and 2.00±0.90 mL/min/kg. During steady state complete AO (T35-55) mean AF was 0.84±0.60 mL/min/kg. This increased statistically significantly to 1.57±0.77 mL/min/kg during T55-T60 ($p=0.035$). Mean bV at T30, T50, T55, and T60 was 0.00±0.00mL, 5.57±1.61 mL, 5.61±1.65 mL, and 7.00±1.52 mL. During steady state AO, mean BV was 5.49±1.57 mL, which increased to 6.11±1.56 mL ($p=0.353$) during AO with concurrent transfusion (T55-T60). The mean bP at maximum AO during blood transfusion was 253.53±62.54 mmHg. During T55-T60, there were 21 balloon inflations among the 10 animals analyzed compared to 5 inflations during the preceding 15-min of steady state AO.

Conclusions: Our data demonstrated that during REBOA with concurrent blood transfusion, progressive balloon inflation was required to maintain aortic occlusion due to increasing pMAP and AF. In clinical practice, following initial establishment of AO in the context of hemorrhagic shock, progressive balloon inflation may be required to maintain AO in response to intrinsic and transfusion mediated increases in cardiac output, blood pressure, and aortic diameter. This is particularly important when definitive hemostasis has not been achieved, as loss of aortic occlusion with blood flow beyond the balloon may result in ongoing hemorrhage and hemodynamic collapse.

Source of mentor's funding or other support that funded this research: United States DoD

Poster Title: The Effect of the Strengthen Opioid Misuse Prevention Act on Opiate Prescription Practices After Total Joint Replacement

Student: Michelle Qiu, Class of 2023
Faculty Mentor and Department: John Shields, MD, Orthopedic surgery

Funding Source: none

ABSTRACT

Background: The field of orthopaedic surgery has been a key contributor to the over-prescription of narcotic pain medications in the United States. Orthopaedic surgeons prescribe an estimated 7.7% of all opioid prescriptions in the United States, making them the third highest prescribers among physicians. In North Carolina, the Strengthen Opioid Misuse Prevention Act of 2017 (STOP Act) went into effect on January 1, 2018, with the intention of increasing the oversight of opioid prescriptions. In 2017, the year prior to enactment of the law, there were 1,953 reported opioid deaths in North Carolina, of which 659 cases were attributed to prescription opioids (6.5 deaths per 100,000 persons). Few studies have been published to assess the efficacy of the new law in preventing opioid over-prescription and its effects on the healthcare system. The purpose of this study was to review the effects of the STOP Act on patients undergoing total knee arthroplasty, total hip arthroplasty and hip hemiarthroplasty.

Hypothesis: We hypothesized the new law would decrease the amount of opioids orthopedic surgeons prescribed with no additional increase in patients' number of visits to the clinic or ED for pain control.

Methods: This study utilized a retrospective chart review of patients who underwent total knee arthroplasty, total hip arthroplasty, or hip hemiarthroplasty between January 1st and June 30th, 2017, before the enactment of the STOP Act, as well as from January 1st to June 30th, 2018, after the enactment of the STOP Act. Two hundred and eighty-nine patients were identified in the Pre-STOP Act group with 333 patients identified in the Post-STOP Act group. Variables of interest included demographics, amount of narcotic pain medications prescribed post-operatively, the number of calls and visits to the orthopedic clinic or emergency room due to post-operative pain, and the number of prescription refills for these patients. The data was analyzed using t-tests and Chi squared statistical analysis.

Results: There was a statistically significant decrease in average number of postoperative narcotic pills prescribed after the implementation of the STOP act (123.4 vs 63.6, $p < 0.001$). We found no significant difference between the number of calls or visits to clinic for pain control (30 vs 49, $p = 0.106$) or the number of post-operative emergency room visits for pain (19 vs 22, $p = 0.988$). However, there was a statistically significant increase in the average number of prescription refills requested and given (30 vs 45, $p < 0.005$).

Conclusions: After the STOP Act, the average number of opioid pills prescribed after knee and hip arthroplasty decreased by more than half, making the law efficacious in its goal to reduce opioid prescriptions written. There was no statistically significant increase in patient calls to clinic or visits to the emergency room for narcotic refills, suggesting the STOP Act did not have a significant increased burden on the healthcare system overall. Our results are in line with similar studies on opioid misuse prevention laws in Florida, which is further evidence that these forms of legislation may be successful in reducing opioid prescriptions nationally.

Poster Title: Comparative Analysis of Costs of Caring for Inpatient COVID-19 Patients and Non-COVID-19 Patients at One Academic Center

Student: Samuel Rafla, Class of 2022
Faculty Mentor and Department: Chi-Cheng Huang, MD, Hospitalist Medicine

Funding Source: None

ABSTRACT

Background: The COVID-19 pandemic created unprecedented hardship for hospital systems as hospitals had to cancel elective procedures as well as take on additional costs such as new ventilators, personal protective equipment (PPE), reduced patient to patient-to-nurse ratio, and more. To combat this, congress signed the Coronavirus Aid, Relief, and Economic Security (CARES) Act which included more than $100 billion in aid for hospital systems. The purpose of our study was to compare the daily average hospital cost of inpatient management of patients with COVID-19 infection to those without.

Hypothesis: We hypothesized that the cost of caring for a patient with COVID-19 in the inpatient setting was higher than the cost of caring for a patient with similar demographics admitted to the hospital for another diagnosis

Methods: Patients were selected from Wake Forest Baptist Hospital adult inpatients admitted to the Hospital Medicine or General Medicine service from March 2020 to February 28, 2021. After applying exclusion criteria, we randomly selected 4 non-COVID patients for each COVID patient-matched by age (≤65 and >65 years) and gender (male and female) to achieve a 1:4 case-control matched dataset. The direct cost for each hospitalization was calculated by adding 'fixed direct cost' and 'variable direct cost'. An average daily cost was calculated as the 'direct cost' divided by the 'total length of stay in days'. Statistical analyses were performed among COVID and non-COVID groups. Mean and standard evaluation of 'average daily cost' was calculated between groups and a student t-test was performed for comparison. Multivariate adjusted linear regression models were used to calculate additional 'average daily costs' needed for the COVID 19 patient group in comparison to the non-COVID patient group.

Results: After applying exclusion and inclusion criteria, the COVID-19 arm had 371 patients and the non-COVID arm had 1509 patients. The mean average daily direct cost was higher among COVID patients ($1504.4) compared to non-COVID patients ($1336.0) with statistical significance (p-value <0.001). In a multivariate-adjusted linear regression model (adjusted for age, gender, race, and MS-DRG weight), the average daily direct cost for patients with the primary diagnosis of COVID was $123.18 greater than that of non-COVID patients (p-value <0.0001).

Conclusions: Inpatient costs for COVID patients were shown to be greater than non-COVID patients. Given that we were only able to use direct costs in our model, we are likely underestimating the cost of COVID-19 patients. Examples of indirect costs that we could not include decreased nursing staff ratios, lower physician censuses, infrastructure changes (negative pressure rooms, ventilation/HVAC upgrades), and the cost of personal protective equipment (masks, gowns, gloves). These factors would likely increase the disparity in cost between the two groups. Our study's increased costs for COVID patients highlight the financial benefit that the CARES Act provided for hospitals and healthcare systems across the country.

Poster Title: Physical Activity and Sleep Habits in Adults with Epilepsy
Student: Dhvani Raghupathy, Class of 2024
Faculty Mentor and Department: Halley Alexander, MD, Department of Neurology
Funding Source: Clinical and Translational Science Institute of Wake Forest School of Medicine

ABSTRACT

Background: Of the 50 million people in the world who have been diagnosed with epilepsy, about one third are refractory to treatment with antiseizure medications. There is a critical need for new therapies for epilepsy, and physical activity is a promising treatment, as animal studies have shown that physical activity may reduce seizure frequency. Moreover, people with epilepsy (PWE) have a high incidence of comorbid health conditions which include cardiovascular disease as well as sleep disorders, which contribute to worse seizure control, worse quality of life, and increased mortality in this population. Physical activity has the potential to improve both seizure control and epilepsy associated comorbidities. Prior studies have found that PWE are more sedentary compared to the general population. This study aims to quantify the physical activity and sleep habits of PWE compared to controls without epilepsy, and to assess adherence and the feasibility of data collection using wearable devices in this population.

Hypothesis: We hypothesize that 1) PWE will have a lower average daily step account, a greater amount of sedentary minutes per day, and lower self-reported activity scores compared to controls without epilepsy, 2) PWE will have a lower total sleep time in minutes per night and poorer self-reported sleep quality as measured by the Pittsburgh Sleep Quality Index (PSQI) compared to controls without epilepsy and 3) Adherence with wearing the tracker will be at or above 80% and missing data gathered from the tracker will be at or below 30%.

Methods: In this prospective, observational, case-control study, adults with focal or generalized epilepsy were recruited from the outpatient adult epilepsy clinics at the University of Virginia Health System and Wake Forest Baptist Medical Center between 2018 and 2021. At the initial visit, subjective sleep and physical activity data were collected via the Pittsburgh Sleep Quality Index (PSQI) and Godin Leisure Time Questionnaire (GLTQ). Data on activity and sleep habits were collected via a Fitbit Charge 2 wrist-worn tracker over a 14-day period. Adherence was assessed by patient report and missing data was defined as <10 hours of daytime data and < 4 hours of nighttime data for any given day or night the device was reported to be worn.

Results: A total of 44 participants completed the study. PWE had a lower average daily step counts compared to controls (4345 versus 6798, p-value 0.080) and more sedentary minutes per day (883 versus 774 minutes, p-value 0.078). When comparing time spent in light, moderate, or high intensity activity, PWE spent significantly less time in light activity per day (145 versus 199 minutes, p-value 0.012), as well as less time in moderate and high activity intensities, though these were not statistically significant. Self-reported activity levels were lower in PWE compared to controls as measured by the GLTQ (29.3 versus 38.1, p-value 0.193). Average nightly minutes of sleep (448 in PWE versus 423 in controls, p-value 0.280) and scores on the PSQI (5.92 PWE versus 6.81 controls, p-value 0.472) were similar in both groups. Adherence with wearing the Fitbit device across all participants was 91%, with 3% of daytime missing data at 18% of nighttime missing data.

Conclusions: PWE are more sedentary than the general population across the full spectrum of activity intensities, with the most significant difference seen in light activity. Focusing on increasing light activity in this population may portend benefits in seizure control and epilepsy-associated comorbidities and should be evaluated in future research. Contrary to previous studies, we found no difference in sleep time or quality when comparing PWE to controls. Adherence with wearing the Fitbit was high and missing data was low, suggesting that it is feasible to use wearable trackers in this population.

Source of mentor's funding or other support that funded this research: NeuroNEXT Fellowship Award 1U24NS107197-01

Poster Title: Readability of Commonly Used Patient Reported Outcome Measures in Laryngology
Student: Shambavi J. Rao, BS, Class of 2022
Faculty Mentor and Department: Lyndsay L. Madden, DO, Department of Otolaryngology- Head and Neck Surgery
Funding Source: None

ABSTRACT

Background: Patient-reported outcome measures (PROMs) are used to evaluate patients' symptoms and clinical improvement after an intervention. Advocacy efforts and increased provider awareness regarding health literacy have helped to improve the readability of PROMs. Recent studies in otolaryngology in rhinology, pediatric otolaryngology, and head and neck reported PROM readability scores above the sixth-grade level. However, there is limited data regarding the readability of laryngology PROMs. Thus, this study aims to report the readability levels of PROMs in laryngology by assessing different readability indices and describing the relationship of readability levels to equitable healthcare.

Hypothesis: We hypothesized that many laryngology PROMs will be above the recommended sixth grade reading level.

Methods: This is a bibliometric study that received approval from institutional review board (IRB) review as a nonhuman subject research study. Recent and widely utilized laryngology PROMs were selected from a publicly available literature search by reviewing laryngology systematic reviews, PubMed, and Google Scholar. Laryngology PROMs were selected from voice, dysphagia, airway, and other PROMs including voice questionnaires administered to patients seeking gender affirming voice care from systematic reviews and expert opinion. There were 37 PROMs included in this study. PROMs were analyzed via Gunning Fog, Simple Measure of Gobbledygook (SMOG), FORCAST, and Flesch Reading Ease Score.

Results: All laryngology PROMs had readabilities above the recommended sixth-grade level. The mean and standard deviation (SD) of Gunning Fog was 7.30 (2.59), SMOG was 8.70 (1.51), FORCAST was 10.05 (1.51), and Flesch Reading Ease Score was 8.08 (2.76).

Conclusions: Laryngology PROMs are above the recommended middle school reading level. To further promote health equity, readability should be considered when developing future PROMs.

Poster Title: Fellaship: A Peer-Facilitated Social Support Group for Preclinical Medical Students

Student: Andrew J. Recker, BS; Kristen Confroy, BS; Zechariah Harris, BS; Lauren Himes, BS; Matthew P. Jamison, BS; Brendan Kemple, BS; Stacey Schmauss, EdD
Faculty Mentor and Department: Stacy Schmauss, EdD, Health Education

Funding Source: None

ABSTRACT

Background: Medical schools are recognizing the need for intervention to address burnout in medicine. One area of focus has been the need for a strong sense of community and peer support.

Hypothesis: By the end of the Fellaship program, learners will be able to (1) report reduced burnout and improvement in social support among peers; (2) demonstrate improved academic performance and (3) recognize the value of peer-facilitated programming for an increased sense of community and inclusion.

Methods: 'Fellaship', is a peer-facilitated social support group for preclinical medical students. Eleven meetings were hosted by students who prepared a meal representative of their family's shared background and facilitated a group discussion; examples of chosen discussion topics were servant leadership, mental health, and time management. School funding was provided for each meal. Survey responses and USMLE Step 1 scores were reported by participants.

Results: Thirteen students attended the first meeting and 42 attended the last, with an average of 21.7 students per gathering. The average budget per meeting was $172.72. Survey results demonstrated that due to participation in Fellaship, students felt more connected to other students (82% strongly agree, 18% agree), felt a sense of community at school (88% strongly agree, 12% agree), able to reset after a difficult exam (94% strongly agree, 6% agree), and were energized to continue medical training (82% strongly agree, 18% agree) (n=17). Average USMLE Step 1 score of Fellaship participants was 246.8 (8.6) (n=13) compared to the class average of 234 (16) (n=132) ($p<0.01$).

Conclusions: Medical students who participated in Fellaship reported reduced feelings of burnout, improvement in social support, and better performance on the USMLE Step 1 exam by the end of the eighteen-month preclinical curriculum. Fellaship is a cost-effective and highly adaptable program, well-suited to adoption at other medical and graduate schools.

Poster Title: Implementation of a Direct Observation Program for Pediatric Trainees using a QR Code Linked Evaluation Tool

Student: Menaka Reddy, Class of 2024
Faculty Mentor and Department: Jeanna Auriemma, MD, Pediatrics

Funding Source: Department of Pediatrics, Wake Forest School of Medicine

ABSTRACT

Background: Direct observation (DO), defined as "the active process of watching learners perform in order to develop an understanding of how they apply their knowledge and skills to clinical practice" is an integral part of medical training, from its start during medical school through years of residency and fellowship. Despite the well-documented advantages of DO on both learners and instructors, many medical programs struggle to implement a systematic process for ensuring that faculty consistently observe trainees and provide associated feedback. This educational lapse is often due to the pressure that attending physicians and residents face to achieve high efficiency, smooth workflow while prioritizing patient care. As such, there is a clear need for further research and program development into creating a streamlined process for facilitating direct observation and feedback between instructors and resident physicians. The aim of this study was to evaluate a novel program for increasing direct observation of resident trainees on all rotations, executed within the Wake Forest Pediatric Residency Program during the 2020-2021 academic year. During the program, interns in the pediatrics department received a QR code to be placed on their ID badge that instructors could scan with their phones, linking them to a Redcap survey for feedback. Results of the study will help determine the impact of such a program on resident training as well as the feasibility of continuing and/or expanding the program.

Hypothesis: If QR codes are placed on intern ID badges, then there will be an increase in the quantity of direct observations residents receive as well as a change in the content of feedback provided following direct observations.

Methods: To evaluate the direct observation program, both qualitative and quantitative data analysis were used. For the qualitative portion, the research team created two semi-structured interview guides for interns and faculty. The guide included questions such as "How did the program influence residency training?" and "How did you feel about the program? What did you like or not like?" Interviews lasted approximately 20-25 minutes and were transcribed and later analyzed using a qualitative coding program. For the quantitative portion, results of the Redcap surveys associated with the QR codes were analyzed using descriptive statistics to report which skills were most frequently observed and in which department sections.

Results: At the conclusion of the study, fifteen faculty and interns participated in the semi-structured interviews. Key themes that arose during the interviews included commentary on (1) quality of feedback; (2) the role of mentorships and relationships in the program; (3) the ability to individualize or tailor education; (4) the integration of the program into clinical workflow; (5) the technology associated with QR codes; (6) how direct observation and associated feedback impacts learning environment; and (7) logistics and program promotion important to implementation. Additionally, participants also reflected on which clinical skills were most useful to have observed as well as whether they had a positive, negative, or neutral experience with the program.

Conclusions: Further analysis of these data will reveal more conclusive evidence about the impact of the implementation of DO in residency programs. Additionally, this will highlight feasibility of continuing and expanding the use of QR codes as a means of capturing direct observation feedback as well as associated benefits and drawbacks of its implementation that would contribute to future modifications to the program.

Poster Title: Monitoring Early Postoperative Mobility at Scale
Student: Alexis Restrepo, Class of 2024
Faculty Mentor and Department: Clancy Clark, MD, Department of General Surgery
Funding Source: Laura Scales Student Research Fellowship Fund

ABSTRACT

Background: Early mobilization is considered an important component of postoperative recovery in the hospital; however, a large portion of patients fail to ambulate during their hospitalization, even with mobility programs and dedicated mobility aides. Large-scale patient mobility monitoring could evaluate the effectiveness of mobility programs and screen for patients at higher risk for postoperative complications due to low mobility. The current study aimed to evaluate posture as an objective measure of postoperative mobility.

Hypothesis: We hypothesized that existing continuous vital sign patient monitoring (VISI Mobile®) technology can objectively characterize the postural behavior of patients in the early postoperative period and identify patients at risk for adverse postoperative outcomes, like readmission.

Methods: In this IRB-approved cohort study, we examined retrospective accelerometer data from 562 postoperative patients between January and November 2019. We included patients who had undergone major cancer surgery and were monitored for at least 24 hours and had a length of stay longer than 24 hours. To evaluate VISI Mobile's accuracy in detecting upright position, we performed a validation study in which five patients were monitored at fixed intervals over five hours comparing observed posture to VISI monitor real-time posture data. VISI monitor posture position was also recorded for 11 patient ambulatory events.

Results: Retrospective accelerometer data allowed us to calculate average time spent upright per day ($\bar{x}$=206.2 min) and percent of observation spent upright ($\bar{x}$=14.32%). We did not find a significant difference in the upright behavior between patients who were readmitted and those who were not. In our validation study, we found that VISI detected upright position with a sensitivity and specificity of 1.0 while a patient was in their room. During walking events, VISI correctly detected a patient's upright position 84% of the time.

Conclusions: Real-time posture data from continuous vital sign patient monitoring (VISI Mobile®) technology was shown to be valuable for monitoring patients' mobility after surgery on a large scale.

Poster Title: An innovative device for rotator cuff repair surgery
Student: Madeline Rieker, Class of 2024
Faculty Mentor and Department: Christopher Tuohy, MD; Department of Orthopaedic Surgery and Rehabilitation
Funding Source: Department of Orthopaedic Surgery and Rehabilitation, Wake Forest School of Medicine

ABSTRACT

Background: Rotator cuff tears pose a significant clinical challenge that is inadequately addressed by current interventions. Currently, there is no "gold standard" surgical treatment to restore pre-injury function, and rotator cuff repair surgeries are associated with retear rates as high as 20-70%.[1] Poor outcomes are often associated with risk factors including large tear size, high degree of muscle atrophy, poor tendon quality, and inappropriate rehabilitation.[2] The Atrium Health Wake Forest Baptist Department of Orthopaedic Surgery and Rehabilitation shoulder research group has identified excessive repair tension as a significant risk factor for impaired rotator cuff function and poor clinical outcomes.[3] However, some amount of mechanical strain is required to improve molecular remodeling and osteointegration of the repaired tendon.[4] Thus, the surgeon must strive for ideal tension at the repair site. Currently, there is no commercially available device that allows the surgeon to determine the amount of intraoperative tension or set ideal repair tension. Wake Forest has developed a surgical device for determination of repair tensions. This study aims to use our device to quantify and test intraoperative rotator cuff repair tensions, as well as correlate repair tensions with clinical outcomes.

Hypothesis: Excessive repair tension during rotator cuff repair surgery will lead to decreased postoperative functional and radiological outcomes.

Methods: This study is designed to include patients with different classes of rotator cuff injury who require an arthroscopic repair surgery. Interactions and interventions will include pre-surgery evaluation, surgical repair, standardized physical therapy, and post-operative follow-up visits at 6 months, 1 year, and 2 years. Participants will undergo standard of care surgical procedures, however, during the surgery, the tension measurement device will be used to measure the amount of tension required for either anatomic or medialized repair. The amount of tension will be quantified, and anatomical details of the injury will be documented. Outcome measures will include physician measurements of range of motion and strength, ultrasound examinations, and patient outcome measures. Results will be analyzed using descriptive statistics, comparison between different repair tensions, and regression analysis to identify independent outcome predictors. Comparison between patients with different repair tensions will be performed using chi square tests, t-tests, or ANOVA, and other statistical analysis may be conducted as appropriate.

Future Directions: This study is ongoing and in the process of enrolling patients. Once underway, data collection will provide measurements of intraoperative repair tensions that can be correlated with postsurgical outcomes. Future directions might include comparison of repair tension between anatomic and medialized repairs, and effect of intraoperative patient positioning on repair tension.

Source of mentor's funding or other support that funded this research: Spark Award Grant

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Poster Title: Associations Between Cognitive Function and Sex Hormones in the Look AHEAD Cohort
Student: Brian Andres Robusto, Class of 2024
Faculty Mentor and Department: Mark Espeland, PhD, Department of Internal Medicine
Funding Source: National Institute of Diabetes and Digestive and Kidney Diseases, T35 Training Grant DK007400

ABSTRACT

Background: Levels of estradiol (E2) and total testosterone (T) in individuals of both sexes decline as they age. Many studies have linked decreases in these sex hormones with increased risk for developing Alzheimer's Disease (AD). As the prevalence of obesity and type 2 diabetes (T2DM) rises it is important to understand the effect of the two on cognitive health: both have been linked to increased rates of cognitive decline and dementia. Weight gain in men with obesity has been found to increase total testosterone levels, whereas, in obese women weight loss decreases endogenous E2 and T levels. It remains unclear how weight loss in individuals with T2DM and obesity may impact brain health as they age. Additionally, prior studies have provided evidence that higher E2 among older women with T2DM increases risk of dementia. To better understand the relationship that T2DM, obesity, weight change, aging, and sex hormones have with cognitive function we used the data from the Action for Health in Diabetes (Look AHEAD) randomized controlled clinical trial.

Hypothesis: We hypothesized that levels of E2 and T in both women and men are associated with cognitive function and may influence the legacy that participation in a 10-year intensive lifestyle intervention featuring weight loss has on cognitive function.

Methods: Participants (579 women, 417 men, mean age 69 years) were randomly assigned to a 10-year intensive lifestyle intervention (ILI) focused on weight loss or a control condition of diabetes support and education (DSE). Participants were followed with standardized measure of body mass index (BMI) and risk factors. Those using postmenopausal hormone or androgen therapy were excluded. Serum E2 and T were assayed twice (Times 1 and 2, an average of 4 years apart) centrally. Standardized measures of cognitive function (attention, executive function, memory, verbal fluency, and composite) were administered by trained and certified staff. Bayesian multiple imputation was used for E2 and T levels that were below the assay's detectable level. Mixed effects models were used to describe relationships that log-transformed sex hormone levels had with current BMI and with intervention assignment.

Results: E2 and T levels were higher among men than women. Among men, greater BMI was associated with higher E2 ($p<0.001$) but lower T ($p<0.001$). Higher T was associated with better verbal fluency; however, the remaining cognitive functions were not associated with sex hormones levels. Among women, greater BMI was associated with higher E2 ($p<0.001$) and higher T ($p<0.001$). None of the cognitive function test scores were associated with E2 or T, in women. The 10-year ILI did not result in a legacy of reduced BMI among women at either epoch. Among men, it had a modest legacy of lower BMI at Time 1 ($p=0.01$), which attenuated by Time 2 ($p=0.08$). ILI had a legacy of poorer cognitive functioning among women that was most evident for executive function (mean z-score difference: -0.146 ± 0.072, $p=0.01$). This effect, however, could not be explained by differences in current levels of sex hormones. The ILI did not have a legacy effect on cognitive functioning in men.

Conclusions: The Look AHEAD ILI did not leave a legacy of alterations in levels of sex hormones. Contrary to some prior reports, serum E2 and T levels had little association with cognitive function in women or men in our cohort, with the exception of enhanced verbal fluency found in men with higher levels of T. The adverse legacy of ILI on women's cognitive function was not conveyed through alterations in levels of sex hormones.

Source of mentor's funding or other support that funded this research: The following DHHS awards: DK57136, AG058571, DK092237, and AG033087.

Poster Title: Pilot Study of Head Kinematics in Rodeo
Student: K. Nicole Rogers, Class of 2024
Faculty Mentor and Department: Joel Stitzel, PhD and Jill Urban, PhD, Department of Biomedical Engineering
Funding Source: The Harry O. Parker Neuroscience Research Fund

ABSTRACT

Background: Concussions account for 12.8% of bull riding injuries; however, concussion protocols for the assessment and management of concussions in the sport are lacking compared to other high-risk sports, putting the athlete at short- and long-term health risks. In rodeo, protective equipment for the head (i.e., helmet) is not required despite frequent impacts between the athlete and the ground, the animal, and/or the perimeter of the arena. Furthermore, riders are likely exposed to possible head injury from non-impact events during the ride itself (i.e. whiplash injury). Understanding head kinematics in rodeo may inform the unique loading environment of riders and concussion safety efforts in the sport.

Objective: This study's objective was to pilot a mouthpiece-based sensor to measure head kinematics associated with typical rodeo events. We hypothesized that the rider would experience the greatest changes in rotational motion about the mediolateral axis (sagittal plane) congruent with greater risk of whiplash injury.

Methods: Mouthpieces equipped with tri-axial accelerometers and gyroscopes were custom-fit to rodeo athletes who were monitored during bull riding events. Head kinematic data, including linear and rotational acceleration and rotational velocity at the head center of gravity were analyzed alongside time-synchronized video footage to determine how the positions and movements of the animal corresponded to head kinematics of the athlete. The film and corresponding kinematic data were segmented by the motion of the bull divided into phase one and phase two of the buck cycle of the bull. The periods in which the rider fell off of the bull at the end of the ride were also segmented out, and any resulting direct head contacts were recorded in the film review.

Results: Data were collected from 3 bull riders during a total of 16 bull rides resulting in 156 buck phases and 16 falls – two in which the athlete's head directly contacted the ground. The median peak resultant linear acceleration, rotational velocity, and rotational acceleration recorded during rides (excluding falls) were 3.6 g, 5.2 rad/s, and 141.0 rad/s^2, respectively. The maximum peak kinematics for falls were 32.8 g, 38.2 rad/s, and 2433.7 rad/s^2, and mean peak kinematics for falls were 12.3 g, 14.7 rad/s, and 825.5 rad/s^2 respectively. Furthermore, the median cumulative angle changes of a rider's head during a single ride were 1001.8, 1200.2, and 1094.1 degrees about the x- (posterior-anterior), y- (medial-lateral), and z-axis (inferior-superior), respectively. The largest cumulative angle change was consistently about the y-axis.

Conclusions: Rodeo athletes are repeatedly exposed to a broad spectrum of head accelerations during normal participation of the sport, both during the ride and fall. This pilot study provides a framework for future study of head kinematics and head impact exposure in rodeo and yielded the first head kinematic data in rodeo athletes.

Source of mentor's funding or other support that funded this research: Department of Biomedical Engineering

Poster Title: Effect of dressings imbued with methylene blue and gentian violet in the treatment of chronic hidradenitis wounds

Student: Anita Rong, Class of 2024
Faculty Mentor and Department: Rita O. Pichardo, MD, Dermatology

Funding Source: Laura Scales Student Research Fellowship Fund

ABSTRACT

Background: Hidradenitis suppurativa (HS) is an inflammatory skin condition that causes open wounds in intertriginous areas. Common sites include the axillae, inguinal area, inframammary region, buttocks, and areas where the skin encounters friction. The severity and presentation of the wounds can vary, ranging from deep nodules to sinus tracts. These wounds caused by hidradenitis suppurativa tend to be painful, are associated with malodorous drainage, and are notoriously difficult to treat. They have substantial negative impact on patients' quality of life, yet relatively few wound care options exist. The aim of this study was to assess the effectiveness of dressings imbued with methylene blue and gentian violet on subjects' wound healing, pain, and quality of life.

Hypothesis: It is hypothesized that dressings imbued with methylene blue and gentian violet will promote wound healing and improve subjects' dermatologic quality of life.

Methods: 4 adult subjects with chronic wounds due to hidradenitis suppurativa were recruited from the Wake Forest Baptist Health Department of Dermatology HS clinic. 1 subject re-enrolled in the study with a new wound, for a total of 5 wounds studied. Subjects were instructed to dress their wounds with an ovine forestomach-based extracellular matrix covered by a polyurethane foam dressing imbued with gentian violet ($\geq$ 0.00005 g/g) and methylene blue ($\geq$ 0.00005 g/g). Wound were measured and photographed, and patients rated their pain (scaled 0-10) and dermatologic quality of life (via Dermatology Life Quality Index, DLQI). Wound measurements, photographs, and assessments were taken at the initial enrollment visit and again at weeks 1, 2, 4, and 8, after which the subjects' participation concluded.

Results: Between the initial study visit and week 8, average total wound surface area decreased 57.2 ± 36.3%, subjects' pain ratings decreased on average 2.7 points, and average dermatologic quality of life improved 5 points. Additionally, patients generally reported improved odor control and comfort along with reduced pain and drainage. Granulation tissue increased in all subjects.

Conclusions: All participants' wounds decreased in surface area, though reduction in wound size varied greatly between participants. Most patients reported improvements in HS-related pain and dermatologic quality of life. Although small, our case series suggests that appropriate wound dressings, in addition to medical therapy, are an essential part of treatment for patients with chronic wounds due to HS. Breathable dressings imbued with methylene blue and gentian violet can help maintain a healthy wound bed and promote wound healing.

Limitations: small study size may limit generalizability. HS-related pain ratings and the DLQI did not distinguish between wounds being treated in our study versus untreated wounds.

Source of mentor's funding or other support that funded this research: Wound dressings and research support were provided by Hydrofera.

Poster Title: Short- and long-term outcomes in retransplanted elderly kidney recipients
Student: Abdu Roussi, Class of 2024
Faculty Mentor and Department: Natalia Sakhovskaya, MD, Nephrology
Funding Source: none

ABSTRACT

Background: With the half-life of standard-criteria deceased donor kidneys in the United States estimated to be 15.5 years, and with an aging population, there is an increased incidence of kidney retransplantation as more patients outlive their first renal allograft. Retransplantation remains a viable option for these patients as well as other patients who experience graft failure.

Hypothesis: It is hypothesized that elderly patients receiving a second kidney transplant have outcomes similar to elderly patients receiving their first kidney transplant.

Methods: This project is a single-center retrospective observational study. All patients are 65 years and older and received a deceased donor kidney transplant at Wake Forest Baptist Medical Center (WFBMC) between 2001 and 2020. Exclusion criteria includes patients who were transplanted at a different transplant center and then transferred medical care to WFBMC, patients who received multiple organs, and patients of living kidney donors. Pre- and posttransplant data was compiled via chart review.

Results: 618 patients were identified, 585 receiving their first kidney transplant and 33 retransplanted patients. Retransplanted patients were more likely to receive an allograft from a standard-criteria donor rather than an extended-criteria donor when compared to first transplant patients (72.7% vs 43.2%, p=.00089). Length of stay for first transplant and retransplanted patients was 6.05 days and 5.91 days (p=.852), respectively. Age at transplantation was 70.1 years and 71.2 years (p=.121). 30-day readmission rates were 21% and 15% (p=.406). Patients admitted for scheduled biopsy, immunosuppression management, or intravenous immunoglobulin treatment were excluded. 30-day bacterial infection rates were 18% and 22% (p=.571). Furthermore, there was also no statistically significant difference between the two groups with respect to: incidences of viremia, primary graft nonfunction, incidences of leukopenia, pretransplant and posttransplant cancer rates, and graft loss occurrence.

Conclusions: We seek to provide the perspective of a single institution with respect to outcomes of first transplant patients and retransplanted patients. The data indicates that outcomes are not different enough to warrant a change in approach to retransplanted patients. However, retransplanted patients were more likely to receive an allograft from a standard-criteria donor rather than from an extended-criteria donor compared to first transplant patients. Due to the relatively low frequency of renal retransplantation procedures, there is a small sample size in the retransplant group (n=33) compared to the first transplantation group (n=585). Additional research with larger data sets is warranted.

Poster Title: Electronic Consults in Dermatology: A Retrospective Analysis
Student: Katherine R. Salisbury, Class of 2024
Faculty Mentor and Department: Lindsay C. Strowd, MD, Dermatology
Funding Source: Department of Medical Education, Wake Forest School of Medicine

ABSTRACT

Background: Dermatologic conditions are among the most common human illnesses, affecting approximately one-third of individuals in the United States. Although nearly one in four office visits to physicians in the United States are for skin conditions, less than a third of those visits are with dermatologists. While many of these patients would prefer to see a dermatologist for their concerns, they may be unable to access specialist care. The limited supply and urban-focused distribution of dermatologists, reduced acceptance of state-funded insurance plans, and long appointment wait times all pose significant challenges to individuals seeking dermatologic care. Electronic consults (e-consults) have emerged as a promising solution to overcoming these barriers while providing high-quality dermatologic care to a large, diverse patient population. Primary care providers (PCPs) place the e-consult via the electronic health record (EHR) to dermatologists, who respond by answering questions, requesting more information or lesion documentation, and/or scheduling in-person visitations. These consults result in diagnostically acceptable and accurate clinical outcomes while improving access to care, reducing wait times, and enhancing overall quality of care.

Hypothesis: E-consults can be quickly completed by dermatologists and will reduce the required number of face-to-face (FTF) dermatology appointments as well as the appointment wait time for patients for whom a FTF appointment is recommended.

Methods: In this IRB-approved retrospective chart review, we recorded demographic information and clinical outcomes from the EHR for all adult and pediatric patients who received a dermatology e-consult between January 1, 2020, and May 31, 2021. E-consult completion times and appointment wait times following e-consults were calculated. Patient residential zip code data was collected for socioeconomic analysis. Median household income data per zip code was obtained from the United States Census Bureau.

Results: A total of 254 (143 adult and 111 pediatric) dermatology e-consults were placed by PCPs over the 17-month timeframe. Seventy percent of patients resided in a zip code with a mean household income below the North Carolina median household income. Thirty-two percent of e-consult patients were uninsured or had Medicaid, compared with 13% of dermatology FTF patients. The median e-consult completion time was less than one day. Rash was the most common complaint for both adult (51.7%) and pediatric (44.2%) e-consults. The consultant dermatologist recommended FTF appointments for 56 patients (22%). Patients recommended for a FTF visit had a 16.5-day shorter appointment wait time than patients who did not receive a FTF recommendation. Seventy-five percent of e-consult patients avoided a FTF visit, defined as not being seen by dermatology within 90 days of e-consult.

Conclusions: E-consults are effective telehealth modalities that can increase patients' access to dermatologic specialty care while minimizing time from PCP appointment to initial dermatologist recommendation. Patients who are typically underrepresented in dermatology practices may especially benefit from the increased accessibility, and all patients requiring FTF visits may benefit from the reduced appointment wait time. The short turn-around time for e-consults allows PCPs to provide timely diagnoses and management of dermatologic issues. The differences in insurance status between e-consult and FTF patients highlights the potential for e-consults to improve payer mix with in-office billing. Integrating and expanding e-consult programs into everyday practice may extend specialty care to broader populations and help reduce access barriers to dermatologic care.

Source of mentor's funding or other support that funded this research: Department of Dermatology

Poster Title: Role of Dietary Iron in Metformin Action
Student: Madeline Seagle, Class of 2024
Faculty Mentor and Department: Donald McClain, MD, PhD, Internal Medicine, Section of Endocrinology and Metabolism
Funding Source: Endocrinology and Metabolism Training Program Grant 3T32DK007012-42S1

ABSTRACT

Background: Metformin is the preferred initial pharmacologic agent for the treatment of type 2 diabetes mellitus (T2DM). Despite that fact, we still do not fully understand its mechanism of action. This is significant because a complete mechanistic understanding might result in new drugs that better target specific pathways, and/or might result in better and more personalized use of the drug. Dr. Donald McClain's research studies and others have shown that high iron is sufficient to cause diabetes, and diabetes is improved by decreasing iron stores in human states of pathologic iron overload and animal models of dietary iron excess. Evidence has emerged that iron-regulated pathways may also be involved in metformin action. In yeast, a novel pathway analysis identified the iron starvation response as the most significant target of metformin action. Iron is tightly coupled to fuel choice and oxidative capacity, and when iron is deficient, the organisms shift to non-oxidative metabolism, mirroring the hepatic response to metformin.

Hypothesis: Body iron stores are a major factor in determining responsiveness to metformin because the iron starvation response and metformin action share a common pathway.

Methods: Six-week-old C57 male mice were fed a "fast-food" (FF) diet containing either 35mg/kg or 2000mg/kg Fe for 3 months. Treatment group mice were then given 300mg/kg/day of metformin in drinking water and placebo group mice were given regular water for 1 month while remaining on diet. Body weight and 6hr fasting glucose were measured weekly. Mitochondria were isolated from mouse tissue livers and mGPDH activity was measured. The cytosolic fractions of mouse liver tissues were used to measure NADH/NAD+ ratios. Whole cell lysates from mouse liver tissues were used to measure lactate and pyruvate. The results from the two independent assays were then used to determine the lactate:pyruvate ratio. Results of enzymatic activity and metabolite assays were normalized to protein.

Results: While fasting glucose increased to an average of 219.4 mg/dL in the FF-35mg placebo group, FF-35mg metformin group average was only 165.5 mg/dL ($p=0.003$). Additionally, FF-2000mg mice were significantly less responsive to metformin than FF-35mg mice (198.4 mg/dL and 165.5 mg/dL respectively, $p=0.0144$). There was no significant difference of body weight between groups of iron or metformin treatment. Both FF-35mg and FF-2000mg metformin groups had significantly lower mGPDH activity, higher cNADH/NAD+ ratios, and higher lactate:pyruvate ratios as compared to their respective placebo groups. There was no significant effect of iron on mGPDH activity, cNADH/NAD+ ratios, or lactate:pyruvate ratios.

Conclusions: Dietary iron determines metformin responsiveness, with the combination of low iron and metformin providing the most protection against the progression of T2D. Improvement of fasting glucose cannot be explained by body weight. While metformin caused increases in hepatic cNADH/NAD+ and hepatic lactate:pyruvate ratios and decreased mGPDH (a prospective target of metformin) activity, the results do not sufficiently explain the significant difference in metformin responsiveness of FF-35mg mice as compared to FF-2000mg mice. To further elucidate the mechanisms behind the effect of iron on metformin response, we plan to investigate other pathways including OGT/OGA, AMPK, and compensatory mechanisms. These findings will help to understand the interaction between iron and metformin, with hopes of a significant translational impact on how we treat patients with T2DM.

Source of mentor's funding or other support that funded this research: This research was supported by the following grants: NIDDK 1R01 DK081842, NCATS 5UL1 TR001420, VA 2I01 BX001140.

Poster Title: Racial Disparities and Sociodemographic-Based Differences in Rhegmatogenous Retinal Detachment Presentation and Postoperative Outcomes

Student: Pooja Shah, Class of 2022
Faculty Mentor and Department: Margaret A. Greven, MD, Department of Ophthalmology

Funding Source: none

ABSTRACT

Background: Sociodemographic factors such as race, ethnicity, insurance status, and proximity to medical care are associated with disparities in health care quality and disease outcomes. Ethnic minorities experience worse outcomes of eye conditions such as retinal detachment, retinoblastoma, and optic neuritis. The purpose of this study is to compare the presentation of retinal detachments and outcomes of surgical repair based on race.

Hypothesis: Of all patients in our cohort undergoing retinal detachment surgery, racial and ethnic minorities will have poorer outcomes.

Methods: A retrospective chart review was performed of all patients who underwent primary retinal detachment repair at Wake Forest Baptist Health from 2013 to 2021. Baseline characteristics, surgical repair techniques, and final visual acuity outcomes were recorded.

Results: 186 eyes of 181 patients were included. 144 patients identified their race as white and 42 patients identified their race as Black, Asian, American Indian or Alaska Native, Native Hawaiian or Pacific Islander, Latin American or Hispanic, or unspecified non-white. Baseline characteristics including gender and baseline visual acuity were similar between the two groups. Age (p=.0005) and insurance status (p=.011) were statistically significant differences between the two groups. A greater proportion of white patients (15.8%) had operative treatment at ages 70-89 than non-white patients (9.5%). The average age difference between the two groups was 7.1 years. 91% of white patients had health insurance, while 23.8% of non-white patients had health insurance. The proportion of patients who presented with macula-off detachments did not differ by racial identity (p=.241). However, the time from evaluation to surgery was significantly longer in non-white patients (p=.027). Differences between the two groups in duration of visual acuity loss prior to presentation, visual outcomes in both macula-on and macula-off detachments, and total duration of follow up were not statistically significant. Average final visual acuity for all macula-on retinal detachments was logmar 0.375 (Snellen 20/47), logmar 0.38 (Snellen 20/48) for the group identifying as white, and logmar 0.35 (Snellen 20/45) for the group identifying as non-white. Average final visual acuity was logmar 0.6597 (Snellen 20/91) for all in macula-off retinal detachments, logmar 0.70 (Snellen 20/101) for the group identifying as white, and logmar 0.54 (Snellen 20/69) for the group identifying as non-white. Single operation success rate did not differ between the two groups.

Conclusions: Although the average final visual acuity did not differ between white and non-white patients undergoing retinal detachment surgical repair, non-white patients who underwent operative management were of younger age, more likely to be un-insured, less likely to have cataract surgery before and after repair, and experience longer waiting times for surgical treatment following clinical evaluation. These findings may help increase physician awareness of barriers to ophthalmic surgical care associated with race.

Poster Title: Resting-State Connectivity Between the Insula and the Ventromedial Prefrontal Cortex Is Sensitive to Injury and Recovery after Sport-Related Concussion

Student: Christopher A. Sheridan, CSCS
Faculty Mentor and Department: Christopher T. Whitlow, MD, PhD, MHA, Department of Radiology; Meeryo C. Choe, MD, UCLA DGSoM Department of Pediatrics, Division of Neurology
Funding Source: The Harry O. Parker Neuroscience Research Fund

ABSTRACT

Background: Autonomic, affective, and nociceptive symptoms are common after sport-related concussion (SRC). These symptom domains have well-established relationships with structures of the central autonomic network (CAN) – neural circuitry involving limbic regions of the prefrontal, insular, cingulate, and temporal cortices and their subcortical targets in the striatum, thalamus, hypothalamus, and brainstem. We have found previously that concussed athletes showed acutely increased connectivity between networks associated with the medial and ventrolateral amygdala. Heart-rate variability was associated with connectivity trajectory over time, and persistently elevated connectivity 3 months post injury was correlated with symptom persistence. Symptom persistence was strongly positively correlated with chronic hyperconnectivity between the medial amygdala and voxels in the ventromedial prefrontal cortex/ subgenual anterior cingulate cortex (vmPFC/sgACC). We hypothesized that other critical hubs of the CAN, especially the insula, might also display hyperconnectivity with the vmPFC/sgACC, supporting our working theory that the vmPFC is a promising target for therapeutic neuromodulation.

Hypothesis: Seed-to-voxel analysis of the left and right insula will reveal a general pattern acute hyperconnectivity to structures in the vmPFC and sgACC followed by a decline to control-level connectivity over time.

Methods: We computed whole-brain seed-to-voxel connectivity maps from BOLD rsfMRI acquisitions at three time points after a sport-related concussion (T1=1-4 days, T2=10-14 days, T3=2-3 months) in collegiate athletes (N=31; female=14) and for two groups of healthy age- and gender-matched controls participating in the same sport (N=36, female=17) and in a non-contact sport (N=37; female=15). Insula seeds for cluster analysis were selected from the Brainnetome 264 Atlas. Voxel threshold was set at an uncorrected $p<0.001$ (two-sided), and cluster threshold was set at a cluster-size false discover rate (FDR) corrected p-FDR<0.001 ($F[4,206]>4.81$; $k\geq153$). Two-way repeated measures ANOVA was used to assess significant differences across group and time for each cluster identified.

Results: Eight of 12 insular seed regions contained at least one cluster of voxels in the vmPFC/sgACC which differed significantly in connectivity across group and time. Nine clusters from the following seeds were identified: L hypergranular $F(2,31)=8.39$, p-FDR<0.001; L ventral agranular $F(2,31)=11.55$, p-FDR<0.001; R ventral agranular $F(2,31)=7.58$, p-FDR<0.001; L dorsal agranular $F(2,31)=10.44$, p-FDR<0.001; L ventral granular $F(2,31)=25.45$, p-FDR<0.001; R ventral granular $F(2,31)=11.08$, p-FDR<0.001; L dorsal granular $F(2,31)=13.95$, p-FDR<0.001 and $F(2,31)=8.37$, p-FDR<0.001; L dorsal dysgranular $F(2,31)=7.74$, p-FDR<0.001. A parametric decrease in connectivity within the mTBI group over time was observed for all clusters except the smaller cluster associated with the L dorsal granular insula. For all clusters, connectivity was at or below control-level by the chronic time point.

Conclusions: Taken together with our previous work, these findings suggest that acute hyperconnectivity between important hubs of the central autonomic network (i.e., the amygdala and the insula) and the vmPFC may be key component of early response to SRC and that normalizing connectivity to vmPFC regions over time may represent a key marker of physiological recovery.

Source of mentor's funding or other support that funded this research: NIH SBIR R44NS092209; the UCLA Steve Tisch BrainSPORT Program; UCLA Easton Clinic for Brain Health; UCLA Brain Injury Research Center; and Stanley and Patti Silver.

Poster Title: Ethnic and Racial Breakdown of Patients with Staphylococcal Scalded Skin Syndrome
Student: Stephanie Snyder, Class of 2024
Faculty Mentor and Department: Lindsay Strowd, MD, Department of Dermatology
Funding Source: Department of Plastic Surgery

ABSTRACT

Background: Staphylococcal scalded skin syndrome (SSSS), also known as Ritter's Disease, is a common dermatological condition in pediatric populations. It is caused by exfoliative toxins A and B released by the bacteria *Staphylococus aureus.* Following a recent infection such as otitis media, upper respiratory infection or infection of the umbilical stump, patients present appearing generally ill. A tender rash develops over the next 1-2 days, followed by blister formation. Fragile bullae form initially on the central face, neck, axillae and groin, with epidermal detachment. The toxins produced by *S. aureus* breakdown desmosomes in the epidermis, leading to blisters. Pediatric patients with SSSS are at risk for secondary infections, but typically progress well with supportive care and the risk of mortality is low.

Hypothesis: Limited information is available regarding the specific racial breakdown of patients with SSSS. One study focused on the epidemiology of SSSS in children and showed an inverse relationship between risk of SSSS and black race. Another study, focusing on the epidemiology of SSSS in adults, showed different results that suggested an increased risk of SSSS with black race. These studies relied on ICD 9 diagnosis codes, indicating the diagnosis was not confirmed by dermatology. More information is needed regarding the prevalence of SSSS in skin of color. Furthermore, the use of ICD-10 codes will provide more accurate data regarding the prevalence of SSSS.

Methods: A retrospective chart review was performed using the electronic medical record. Any patient regardless of sex, age, ethnicity diagnosed with SSSS between 10/1/2010 and 5/1/2021 at select academic medical centers, who also had a formal inpatient dermatology consultation or virtual consultation with clinical images, was considered eligible for the study. The electronic medical records were evaluated for age at admission, sex, race, ethnicity, need for inpatient hospitalization, length of hospital stay, culture data, choice of initial antibiotic, choice of final antibiotic, length of antibiotic use, wound care, and post-disease sequelae.

Results: Forty-four medical charts were reviewed. Twenty males and 24 females were recruited. The average age was 6.1 years. The ethnic/racial background of the group included 26 (59%) Caucasian, 13 (30%) African-American, 2 (5%) Hispanic, 1 (2%) Native American/American Indian, and 2 (4%) did not have a reported race. Forty-two individuals required inpatient hospital stay, and the average length of stay was 4.7 days. The average hospital stay length for Caucasian patients was 5 days and for non-white patients was 3.6 days ($p>0.05$). Fifteen patients had positive culture results for *S. aureus*, 4 were positive for coagulase negative Staph, 1 for *Enterococcus faecium,* 1 for *Corynebacterium,* 16 had no growth, and for 6 patients, cultures were not completed. The most commonly prescribed initial and final antibiotic was clindamycin. The average length of antibiotic course was 10.2 days. The most commonly prescribed wound care was Vaseline and Bacitracin ointment. The most common post-disease sequalae was post-inflammatory hyperpigmentation but was present in only 2 patients. Atopic dermatitis was the most common co-morbid condition with 7 patients having a prior diagnosis (5 African America, 2 Caucasian).

Conclusions: Prior studies focused on the epidemiological and racial breakdown of patients with SSSS used ICD-9 codes and national databases to observe the differences between cases of SSSS. These cases were not confirmed by dermatology, which increased the potential for error. Our study aimed to investigate the racial breakdown of dermatology confirmed cases of SSSS using updated ICD-10 codes. The majority of patients seen for SSSS in the inpatient setting were Caucasian, but African American patients were overrepresented in the study compared to the United States population (30% vs. 13%). Hispanic patients were underrepresented compared to the United States population (5% vs. 20%). The importance of using validated cases when publishing demographic results is imperative to minimize potentially inaccurate findings.

Poster Title: Clinical Characteristics Associated with Acute Pulmonary Emboli in SARS-CoV-2 Positive Patients in the Emergency Department Setting

Student: Kevin Alexander Soltany, Class of 2024
Faculty Mentor and Department: Iltifat Husain, MD, MPH, Emergency Medicine

Funding Source: Department of Emergency Medicine, Wake Forest School of Medicine

ABSTRACT

Background: There is growing research documenting the incidence of acute pulmonary embolism (PE) in hospitalized patients with COVID-19, yet few published studies investigate the association between SARS-CoV-2 infection and acute PE upon initial presentation to the emergency department (ED). This study aims to compare the diagnostic yield of CTPA for PE in COVID-19 ED patients, review traditional ED algorithms for suspected PE, and examine how clinical characteristics can be utilized to improve CTPA yield for PE.

Hypothesis: (1) The diagnostic yield of CTPA for evaluation of PE in the setting of COVID-19 patients presenting to the ED will be significantly higher than that of a similar cohort of ED patients with suspicion of PE one year prior. (2) Patients in the study cohort with a diagnosis of PE on CTPA will have significantly higher D-dimer levels, average ages, BMIs, and heart rates when compared to those with a negative CTPA study.

Methods: This is a multicenter retrospective chart review of pediatric and adult patients who arrived to any of the five Wake Forest Baptist Health EDs from 3/17/2020-1/31/2021. The study cohort included patients with a positive COVID-19 test or a COVID-related diagnosis and a CTPA ordered while in the ED. The overall CTPA yield for PE within this study cohort was calculated and compared to that of a control cohort of patients who presented to the ED during a period one year prior to the study cohort and had a CTPA study ordered. We compared demographics and clinical characteristics of patients within the study cohort.

Results: 425 patients were identified by discharge diagnosis as having undergone evaluation for PE in the setting of suspected COVID-19 infection during the study period. Of this cohort, 370 patients (87.1%) tested positive for SARS-CoV-2 infection and underwent CTPA for suspected PE. 23 patients (6.5%) were ultimately found to have a PE on CTPA. Within the study cohort, the average heart rate was significantly higher in patients who were found to have PE (105 ± 14 compared to 97 ± 19, $p = 0.03$), while both average age and BMI were not significantly different ($p = 0.13$ and 0.76, respectively). Of those who underwent D-dimer testing, abnormal D-dimer had a sensitivity of 86% (CI 57-89%) and specificity of 14% (CI 9-19%) for diagnosis of PE. No patients with both a D-Dimer less than 1500 µg/L and a heart rate less than 90 beats per minute were found to have PE. When compared to the control cohort, ED CTPA yield was substantially lower in the study cohort (12.2% vs 6.5%).

Conclusions: In the ED, CTPA studies in patients with COVID-19 have lower yield when compared to that of ED CTPA studies in control patients. Traditional strategies for PE diagnosis may be clinically appropriate during the COVID-19 pandemic, as there was no association between PE diagnosis and COVID-19 status. In the setting of COVID-19, utilizing D-Dimer and heart rate cutoffs of 1500 µg/L and 90 beats per minute would have yielded a 28.5% reduction in CTPA study orders.

Poster Title: Dual Plating of Periprosthetic Distal Femur Fractures Leads to Near Anatomic Coronal Plane

Student: Gabriel Sowards, Class of 2024
Faculty Mentor and Department: Eben Carroll, MD, Orthopaedics

Funding Source: Wake Forest Institute of Regenerative Medicine

ABSTRACT

Background: The incidence of periprosthetic distal femur fractures is rapidly rising, and this trend is expected to continue as the number of total knee arthroplasties preformed increases with the aging population. These fractures are challenging to manage for orthopaedic surgeons as they are typically the result of low energy mechanisms in elderly patients. These patients are more likely to have poor bone quality, limited bone stock, and increased comorbidities. Current fixation strategies for such fractures include lateral locked plating, intramedullary nailing, and dual implants with both lateral locked plating and intramedullary nail or dual medial and lateral locked plating. Lateral locked plating has produced some success in treating these fractures but is less than ideal due to increased non-union and complication rates. Intramedullary nailing allows for the patient to be immediately weight bearing but has been shown to result in increased rates of malunion. These shortfalls make dual implantation an attractive choice for many surgeons.

Hypothesis: We hypothesize that the dual plating method described above leads to high rate of union, low complication and malunion rates, and near anatomic coronal plane reduction.

Methods: We conducted a retrospective review of all patients who underwent dual plate fixation of a periprosthetic femur fracture at a Level I tertiary care trauma center from 2018-2020. The primary outcomes evaluated were fracture union, complications, revision surgery, sagittal plane alignment and coronal plane alignment.

Results: Of the 30 patients that underwent dual plating for a periprosthetic distal femur fracture between 2018 and 2020, nine patients were excluded from analysis due to lack of follow up. The average age of the remaining 21 patients was 81.0 years, 76.2% of whom are female. Every patient analyzed (100%) achieved union at last follow up. A total of two patients (9.5%) experienced complications. One patient (4.8%) required reoperation for the removal of a prominent screw. The other complication was an instance of wound dehiscence that resolved with local wound care. The average anatomic lateral distal femoral angle was 83.2 degrees.

Conclusions: Dual plating of periprosthetic distal femur fractures confers the patient with advantages like immediate weight bearing status, near anatomic alignment, high union rates, and low incidence of complication. This complements biomechanical studies showing that dual plating constructs provide stronger fixation than other dual implant constructs. This combination makes dual plating an appealing choice in the treatment of periprosthetic distal femur fractures. The dual plating method also obviates the need to determine the compatibility of a given knee prosthetic with a properly sized retrograde intramedullary nail. As the number of distal periprosthetic fractures increases with time, orthopaedic surgeons will rely more heavily on dual plating to obtain stronger mechanical fixation and proper anatomic coronal plane reduction.

Poster Title: Case Series: Treating Fractures with Revision Total Knee
Student: Emily Sparks, Class of 2024
Faculty Mentor and Department: John Shields, MD; Department of Orthopaedic Surgery
Funding Source: Department of Medical Education, Wake Forest School of Medicine

ABSTRACT

Background: Total knee arthroplasty (TKA) is one of the most common and successful procedures done today. Excellent functional outcomes are seen with patients undergoing TKA for arthritis, with the greatest improvement found in patients with severe disease. Periprosthetic fractures occur around total knee components, most commonly the supracondylar femur with a rate of 0.3-2.5%, with the tibia being less common. The primary goal of periprosthetic management is to allow patients to regain function and have early mobilization to assist the healing process. When such fractures occur in the absence of total knee replacements, management is much more straightforward, however severe ipsilateral arthritis may impede early mobilization and fracture healing. Fractures are managed by conservative treatment, intramedullary nailing (IMN), and open reduction and internal fixation (ORIF). Patients who have long bone fractures along with arthritis in their knee present a difficult problem as arthritic pain limits the ability of a patient to bear weight, which hampers their ability to heal the fracture. It is estimated that in 1.9% to 10% of all long bone fractures, delayed unions and non-unions occur for a variety of reasons. Mechanical load is considered one of the most important factors in regulating bone mass. TKA can be a mechanical solution to a biological problem, allowing fixing both long bone fractures and correcting bone deformities due to fracture. Additionally, evidence has shown that intervention with TKA is effective and successful for reducing pain from arthritis and improving physical function.

Hypothesis: Long bone fractures are a common orthopaedic injury. When presenting in conjunction with ipsilateral knee osteoarthritis, rehabilitation and bone healing can be impaired secondary to limited weight bearing. One can manage both pathologies with long stemmed revision total knee components. The average improvement in our knee outcome scores via pre-operative Knee Injury and Osteoarthritis Outcome Score for Joint Replacement (KOOS, JR.) and one-year post-operative KOOS, JR. is 44.37. We present four cases as a proposal of a novel way to treat these injuries in an effective way.

Methods: retrospective case-series

Results: When a patient presents with a long bone injury, there is a focus on managing the fracture. When the patient's other musculoskeletal co-morbidities impede early mobilization, fracture healing can be impacted. One should consider revision TKA with long stemmed components for management of ipsilateral knee arthritis which can inhibit early weight bearing, and simultaneously manage the long bone fracture.

Patient outcomes were reported pre-operatively and post-operative via the Knee Injury and Osteoarthritis Outcome Score for Joint Replacement (KOOS, JR) survey seen in Table 1.

Patient outcomes showed excellent improvement with an average difference in KOOS, JR. score of 44.37 one year post-operatively versus pre-operatively. All four patients underwent total knee arthroplasty with long stemmed components to management their knee osteoarthritis and simultaneous long bone pathology. For all patients, their anteroposterior and lateral radiographs demonstrated well fixed and aligned femoral and tibial components, along with healed fractures. On physical exam, all patients had improved satisfaction and range of motion at 1-year follow up.

Conclusions: Ipsilateral knee osteoarthritis with concurrent long bone fractures is a complicated problem that presents a challenge to surgical management. Here we present case examples of a novel way to treat both pathologies simultaneously with TKA with long stem prosthetic for fracture fixation. Treating patients in such a way improves patient outcomes, mobilization, and system cost.

Poster Title: Do vascular risk factors falsely elevate ankle-brachial index measurements in the evaluation of tibial plateau fractures concerning for vascular injury?

Student: Lauren Strickland, Class of 2023
Faculty Mentor and Department: Nicholas Andring, MD, Orthopaedic Surgery
Funding Source: none

ABSTRACT

Background: The ankle brachial index (ABI) is a useful tool in detection of lower extremity vascular injury. However, diabetes mellitus (DM), chronic kidney disease (CKD), and peripheral vascular disease (PVD) may effect extremity perfusion leading to possible false elevation of ABI value. If true in trauma patients this can affect initial evaluation, diagnostics, and management. We therefore explored mean ABI values in tibial plateau fractures of patients with vascular risk factors to help determine whether there is a difference.

Hypothesis: We hypothesize that the ankle brachial index measurements used in evaluation of tibial plateau fractures concerning for vascular injury will be falsely elevated in patients with vascular risk factors in comparison to those without risk factors.

Methods: This is a retrospective chart review of patients sustaining tibial plateau fractures with a specific ABI value recorded in the medical record at a Level 1 academic trauma center, Wake Forest Baptist Medical Center. Patients were identified as having either vascular risk factors or not and data analysis was performed to determine if their ABI differed and whether they were more likely to have vascular injury.

Results: 282 tibial plateau injuries with specific ABI values were identified, 46 of which carried the risk factors in question. The average risk factor group ABI was 0.95 +/- 0.15 versus those without risk factors 1.0 +/1 0.15 (p=0.057). No patient with risk factors required a vascular intervention or four-compartment fasciotomy.

Conclusions: This study shows no statistical significant between the presenting ABI of patients with risk factors such as DM, CKD or PVD and those without those risk factors who sustained tibial plateau fractures. Therefore, in general the ABI still holds as a useful screening tool for evaluation of vascular insult in the setting of acute lower extremity trauma.

Poster Title: Comparison of Different Methodologies for Sutureless Sclerotomy Wound Closure In a Porcine Animal Model

Student: Mallory Suarez, Class of 2024
Faculty Mentor and Department: Bartlett Hayes, MD, Department of Ophthalmology

Funding Source: Department of Plastic and Reconstructive Surgery, Wake Forest School of Medicine

ABSTRACT

Background: Pars plana vitrectomies are performed using 20-, 23-, 25-, or 27-gauge instruments. Although the incisions made in pars plana vitrectomies can be constructed to be self-sealing, current methods of wound closure, including using sutures and ocular adhesives, introduce the potential for complications including incomplete sclerectomy closure, hypotony, wound leakage, endophthalmitis, ocular irritation, and granulomatous inflammation, any of which could contribute to adverse post-operative outcomes.

Hypothesis: Platelet rich plasma, whole blood, and polymerized ReSure Sealant could be utilized for clot preparation and delivery into sclerotomy incisions for sclerotomy wound closure in 23-gauge pars plana vitrectomy.

Methods: Three enucleated cadaveric porcine eyes were utilized to examine the use of different materials for sclerotomy closure. Manual vitrectomy of the porcine eye was performed, and a 23-gauge trocar was used to create a scleral wound which leaked saline infusion fluid. For PRP clot formation, 200µL of platelet rich plasma was mixed with 100µl of thrombin. In one trial, A 2mm dermatological hole punch was utilized to obtain a molded piece of clotted plasma. A pair of 23-gauge Grieshaber MAXGrip Forceps were used to deliver the clot through the 23-gauge trocar to plug the scleral wound as the trocar was removed. In another trial, we removed the 23-gauge trocar and placed a 2-20µl pipette tip up against the scleral wound to deliver the clotted plasma into the wound. We created a plunger to push the clot through the micropipette tip and into the wound by using a 2 mm diameter piece of foam held with a pair of 23-gauge Grieshaber MAXGrip Forceps. For clotted blood preparation, we utilized thrombin as a clot activator. As soon as thrombin was added to a vial of whole blood, the mixture was aspirated into 16-,18-, and 20-gauge angiocath tips on 1ml Luer-Lok syringes. The IV angiocath catheter tips were cut into 6-8mm cylindrical pieces, creating different sized cylindrical clots. The cylindrical piece of the 20G angiocath tip was aligned with the opening of the 23- gauge trocar and a 24-gauge IV angiocath was used to push the clot out through the 23-gauge trocar as it was being removed and into the scleral wound. We utilized this similar methodology of delivery to attempt to deliver polymerized ReSure Sealant through the 23-gauge trocar and into the scleral wound.

Results: In this study, the use of clotted platelet rich plasma was proven to be the most effective for scleral wound closure. In one trial utilizing platelet rich plasma, a clot was successfully delivered through a 2-20µl pipette tip into the eye, using a pair of 23G Grieshaber MAXGrip Forceps holding a 2mm diameter piece of foam as a plunger to push the clot into the sclerotomy. The effectiveness of the clot was measured using the Seidel Test at increasing intraocular pressure to evaluate for wound leakage. The clot remained stabilized without ocular wound leakage up to a pressure of 60 mmHg. In one trial with clotted whole blood, a clot prepared in a 20G IV angiocath tip was successfully delivered through the 23G trocar, plugging the scleral wound of the trocar. The Seidel test was performed and confirmed that there was no ocular wound leakage at baseline. Although the clot was successfully delivered, before it could be tested against an increased intraocular pressure, it was dislodged during the performance of the Seidel test.

Conclusions: This study was a proof of concept that provided preliminary evidence that clotted platelet rich plasma and clotted whole blood could be feasible options for the future of scleral wound closure. Further well controlled, randomized, and live animal studies will be required to determine the efficacy of this as an adjunct or alternative to other methods of treatment for scleral wound closure in pars plana vitrectomy.

Poster Title: The Effects of Reframing: Interventional Resilience Training on Inpatient Physical Therapy

Student: Davis Temple, Class of 2024
Faculty Mentor and Department: David Popoli, MD, Orthopaedics and Rehab, pediatrics

Funding Source: Department of Student Affairs, Wake Forest School of Medicine

ABSTRACT

Background: Resiliency is the capacity to cope effectively with a difficult situation and maintain a healthy disposition in the face of disaster, pain, or adversity. Previous research on the topic has indicated that resilience is not explicitly an inherent quality, but it also can be learned. In respect to patient care, previous work in resilience has ascertained a correlation between this inherent, preexisting resilience and patient psychological wellbeing or health outcomes. Additional studies that have been conducted specifically to study resilience interventions and have found a positive correlation with improved health outcomes measured by improved quality of life, decreased anxiety, and decreased perceived stress. These interventional studies are heavily concentrated in outpatient settings and in the fields of adult and pediatric oncology.

Hypothesis: The hypothesis for this project is that the implementation of interventional resilience training during an inpatient stay will improve resilience (measured by the Brief Resilience Scale and Brief Resilient Coping Score), mental health (measured by General Anxiety Disorder-7, Perceived Stress Scale, and Patient Health Questionnaire-9), and rehabilitation outcomes (measured by Activity Measure for Post-Acute Care, Basic Mobility (AM-PAC BM) and Daily Activity (AM-PAC DA)) in patients undergoing inpatient physical rehabilitation.

Methods: To assess the effectiveness of the resilience course, the project will use a two-study design: a before-and-after study to examine the effects of training on mental health, and a case control study to examine the impact of the course on physical rehabilitation. Patients who choose to participate in the study will have their rehabilitation metrics compared to other patients with a similar injury.

Results: Data collection is ongoing.

Conclusions: Data collection is ongoing.

Source of mentor's funding or other support that funded this research: Department of Orthopaedics and Rehabilitation

Poster Title: Outcomes of Patients with Oral Cavity Malignancies Invading the Skin
Student: Sharon Thomson, Class of 2022
Faculty Mentor and Department: J. Dale Browne, MD, Otolaryngology-Head & Neck Surgery
Funding Source: none

ABSTRACT

Background: Squamous cell carcinoma (SCC) of the oral cavity affects approximately 34,000 individuals, usually age > 50, in the United States every year.[1] Tobacco smoking and alcohol use are key risk factors. Previous studies have established that perineural invasion (PNI) of small nerves is associated with an increased risk of local recurrence and cervical metastasis in patients with SCC of the oral cavity, oropharynx and hypopharynx, or larynx.[2] Less commonly, advanced oral cancer can extend into neighboring soft tissues and invade the overlying skin; this finding has demonstrated to be a negative prognostic factor by staging criteria. Few studies have investigated the effects of age, insurance coverage, presence of comorbidities, lymphovascular invasion (LVI), 30-day hospital readmission, and completion of prescribed therapy, on outcomes of those patients with advanced oral cavity malignancies that invade the skin.

Hypothesis: We hypothesize that demographic factors such as advanced age and lack of insurance coverage would contribute to an increase in patient mortality in this subset of patients with skin invasion. We predict that clinical features such as tobacco use, alcohol use, presence of medical comorbidities, length of hospital stay, 30-day readmission, and incomplete adjuvant therapy would contribute to worse outcomes. Finally, we speculate that pathologic features such as PNI and LVI would be indicators of poor patient prognosis.

Methods: A retrospective case series of patients surgically treated for head and neck cancers invading the skin was conducted. Inclusion criteria of subjects was as follows: 1) > 18 years of age and 2) received surgical treatment for oral cavity cancer invading the skin at Atrium Health Wake Forest Baptist from 2012 – 2021. Upon review of 1,050 patient records, 17 patients met the inclusion criteria. Odds ratio analysis was used to evaluate the effect of age, insurance coverage, tobacco use, alcohol use, comorbidities (diabetes mellitus (DM), hypertension), PNI, LVI, length of hospital stay, 30-day hospital readmission, and incomplete treatment regimen on increased risk of patient mortality.

Results: Seventeen patients met inclusion criteria for this study. The median age of patients was 61 and 12 (70.5%) patients identified as male. In this sample, 9 patients reported using private insurance, 6 patients had Medicare/Medicaid coverage, and 2 patients had no insurance coverage. When compared to patients with private insurance, those without insurance were at increased risk of death ($p=0.026$). Similarly, when compared to patients covered with Medicare or Medicaid, those with no insurance were at higher risk of death ($p=0.0079$). Four patients reported a comorbid diagnosis with DM; this comorbidity was seen to be associated with worse outcomes ($p=0.02$). Furthermore, 30-day hospital readmission was found to be a significant predictor of poor prognosis ($p=0.01$). Although not statistically significant, it is noteworthy that there was a 10% increase in risk for every 5 years of age ($p=0.38$) and LVI ($p=0.099$) was also associated with increased risk of death.

Conclusions: These study findings, specifically the lack of insurance coverage, presence of DM, and 30-day hospital readmission, were found to have a significant effect on patient mortality. While the present study was limited by sample size, these findings suggest the importance of accounting for social determinants of health such as lack of insurance coverage and systemic factors such as prevention of hospital readmission in promotion of patient health and disease-free periods.

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Poster Title: Comparison of Visual Outcome After Hyperopic LASIK Using a Wavefront-Optimized Platform Versus Other Excimer Lasers in the Past Two Decades

Student: Mitchell Tingey, Class of 2024
Faculty Mentor and Department: Majid Moshirfar, MD, Ophthalmology, University of Utah

Funding Source: Unrestricted Grant from Research to Prevent Blindness (RPB)

ABSTRACT

Background: Laser-assisted in-situ keratomileusis (LASIK) for the correction of hyperopia and hyperopic astigmatism is challenging and has been less studied than for the correction of myopia and myopic astigmatism. The aim of this study was to analyze the refractive outcomes of LASIK in hyperopia and hyperopic astigmatic eyes using a wave-front optimized laser platform (the Allegretto EX500 laser) and perform a historical comparison with other excimer lasers within the past two decades.

Hypothesis: We hypothesized that there have been significant improvements in LASIK treatment for hyperopia and hyperopic astigmatism in the past two decades, in part due to wave-front optimized laser platforms.

Methods: A one-center (Tertiary Refractive Center, Draper, Utah), retrospective, non-comparative study was conducted on 379 eyes treated with LASIK for hyperopia and hyperopic astigmatism. The data retrieved on these eyes were analyzed using uncorrected distance visual acuity (UDVA), corrected distance visual acuity (CDVA), and spherical equivalents. A literature search of excimer platforms in use in the past 20 years and a comparison of US Federal Drug Administration-approved platforms for hyperopia were performed.

Results: At 3 and 12 months postoperatively, 142 (66%) and 81 (69%) eyes had a UDVA of 20/20 or better and 207 (96%) and 114 (97%) eyes had a UDVA of 20/40 or better, respectively. The mean refractive spherical equivalent was - 0.52 ± 0.78 D at 3 months and - 0.46 ± 0.79 D at 12 months. At 12 months, 181 (96%) eyes achieved a spherical equivalent within ± 1.00 D of the intended target. Studies published before 2005 reported lower rates of UDVA 20/20 or better (32%) compared to those published after (68%); however, this discrepancy was less evident for UDVA 20/40 or better. A similar trend towards improved accuracy was noted in the literature with postoperative manifest refractive spherical equivalent within ± 0.50 D before and after 2005.

Conclusions: There has been significant improvement in safety, efficacy, stability, and accuracy of LASIK treatment for hyperopia and hyperopic astigmatism within the past two decades. Newer excimer lasers meet industry standards and in particular, the Allegretto EX500 used in this study exceeded industry standards.

Poster Title: Preterm Birth and its Association with Altered Renal Sodium Handling in Response to Mental Stress in Young Adults

Student: Nicholas Tully, Class of 2024
Faculty Mentor and Department: Andrew South, MD, MS

Funding Source: National Institute of Diabetes and Digestive and Kidney Diseases, T35 Training Grant DK007400

ABSTRACT

Background: Early-life programming risk factors such as preterm birth and very low birth weight (VLBW; <1500 g) contribute to later hypertension development, but the underlying mechanisms are not fully developed. Experimental data suggest that altered pressure natriuresis (defined as an increase in renal perfusion pressure to promote sodium excretion) and renal sodium handling may be important contributing mechanisms. Adults with primary hypertension exhibit blunted pressure natriuresis in response to sympathetic arousal, but this has not been described in adults born preterm. We investigated renal sodium excretion relative to the change in blood pressure (BP) in response to stress in a cohort of young adults born preterm with VLBW compared to term-born controls with normal birth weight.

Hypothesis: We hypothesized that young adults born preterm will have a blunted pressure natriuresis response to mental stress compared to those born term.

Methods: In this long-term prospective cohort of 161 individuals aged 18–23 years, 129 (80%) born preterm and 32 (20%) born term, we measured spot urine sodium/creatinine before and after a 30-min mental stress test and non-invasive continuous BP every 2 min prior to and during the stress test. We defined our outcome, pressure natriuresis, urine sodium corrected for creatinine relative to the change in mean arterial pressure (MAP) before and after the stress test, using three estimations: (i) relative change in sodium/creatinine per relative change in MAP; (ii) percent change in sodium/creatinine per percent change in MAP; and (iii) sodium excretion rate per change in MAP. We further defined blunted response as ≤0 for each of these estimations. We used generalized linear models to estimate the association between prematurity and the outcome and tested for effect modification by sex by including an interaction term in each model and stratifying by sex.

Results: The mean age of study participants was 19.8 years (SD 0.9) of whom 56% were female. On unadjusted analyses, the preterm-term difference in the relative change in sodium/creatinine per change in MAP was β=0.11 per mmHg (95% CI: -0.06 to 0.27). When defined as the percent change in urine sodium/creatinine per percent change in MAP, the difference in pressure natriuresis between the two groups was β=42.4% (4.7 to 80.2). Lastly, the difference in sodium excretion rate relative to change in MAP was β=0.08 min/mmHg (-0.03 to 0.18). Across the three measures of pressure natriuresis, the relative risk of blunted response was 1.2 (0.68 to 2.1). Upon assessment of effect modification by sex, percent change in urine sodium/creatinine per percent change in MAP was β=67.6% (-5.78 to 141.0) in males and β=18.9% (-13.8 to 51.7) in females, but all interaction terms were not statistically significant.

Conclusions: Except for percent change in urine sodium/creatinine relative to percent change in MAP, we did not observe a difference in pressure natriuresis in response to mental stress between those born preterm and term. Through preliminary stratified analyses, we observed no evidence of effect modification by sex. Ongoing analyses include investigating other measures of pressure natriuresis and adjusted multivariable models.

Source of mentor's funding or other support that funded this research: NIDDK T35DK007400; NHLBI K23HL148394, L40HL148910, and R01HL146818; NICHD P01HD047584 and P01HD084227; NCRR M01RR07122 to the Clinical Research Unit of Wake Forest Baptist Medical Center; NCATS UL1TR001420 to the Wake Forest Clinical and Translational Science Award, American Heart Association (14GRNT20480131 and 18TPA34170522), and the Forsyth Medical Center and Wake Forest School of Medicine Department of Pediatrics research funds.

Poster Title: Weight and Nutritional Correlates with Bacterial Vaginosis – A Pilot Study
Student: Karolina Wadolowska, MS, Class of 2022
Faculty Mentor and Department: Candice J. McNeil, MD, MPH, Department of Medicine
Research Team: Jamy Ard, MD, Iqra Munawar, MS, Department of Medicine
Funding Source: This study is not funded. Specimens were processed courtesy of the Schwebke Lab at University of Alabama Birmingham.

ABSTRACT

Background: Bacterial vaginosis (BV), a condition characterized by the disruption of the normal vaginal microbiota, leads to increased vaginal discharge and malodor in approximately half of the women affected and is the most common cause of vaginal symptoms among women. The prevalence of BV among women age 14-49 in the United States is estimated to be 21.2 million (29.2%).[1] This condition places a significant burden on the healthcare system, resulting in millions of health care visits annually in the United States alone.[2] Furthermore, BV has been linked to numerous other adverse health outcomes, including serving as an independent risk factor for the acquisition of HIV and other sexually transmitted infections (STI) as well as the development of pelvic inflammatory disease (PID) which is associated with serious long term sequelae including infertility and pelvic pain.[3] BV has also been associated with increased risk of adverse events during pregnancy including premature rupture of membranes, intraamniotic infection, low birth weight and preterm birth.[4] Studies have shown that certain alterations in the gut microbiome are associated with obesity and that changes in gut microflora occur with weight loss and certain dietary changes such as reduced carbohydrate intake and increased protein intake. [6] However, the impact of diet and weight on the vaginal microbiome and BV has not yet been explored.

Hypothesis: Diet and weight will negatively influence the vaginal microbiome and increase the likelihood of BV.

Methods: Female patients entering Wake Forest Baptist Health (WFBH) Weight Management Program (WMP) between 2016 to 2019 were invited to participate in a survey with questions addressing demographic information and various behavioral characteristics that may influence rates of BV. Participants also provided a one-time self-obtained vaginal swab that was analyzed for presence of BV using the Nugent gram stain. A chart review was simultaneously conducted to collect participants' past medical history, weight, nutrition information, and laboratory values to include HbA1c, lipid profile, and C-reactive protein (CRP). Information was entered into RedCap and subsequently analyzed.

Results: 31 participants were recruited into the study, with a participant median age of 45. A majority of participants self-identified as White Non-Hispanic/Latino (n=24, 82.8%) and Black or African American (n=5, 17.2%). 37.9% (n=11) of participants were post-menopausal, while 62.1% (n=18) were pre-menopausal at time of survey administration. A majority of participants indicated that they have never been diagnosed with vaginosis (n=18, 64.3%), followed by those (n=8, 28.6%) indicating that they have been diagnosed, while two (7.1%) participants were unsure. In contrast, 23 (82.1%) participants indicated that they had been previously diagnosed with vaginal yeast infection, while 5 (17.9%) participants indicated that they have not. Participants reported treatment for a vaginal yeast infection an average of six times in their life. The most commonly observed concurrent medical conditions in study participants included hypertension (58.1%), dyslipidemia (45.2%), diabetes (42.0%), and obstructive sleep apnea (29.0%). Of 20 specimens where Nugent gram stain was available, one was indicative, 15 negative, and four indeterminate samples for BV, respectively.

Conclusions: The most common vaginal complaint on history was vaginal yeast infection. Most women had never experienced bacterial vaginosis and few had evidence of vaginal dysbiosis as represented by an abnormal Nugent score. Further studies are needed to explore the influence of the gut on the vaginal microbiome.

Poster Title: Sex differences in thoracic injury patterns and mechanisms in seriously injured motor vehicle crash occupants

Student: Gabrielle Walsh, Class of 2024
Faculty Mentor and Department: Ashley Weaver, PhD, Biomedical Engineering
Funding Source: Department of Medical Education, Wake Forest School of Medicine

ABSTRACT

Background: Vehicle safety technology has improved significantly over the past several decades. Thanks to advances such as the 3-point seat belt system in combination with airbags, injuries and fatalities in motor vehicle crashes (MVC) have decreased. However, while overall risk of fatality in frontal collisions has been reduced, there exists a sex-specific disparity between males and females in MVC injury outcome. Male drivers are 3 times more likely to be involved in a moderate to serious MVC, leading to potential bias towards midsized adult males in the design of vehicle safety features. As a result, when accidents occur, females have 50% or higher odds of sustaining injury than males in comparable MVCs. The aim of this study is to determine male vs female differences in thoracic injury patterns in seriously injured MVC occupants.

Hypothesis: By analyzing occupant and crash characteristics, we hypothesize that females are more likely than males to sustain thoracic injury in comparable MVCs.

Methods: Data was obtained from the Crash Injury Research and Engineering Network (CIREN) public dataset years 2005-2014. CIREN cases must meet inclusion criteria regarding injury and crash severity and require at least one AIS 3+ injury or two AIS 2 injuries in separate body locations. All cases previously underwent full review by medical and engineering specialists to construct injury causation scenarios. For this study, CIREN cases were restricted to frontal impacts only (principal direction of force between 300 and 60 degrees) and front seat occupants only. Only AIS 2+ thoracic injuries were examined in this study. Occupant demographic information included sex, age, height, weight, body mass index (BMI), and injury severity score (ISS). Vehicle and crash variables include change in vehicle velocity (delta-V), seat position, and belted status. JMP statistical software was used to analyze relationships in this study.

Results: In frontal MVCs, thoracic injury patterns differed based on sex, age, and seating location. On average, female occupants sustained thoracic injuries at a lower delta-V than males, with the average ± SD being 48.6 ± 19.7 km/hr for females versus 53.3 ± 22.7 km/hr for males. Younger female occupants (ages 12-25) had a higher incidence of thoracic skeletal fracture than males (50% vs 27% respectively). Occupants over 25 years old had more thoracic skeletal fractures (80% for ages 26-55; 98% for ages 56+) compared to younger occupants (39% for ages 12-25), but the difference between males and females for older frontal MVC occupants (25+) was unsubstantial. By nominal logistic fit, older age is predictive of soft tissue injury in addition to skeletal injury, with a p-value less than 0.001. In comparison, sex and delta-V were not predictive of injury type, with p-values of 0.46 and 0.36, respectively.

Conclusions: Females are more likely than males to sustain thoracic injury in comparable frontal MVCs producing at least one AIS 3+ injury or two AIS 2 injuries in separate body locations. Younger female occupants had a higher incidence of thoracic skeletal fracture than males, though the sex disparity did not continue past age 25. Age is the most reliable predictor for thoracic skeletal fracture, with 98% of occupants with a thoracic injury sustaining fracture past age 55. These results provide insight to vehicle safety manufacturers on what features may be altered to reduce sex and age-based disparities in MVC thoracic injury incidence, such as age or sex-based adjustment of seatbelt load limiters.

Source of mentor's funding or other support that funded this research: Funded by National Highway Traffic Safety Administration (NHTSA) DTNH2217D00070.

Poster Title: Deconvolution analysis and differential exon inclusion at the 17q21.31 locus in patients with autopsy-confimed PSP

Student: Hadley Walsh, Class of 2025
Faculty Mentor and Department: John Crary, MD-PhD, Icahn School of Medicine at Mount Sinai

Funding Source: none

ABSTRACT

Background: Progressive supranuclear palsy (PSP) is a neurodegenerative disease neuropathologically characterized by accumulation of abnormal hyperphosphorylated tau, but how and why this protein accumulates and its role in toxicity is unclear. Much of the emphasis has been on tau clearance through ubiquitin proteasome, autophagy, and lysosomal pathways. However, less attention has been given to protein synthesis, despite the strong genetic association with the 17q21.31 locus. The preferential accumulation of 4R tau in PSP suggests that alterations of specific tau isoforms may play a role.

Hypothesis: Dysregulation of mRNA at the 17q21.31 locus contributes to toxic accumulation of tau protein in PSP.

Methods: Publicly available next-generation RNA sequencing data from the cerebellum and neocortex (n = 164) were analyzed, with a novel replication cohort from the neocortex (n = 40). These data were trimmed, aligned, and quality controlled using STAR, Trimmomatic, FASTQC, and Picard. Transcript quantification and differential gene expression was performed using RSEM, and differential splicing analysis was performed using LeafCutter. Cell type deconvolution analysis generated using BRETIGEA shows the relative cell type abundance of neurons, astrocytes, oligodendrocytes, OPC, microglia, and endothelial cells in PSP cases compared to controls. Data was visualized with ggplot2.

Results: The average read length for the neocortex and cerebellum samples was 164.7 bp and 171.4 bp respectively. 5,039 genes were differentially expressed in the neocortex, and 7,753 genes were differentially expressed in the cerebellum, with 2,764 genes overlapping. Total levels of *MAPT* were significantly increased in both regions when controlling for relative cell type abundance. Leafcutter identified alterative splicing of *MAPT* exon 10 in both regions, indicating increased 4R tau in cases compared to controls. Other genes at the MAPT 17q21.31 locus are also differentially expressed in PSP (PLEKHM1, KANSL1, ARGHAP27, LRRC37A).

Conclusions: Pending further validation, these findings indicate that increased synthesis of 4R *MAPT* mRNA may play a role in the toxic accumulation of tau in PSP.

Poster Title: Can Old Imaging Alter the Preoperative and Operative Course of Patients Undergoing Parathyroidectomy for Primary Hyperparathyroidism?

Student: Hope Werenski, Class of 2023
Faculty Mentor and Department: Reese Randle, MD, General Surgery

Funding Source: None

ABSTRACT

Background: Surgical intervention provides the only definitive treatment for primary hyperparathyroidism (PHPT). Although imaging plays no role in diagnosis, it is essential for preoperative localization when a focused parathyroidectomy is planned.

Hypothesis: We hypothesized that identification of enlarged parathyroid glands on imaging obtained prior to the diagnosis of PHPT has the ability to impact the preoperative evaluation and intraoperative course of patients undergoing parathyroidectomy.

Methods: The study included adult patients with a diagnosis of PHPT who underwent parathyroidectomy between 10/2015 and 10/2020 and had contrast-enhanced CT imaging of the lower neck and upper chest prior to diagnosis for unrelated indications. A neuroradiologist retrospectively viewed these prior scans blinded to the operative findings, and a surgeon compared the imaging findings to preoperative notes and operative reports to determine whether and how information derived from prior imaging might have impacted the preoperative work-up and intraoperative course of these patients.

Results: We identified at least one visibly enlarged parathyroid gland on a prior contrast-enhanced CT in 30 (75%) of 40 included patients. The average time between the oldest scan where an enlarged parathyroid was visible and parathyroidectomy was 4.6 years (range 0.9 to 11.4). Despite old imaging enabling correct localization, 16 of these 30 (53.3%) underwent a sestamibi scan and 2 (6.7%) underwent a parathyroid CT prior to parathyroidectomy. Additionally, knowledge of the enlarged parathyroid(s) on prior imaging might have allowed a more focused approach in 3 (10.0%) and prevented 1 unnecessary thyroid lobectomy performed in search of disease. Similarly, localizable disease on old imaging might have prompted a more thorough exploration in 4 (13.3%) and possibly prevented missed disease and failure to cure in 3 (10.0%). We determined that viewing prior imaging could potentially change the preoperative evaluation in 70.0% of patients with localizable disease on old imaging and the operative course in 23.3%. When considering the entire cohort with relevant old contrast-enhanced imaging available, conservative estimates indicate reviewing these scans might alter the preoperative work-up in 52.5% of patients presenting with PHPT and the operative course in 17.5%.

Conclusions: The identification of enlarged parathyroid glands on imaging that predates a diagnosis of PHPT has the potential to impact the preoperative evaluation and intraoperative course of patients undergoing parathyroidectomy. When available, prior contrast-enhanced CT imaging should be reviewed prior to obtaining additional imaging or planning the operative approach.

Poster Title: Adaptation and Validation of the Garcia Score for Neurobehavioral Testing in ICH Rat Models

Student: Yager, Brock, Class of 2024
Faculty Mentor and Department: Stacey Wolfe, MD, Neurological Surgery

Funding Source: none

ABSTRACT

Background: The incidence of spontaneous intracerebral hemorrhage (ICH) has been alarmingly high in the United States since the early 1980's, without any significant medical advancements in treatment. With case fatality rates up to 50%, new treatment strategies are critically needed. The majority of ICH research has been conducted in young, healthy male mice, which do not mirror the human ICH population. We have developed a rat model of ICH with concomitant cardiometabolic comorbidities, which more closely align with the human ICH population in order to improve chances for successful identification of translational therapeutic targets, however, efficient neurobehavioral measurements have not been well-validated in rat models. In murine models, the Garcia score and Corner Turn tests are two measures of neurobehavioral change, however, there is significant variation in the amount of time and effort required to complete these two tests and the Garcia score measure has not been validated in rat models.

Hypothesis: The Garcia test will have higher sensitivity in detecting neurobehavioral changes in rats than the Corner Turn test and will be more efficient in terms of completion time.

Methods: The Garcia score and Corner Turn test were performed on 11 male Sprague Dawley rats at 7-8 weeks old for baseline measurements. Following this, small volume (50μL) autologous-injection ICH (n=6) and large volume (150μL) autologous-injection ICH (n=6) was performed per the standard Diz/Wolfe ICH lab protocol. At 24- and 72-hours post-surgery, both behavioral measures were repeated by the same technicians on all rats with video capture to document and standardize scoring.

Results: Friedman's Test was used to determine differences between days for both the Garcia score and Corner Turn test. For the Garcia score, day 1 was significantly different from 3 day ($p=.023$) and the Garcia score at day 1 was significantly different from baseline ($p<.001$). For the Corner Turn, the left percentage was significantly different at day 1 from percentage at baseline ($p=.017$) and the Corner Turn left percentage at day 1 was significantly different from percentage at baseline ($p=.009$). Both models illustrated significant differences at post-ICH day 1. There was statistically significant correlation at 1 day post-ICH between Garcia and corner turn ($p=.021$), however, there was no significant correlation at baseline or 3 days post-ICH among all animals. Mann Whitney U tests were computed on the Garcia and Corner Turn tests at each timepoint which demonstrated no differences between hematoma volumes.

Conclusions: The Garcia test and the Corner Turn test both effectively demonstrate neurobehavioral changes 24 hours post-ICH in a rat model. However, neither test was able to detect behavioral changes from baseline at 72 hours. Both models also lacked the sensitivity to detect behavioral differences between the 50μL and 150μL hematomas. With this information, we are more aptly able to understand the limitations of these measures and interpret the data they produce more carefully. Additionally, we can have confidence in the fidelity of the Garcia score and use this method alone rather than the corner turn test in order to conserve time and effort.

Source of mentor's funding or other support that funded this research: This work was supported by a pilot grant from the Wake Forest Cardiovascular Sciences Center.

Poster Title: Relationship Between Race, Barriers to Prenatal Care, and Receipt of Prenatal Care Among Pregnant Individuals at Atrium Health Wake Forest Baptist

Student: Morgan Yapundich, Class of 2024
Faculty Mentor and Department: Shahla Namak, MD, Dept of Family & Community Medicine; Justin B. Moore, PhD, Dept of Implementation Science, Wake Forest School of Medicine

Funding Source: Department of Medical Education, Wake Forest School of Medicine

ABSTRACT

Background: Inadequate prenatal care is associated with several adverse pregnancy outcomes including increased risk of preterm birth, small for gestational age infants, intrauterine fetal demise, and infant death. In 2018, 16.4% of live births were delivered by mothers with inadequate prenatal care, with black and Native American women exhibiting the highest rates of inadequate prenatal care. Forsyth County, North Carolina (NC) consistently reports high rates of preterm birth, with 12.2% of women in 2018 experiencing preterm births compared to the NC average of 10.4%. While previous studies have elucidated that race and income are associated with lower receipt of prenatal care, the factors underlying low rates of prenatal care in Forsyth County remain poorly characterized. The objective of this study was to assess rates of prenatal care receipt and identify barriers to care among individuals receiving childbirth services at the Atrium Health Wake Forest Baptist (AHWFB) hospital.

Hypothesis: Non-white individuals experience more barriers to care and are less likely to receive adequate prenatal care than white individuals, and a greater number of barriers to care is associated with less adequate prenatal care.

Methods: A convenience sample of 200 individuals receiving childbirth services at AHWFB were surveyed regarding their prenatal care, barriers to prenatal care, and demographic factors including age and income. Individuals eligible for the study spoke English or Spanish, were aged 18 or older, and at least 35 weeks gestation at delivery. After obtaining verbal consent from study participants, a 14-question survey was administered by a trained research assistant.

Results: In terms of barriers to care, 19% of participants reported at least one barrier to prenatal care, with the most common barrier cited as other competing responsibilities such as childcare or work. There were no significant differences in reported barriers to care between white vs. non-white participants or between participants with low (defined as a family income of less than $40,000 annually) vs. middle or high family incomes. The overall prenatal care receipt rate was 81%, 87%, and 88% in the first 28 weeks, between 28 and 36 weeks, and after 36 weeks gestation, respectively, with 76% of participants receiving adequate prenatal care at all three time periods. The rate of adequate prenatal care among non-white participants in the first 28 weeks of pregnancy was 88%, which was significantly lower than their white counterpart's rate of 98% ($p<.01$). Interestingly, there were no significant differences in prenatal care rates between white and non-white participants after 28 weeks of pregnancy. Additionally, participants of lower income were significantly less likely to receive prenatal care throughout their pregnancies. Finally, participants who reported barriers to care were more likely to report inadequate prenatal care at all three gestational periods, but the relationship was moderated by race in the first two gestational periods.

Conclusions: In our sample, relatively few barriers to care were reported, and the prevalence of barriers didn't differ by race or income, while adequate prenatal care rates were relatively high. However, non-white participants who experienced barriers were more likely to report inadequate prenatal care in the first 28 weeks and between 28 and 36 weeks of their pregnancy compared to white participants who also reported barriers. These findings suggest that white individuals might have resources to overcome barriers that are unavailable to non-white individuals.

Poster Title: Outcomes 2-Years After Hip Microfracture Augmented with Allograft Cartilage and Autologous Platelet Rich Plasma

Student: Keon Youssefzadeh, Class of 2024
Faculty Mentor and Department: Allston J. Stubbs IV, Department of Orthopaedic Surgery
Funding Source: Department of Orthopaedic Surgery, Wake Forest School of Medicine

ABSTRACT

Background: Articular cartilage injuries and early osteoarthritis of the hip joint, often as a result of femoroacetabular impingement (FAI), propose a unique challenge to surgeons. Due to its avascularity, articular cartilage exhibits a limited ability to regenerate itself. Acute damage or repeated insult of the cartilage may lead to progressive osteoarthritis (OA) of the hip joint, pain, and loss of function. For patients with these injuries, cartilage salvaging procedures and correction of bony morphology may provide a less invasive alterative to total hip arthroplasty (THA). In this study we examine the outcomes of acetabular microfracture augmented with allograft cartilage and autologous platelet rich plasma (PRP).

Hypothesis: Hip microfracture augmented with allograft cartilage and autologous platelet rich plasma will yield stable and significant improvement to hip outcome measures at a minimum 2-year time point.

Methods: Data from a prospective series of consecutive patients with Outerbridge grade IV chondromalacia of the acetabulum or femoral head who underwent acetabular microfracture augmented with allograft cartilage and autologous PRP from 2016 to 2019 was analyzed. Modified Harris Hip Score (mHHS), Hip Outcome Score Activities of Daily Living (HOS-ADL) HOS Sport-Subscale (HOS-Sport), Non-Arthritic Hip Score (NHS), visual analog scale (VAS) pain, and VAS satisfaction served as outcome measures for this study.

Results: 84 hips were included in the final study. Six hips (7%) underwent conversion to THA and 1 hip (1%) underwent revision surgery, and subsequently were excluded from further analysis. Of the remaining 77 hips (72 patients) average age at surgery was 34.8 ± 10.3 years old, average BMI was 26.8 ± 4.8, and final follow-up time was 35.4 months (range 24-54 months). Sixty-five (84%) had pre-operative scores available and 48 (62%) had minimum 2 year post operative sores available. Student's t-tests demonstrated significant increases in HOS-ADL (62.9 ± 18 to 85.4 ± 15.3, n=42), HOS-Sport (42.8 ± 21.4 to 70.3 ± 23.8, n=42), mHHS (62.0 ± 16.0 to 84.2 ± 18.8, n=40), and NHS(61.2 ± 16.1 ± 3.6 to 82.1 ± 17.5, n=38); $p<0.001$ for all scores. Average VAS pain (2.4 ± 2.4, n=47) and VAS Satisfaction (8.3 ± 2.4, n=48) at two year follow up were also recorded.

Conclusions: Microfracture augmented with allograft cartilage and autologous PRP can be used to successfully treat focal cartilage injuries of the hip. This novel procedure has demonstrated significant clinical improvement for patients at a minimum of two years following surgery. We believe this procedure is appropriate for patients suffering from early onset arthritis with focal injuries of the femoral or acetabular cartilage.

Poster Title: A Focused Neuromuscular Ultrasound Approach for the Diagnosis of Chronic Inflammatory Demyelinating Polyneuropathy

Student: Chelsea Yun, Class of 2024
Faculty Mentor and Department: Michael Cartwright, MD, Neurology

Funding Source: None

ABSTRACT

Background: Peripheral nerve ultrasonography in individuals with chronic inflammatory demyelinating polyneuropathy (CIDP) have been studied using a variety of approaches over the past decade. Several scales have been proposed to quantify upper and lower extremity nerve enlargement, with some scales being more comprehensive than others. Based on previous studies, it appears that the median and ulnar nerves are typically involved in CIDP. While these comprehensive scales are informative, they may not be feasible in busy neurodiagnostic laboratories on a routine basis. This prospective study compares only the bilateral median and ulnar nerves of individuals with CIDP to reference values in order to determine the clinical usefulness of this focused approach as a diagnostic tool.

Hypothesis: Measuring the cross-sectional area of the bilateral median and ulnar nerves with ultrasound is a targeted approach that can help diagnose CIDP in clinical practice.

Methods: The cross-sectional area (CSA), echogenicity, and vascularity of the bilateral median and ulnar nerves of twenty-five volunteers with CIDP were measured using ultrasound. Nineteen had definite CIDP based on EFNS/PNS guidelines, whereas six had probable/possible CIDP and were diagnosed based on clinical impression.

Results: Focal nerve enlargement was found in at least one segment in all subjects. The sensitivity of this approach was therefore 100%. Twenty-three of the twenty-five subjects had ≥ 4 enlarged nerve segments, and subjects with definite CIDP had larger CSAs compared to subjects with probable/possible CIDP. Definite CIDP subjects were also twice as likely to have at least one nerve segment that exceeded 1.5 times the upper limit of normal.

Conclusions: A focused ultrasound study, involving only the median and ulnar nerves, is sensitive for the detection of nerve enlargement in CIDP. Measuring the CSA of the median and ulnar nerves is clinically feasible and may help establish the diagnosis of CIDP.

Poster Title: Oncogene-Induced Senescence in RTK-fused Infant High-Grade Gliomas
Student: Tamir Zitelny, Class of 2024
Faculty Mentor and Department: David Kram, MD, Pediatric Hematology and Oncology
Funding Source: Laura Scales Student Research Fellowship Fund

ABSTRACT

Background: While the association between histologic grade and patient outcomes in pediatric and adult glioma diagnoses is well established, this correlation is less predictable in infants under the age of two years. Typically, infant low-grade glioma (LGG) express a more aggressive course and infant high-grade gliomas (iHGG) exhibit superior outcomes. Recent findings have highlighted the unique genomic landscape of iHGG as a potential explanation, characterized by an enrichment in receptor tyrosine kinase (RTK) fusions – thus these tumors may display a more pediatric "LGG-like" and favorable methylation pattern. However, this biology neither explains this tumor behavior nor provides sufficient evidence to avoid the classic, and potentially excessive, treatment approach for iHGG.

Oncogene-induced senescence (OIS) is a process by which aberrant activation of an oncogene triggers a stable form of cell cycle arrest in normal cells. OIS in *MAPK*-driven pLGG seems to explain the variable behavior of pediatric LGG, a subset of tumors that behave and display methylation patterns quite similar to iHGG. Whether RTK-fused iHGG is similarly mediated by OIS, and whether this is identifiable from a prognostic standpoint or targetable from a therapeutic standpoint is currently unknown and under investigation.

Hypothesis: We expect that the percentage of cells positive for the senescence markers in RTK-fused iHGG will be similar to *MAPK*-activated pLGG, and higher compared to pediatric/adult HGG specimens. These results will suggest that senescence contributes to the different behaviors and outcomes of infant and pediatric/adult glioma.

Methods: Infant and pediatric/adult HGG and LGG tissues have been obtained and experiments will be performed in triplicates and with 2 biological repeats. RNA was extracted from the tumor tissues and reversed transcribed. Quantitative real-time PCR was then performed to determine the expression levels several senescence associated secretory phenotype (SASP) factors using GAPDH signal as an internal control. Immunohistochemical staining was performed on sections of these samples to detect expression of senescence markers. Sections of the frozen tissue samples were then stained for senescence-associated β-galactosidase (SA-β-gal), a lysosomal enzyme found in high concentrations in senescent cells, and compared to aHGG controls to assess the tissue's degree of senescence.

Results: RTK+ iHGG tissue samples displayed a mean of over 40% SA-β-gal positive cells, a significant increase compared to less than 20% in aHGG samples ($p=0.021$). Further, when comparing both RTK- and RTK+ iHGG samples to aHGG tissue, there was an increase of over 20% SA-β-gal positive cells ($p=0.037$). These results suggest that senescence is one differentiating factor between iHGG and aHGG.

Conclusions: Senescent profiles in iHGG tissue, compared to aHGG, suggest that iHGG harboring RTK-fusions may be a distinct subset of potentially favorable tumors. The significance of this finding lies in the potential for the modification of the current, extremely aggressive treatment plan in infants with this tumor. This will be further explored through analysis of the effects of manipulations of RTK fusions on senescence and tumorigenesis in primary human gliocytes and cell lines derived from iHGG tissues without RTK fusions. By overexpressing RTK fusion genes in non-cancerous gliocytes and iHGG cell lines without endogenous RTK fusion, we can isolate the impact of RTK fusions on tumorigenesis and OIS initiation. This may also provide insight into whether OIS can be induced as a therapeutic approach to potentially render a mass more benign and/or more amenable to resection.

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