3rd Annual Student Research Symposium

July 30th, 2021

School of Medicine Greenville
Feasibility and Limited Efficacy of a Tandem Cycling Community Exercise Program on Physiological Health, Functional Health, Therapeutic Relationships, and Quality of Life in Persons and Care Partners affected by Parkinson's Disease

Abstract:
“Background: The therapeutic effects of forced aerobic exercise cycling on Parkinson's Disease is well established, as is the link between Parkinson's Disease (PD) patients' health, and the health of their primary caregivers.

Purpose: To examine the feasibility and limited efficacy of combining the two into a novel therapy where patient and caregiver undergo an 8-week training regimen of VR tandem cycling aimed to improve physiological and psychological health.

Methods: Ten patient dyads (PD and caregiver) will undergo 16 sessions of VR tandem cycling for 8 weeks, 2x/week. They will be clinically evaluated pre/post-intervention for physiologic benchmarks such as Heart Rate Variability (HRV), and Stress Response via 48-hr heart rate monitoring and Kubios software. Psychological benchmarks will be determined by Parkinson's Disease Quality of Life Measurement System (PD-QOL), Montreal Cognitive Assessment (MoCA), and a Dyadic Relationship Scale among others. Statistically significant differences will be established at p<0.05.

Results: We hypothesize that HRV, sleep quality, and stress response will improve. PD-QOL and the Dyadic Relationship Scale and other QOL metrics are expected to improve for both caregiver and patient. The MoCA and Hoen and Yar scales are not expected to change due to primarily being used as exclusion criteria, however the Unified Parkinson Disease Rating Scale (UPDRS) metrics are expected to improve for the patient.

Discussion: The ongoing study hopes to demonstrate that the novel tandem VR cycling training improves the motor functions, gait, cognitive performances, quality of life, and dyadic relationship of PD patients and their caregivers.

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SOMG Summer Research Scholar funded by the Sargent Foundation
Evaluation of the 2016 Grading System of Post-operative Pancreatic Fistulas: Literature vs Clinical Disparity

Abstract:
Autism spectrum disorders (ASD) are a highly varied group of lifelong neuro-developmental disorders that have an impact on the social, behavioral, and communicative abilities of those with the disorder. ASDs are associated with significant health loss across an individual’s lifespan as well as with significantly higher healthcare and school costs. Additionally, individuals with ASD face difficulties getting access to care, specifically specialty care, leading to many unmet healthcare needs. Consequently, the Autism Care Network (ACN) seeks to establish a multi-site registry across the US and Canada that works to improve the standard of care and, ultimately, health outcomes for children and adolescents with ASD. Patient information (e.g., autism diagnosis date, testing, behavioral challenges, etc.) will be collected directly from their electronic medical record and input into the ACN registry, where it will be stored for later analysis via informatics applications. As the Prisma site is relatively new, data collection is underway, however, analysis cannot yet be completed. The expectation is that the data analysis will identify gaps in the medical care of children with ASD. These gaps will then inform researchers and physicians where standard of care guidelines need to be improved or completely changed. Additionally, this project will identify what health information is not being collected adequately, which will lead to improvements in information gathering and note-taking. As these gaps are closed, the ultimate expectation is an improvement in the health and outcomes of patients with ASD.

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Abstract:
“Invasive aspergillosis, primarily caused by Aspergillus fumigatus, infects more than 200,000 people per year. Although azole drugs successfully eradicate A. fumigatus in vitro, it is unknown how they work in living hosts, and 50% of patients treated with these drugs still die. We used the larval zebrafish as an in vivo model to study the interactions of the innate immune system with A. fumigatus. Our goal was to investigate the interactions of Posaconazole, a frontline azole drug, with macrophages to prevent A. fumigatus spore germination and hyphal growth in larval zebrafish. We selected larvae with a mutation preventing neutrophils from migrating to the site of infection, injected spores into the hindbrains of the larvae, and added either DMSO as a control or Posaconazole to their water. We imaged the hindbrains with high-resolution confocal microscopy for the following 5 days and monitored the larvae for survival for 7 days post injection. We found that Posaconazole works with macrophages, which form clusters around the spores, to delay spore germination by 1-2 days after injection with A. fumigatus. In addition, Posaconazole significantly decreases hyphal growth in the larvae, increasing zebrafish survival by 20%. These findings illustrate one way that Posaconazole interacts with the innate immune response in living hosts to target A. fumigatus spore germination and hyphal development.

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Distrust, doubt, and disparities: Barriers to recruitment in a clinical research study.

Abstract:
“Introduction: In clinical research, recruitment is a critical step in starting a project. However, many barriers exist in this process that make recruiting participants both difficult and time consuming. To successfully enroll participants, it is crucial that these barriers are diagnosed and understood.

Methods: The various barriers to enrollment were identified through studying the recruitment process of the WeLCKME research project (SEED grant). This project aims to study the microRNA profile longitudinally in the urine of children who have attempted to lose weight. Originally recruitment efforts included flyers and a website to direct patients from an obesity clinic to the study. Later, in-person recruitment began at a Medicaid clinic in Greenville, SC. The study involved monetary incentives plus a free Fitbit and was designed to avoid blood work to increase compliance in pediatric patients.

Results: 419 children were screened. 200 met study criteria. 80 attended clinic, 60 agreed to talk to recruiter, 37 agreed to participate, 14 attended first visit. We identified three potential barriers to participation in clinical research. First, Socioeconomic barriers (transportation, parental job restrictions) Second, racial barriers centered around mistrust of the healthcare system, caused hesitancy to participate in research. Third, language barriers made effectively communicating the nature of the study difficult. These factors lead to significant impediments that cause low yield recruitment even with a large population of potential recruits.

Conclusion: Several systemic barriers exist to prevent effective recruitment in clinical studies. Study design should incorporate solutions to these issues to conduct effective and equitable research."

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The value of Pharmacogenomics for White and Indigenous Americans after Kidney Transplant

Abstract:
Introduction: Kidney transplant recipients (KTR) have a significant medication burden with risk for drug-drug and gene-drug interactions. The objective of this study is to define the value of pharmacogenomics (PGx) testing comparing a cohort of White versus Indigenous American (IA) KTR. Methods: A prospective cohort study of 26 IA and 50 White KTR patients with OneOme22 PGx gene panel. Results: Mean age 53 (SD14.5 years), 50% female, 75% required dialysis prior to transplant. Mean number of medications at the time of the OneOme test was 13 (SD4.6), 54% were on beta blockers, 31% on antidepressants, 17% on anticoagulation, 50% on pain medications and 25% on statin therapy. Significant differences in CYP2C19 and CYP2D6 were noted between IA and White patients (p<0.05). IA patients had more low or intermediate activity of VKORC (vs normal) compared to White (p=0.018) and more normal activity (vs reduced) of CYP4F2 compared to Whites (p=0.005), both are critical for warfarin drug dosing and efficacy. More IA patients had increased metabolism of NUDT15 (2% vs8%) and TMPT phenotypes compared to Whites (27% vs14%) which has significant dosing implications for Azathioprine. SLC6A4 phenotype, significant for antidepressant metabolism, was reduced in 39% of IA patients compared to 20% of whites suggesting delayed or lack of response to therapy (p=0.07). 12% of Whites had increased F2 phenotype associated with increased risk of thrombosis. 34% of patients had recommended change in medication and 19% had drug-gene interactions identified based on current medication. Conclusions: KTR have a high rate of identified drug-gene interactions and over a third of patients would benefit from modification in medication based on PGx results.

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Impact of Harm Reduction in South Carolina: What's the Harm in Harm Reduction?

Abstract:
“Introduction: In South Carolina in 2017, there were 6,724 reported cases of newly confirmed or probable chronic hepatitis C virus (HCV), which is potentially an undercount (South Carolina Institute of Medicine and Public Health, 2019). An example of harm reduction services is syringe exchange programs (SEPs), which help to reduce the spread of HIV and HCV infections among people who inject drugs (McGinty et al., 2018). SEPs also typically provide other services including but not limited to HIV/HCV testing, naloxone distribution and training, overdose education, condom distribution, and referrals for healthcare and addiction treatment services (Baker et al., 2021).

Methods: Researchers will collect observational data as they observe harm reductionists in public spaces where supplies and services are offered to the general public. In the same space, survey data will be collected from consumers receiving harm reduction services. Additionally, this study will use Photovoice methodology.

Results: Anticipated results include determining the importance of harm reduction in South Carolina, the needs of the consumers receiving harm reduction services, and how harm reduction services impact the health of consumers.

Conclusion: Through gathering the anticipated results, the goal is to discuss the findings with community leaders and healthcare providers and to educate the general public as appropriate. By identifying the harm reduction and healthcare services that are not being provided but are needed by people who use drugs, this will help to implement better care and support for a vulnerable population in the Upstate of South Carolina and surrounding areas. “

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Summer Research Funded by UofSC SOMG
Abstract:
“Food insecurity among undergraduate students is a topic that has garnered much attention in recent years, and many studies have been conducted to evaluate its impact among students at the university level. However, there is minimal data on how food insecurity may extend past the university level and into professional studies such as medical schools.

Oregon Health & Science University (OHSU) developed a 39-item survey in which they assessed responses to quantitative questions about age, sex, race, pre-tax income, food shopping behaviors and factors that affected eating patterns. The responses from their health professions students (including PA, dentistry, medicine, nursing, pharmacy, and public health) were analyzed based on the USDA definition of food insecurity. In addition to the quantitative questions, a series of open-ended questions were also included in which students could describe their situation using their own words. Their survey data showed that 28.5% of the respondents reported food insecurity.

Given that the previously described OHSU study was the only one conducted out of the hundreds of health professions programs in the U.S., more studies need to be conducted across other health professions programs across the country. At present, the University of South Carolina has not evaluated the prevalence of food insecurity across its medical, pharmacy, and public health programs. This project aims to adopt the survey instrument piloted by OHSU as described above and evaluate responses from health professions programs within the University of South Carolina system.”

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CenteringPregnancy - Depression Diagnosis Among Prenatal Women

Abstract:
“Objectives: To assess differences in depression diagnosis rates between women assigned to CenteringPregnancy group prenatal care (GPNC) compared to those receiving traditional individual-based prenatal care (IPNC). With a structured intervention such as group care, we hypothesize that women in GPNC with clinical depression would have higher rates of diagnosis due to increased time providers spend with patients.

Design: Secondary analysis of the CRADLE study, a randomized control trial of GPNC. Patients were allocated 1:1 to either GPNC or IPNC prior to 24 weeks gestational age and stratified by self-reported race/ethnicity. Patients completed comprehensive psychosocial surveys at study enrollment, including Center for Epidemiological Studies Depression Scale (CES-D). Comprehensive review of the medical record were also completed. A positive screening was defined as a CES-D survey score of ≥ 12. Categorical variables were analyzed using chi-squared analysis and logistic regression was used to evaluate the association between prenatal care model and rates of depression.

Results: 1,918 women were enrolled, 1,094 in IPNC and 824 in GPNC. CES-D positive screens were similar between IPNC (n=424, 45.1%) and GPNC (n=306, 42.3%), P=0.26, OR 0.89 [IRQ 0.73 - 1.09]). There was also no difference in rates of clinically diagnosed depression between IPNC (n=93, 21.2%) and GPNC (n=56, 18.3%), p= 0.26, OR 0.33 [IQR 0.57 - 1.21].

Conclusion: There is no difference in depression diagnosis rates between GPNC and IPNC care. However, a significant number of women, regardless of care group, are not being captured in their medical record as having depression.”

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When the Shift Hits The Fan: Investigating Burnout in Local EMTs and Paramedics

Abstract:
Emergency Medical Services (EMS) providers regularly experience long shifts, stressful patient care situations, and an unpredictable work pace that can result in increased stress/emotional exhaustion, and feelings of depersonalization. Greenville County EMS, a large agency that runs 80,000 calls per year in the Upstate of South Carolina, has had consistently low morale and high turnover among the field staff. Burnout is most commonly defined as a three-dimensional syndrome consisting of emotional exhaustion, depersonalization and reduced personal accomplishment. The aim of this research sought to examine the relationship between stress and burnout in Greenville County EMS providers. This study was composed of 20 paramedics and 10 EMT's who were evaluated 30 minutes prior to and immediately following the conclusion of their shifts. Participants were assessed on perceived stress (PSS) and salivary cortisol prior to their shift, and they were assessed on burnout (MBI), PSS, and salivary cortisol post-shift. Results indicated that there was no significant difference between perceived stress (PSS) prior to and following a participant's shift. However, salivary cortisol (physiological stress) was significantly higher post-shift compared to pre-shift samples, indicating that the 12-hour shifts significantly increased the physiologic stress of the participants. This pattern of increased cortisol later in the day is atypical. There was no correlation between perceived stress or physiological stress within any of the three areas of the MBI. These results indicate that stress may not play as crucial a role in the etiology of burnout as previously described in the literature.

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Engaging with Latinx community stakeholders: Building a protocol to understand COVID-19's impact on Latinx community in Upstate SC

Abstract:
In the summer of 2020, Latinos represented 31% of COVID-19 cases in Greenville County despite comprising only 9% of the population. Despite extensive evidence of disparities in COVID-19 testing, vaccination, infection, and outcomes, a paucity of literature exists providing insight into the source of these disparities. We aimed to develop a qualitative protocol to explore, in depth, perceived barriers to accessing and utilizing care within the Latinx community of Greenville County. We partnered with SC PASOS, an organization that provides resources and support to our Latinx community, to engage community stakeholders to collaboratively develop an interview guide to be used during focus groups and solicited perceptions. We learned to keep our interview guide easy to understand using phrases instead of words and rearranging our proposed questions to allow for more dialogue. Ultimately, we designed a qualitative study with a target of conducting 3 focus groups, totaling 25 Latinx community members over the age of 18. Focus groups will be conducted in Spanish by two native speakers, audio recorded, and transcribed verbatim. Data will be analyzed in Spanish following an inductive deductive thematic approach with a priori codes drawn from stakeholder feedback and extant literature on healthcare disparities in the Latinx community. Two independent interpreters will translate and back translate transcript portions of interest to be coded into English to ensure accuracy and facilitate analysis. By identifying and describing disparities the results can potentially guide future policy that can minimize the inequities this community continues to encounter.

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Provision of Blood Pressure Monitors to improve Hypertension Control and enhance patient self-management and empowerment

Abstract:
“Background: Uncontrolled hypertension (HTN) is a major contributor to the burden of chronic disease in the United States. Patient ability to adhere to blood pressure (BP) monitoring, medication management, and lifestyle changes are all drivers in controlling chronic HTN. The American Medical Association has outlined the MAP strategy (Measure accurately, Act rapidly, Partner with patients/families/communities) as one method to help ease the burden of chronic uncontrolled hypertension.

Objective: To evaluate patients’ ability to self-manage their HTN by evaluating BP control, providing patients with a BP monitor for at-home use, and evaluating patients’ levels of motivation and self-empowerment in managing their HTN.

Methods: 30 patients with a diagnosis of HTN were provided with a BP monitor. Across a 12-week period, interviews are being conducted employing motivational interviewing (MI) strategies to assess barriers to patient adherence as well as self-empowerment in BP management. An adherence estimator questionnaire will be administered pre- and post-intervention to evaluate patients’ adherence to medication and BP monitoring regimens.

Expected Results: Previous studies have shown motivational interviews to improve level of adherence and decrease level of discontinuation in patients managing HTN through medication regimens. Additionally, frequent monitoring of blood pressure has been shown to enhance patients’ understanding of their HTN and improve patient engagement with their treatment plan. As such, it is hypothesized that post-intervention adherence estimator questionnaires may show an improvement in treatment adherence in enrolled patients, as well as increased levels of confidence and motivation in monitoring BP and taking medication as prescribed.”

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Correlation of Marshmallow Esophagram with High Resolution Manometry and Clinical Outcomes

Abstract:

“Introduction:
Esophageal motility is important in understanding candidacy for anti-reflux surgery. Traditionally, this has been performed with high-resolution manometry (HRM). HRM provides detailed analysis of esophageal motility and function. Unfortunately, it is performed with passage of a tube down the nares into the stomach, which some patients find quite intolerable. In 2019, Prisma introduced a screening test for motility which involves a marshmallow swallow with radiographic visualization.

Purpose: To evaluate the accuracy of using the minimally invasive marshmallow esophagram as a preoperative screening technique for patients.

Aim 1: Correlate marshmallow study results with HRM results.
Aim 2: Correlate marshmallow study results with postoperative dysphagia and surgery outcomes.

Materials and Methods: A retrospective chart review of data on 100 adult patients (>18 years of age) who underwent marshmallow swallow studies at Prisma Health-Upstate from June 1, 2020 through May 1, 2021 was completed. Data abstraction and analysis focused on patient data routinely collected and documented in the Prisma Health electronic health record system (EPIC).

Results: Pending Analysis.
Hypothesis 1: Marshmallow esophagram results will be correlated with HRM results.
Hypothesis 2: Marshmallow esophagram results will be correlated with post-operative dysphagia.

Conclusions: If results demonstrate the marshmallow study correlates with outcomes of HRM, we would be able to recommend this Marshmallow screening technique in place of HRM. Marshmallow study would then be able to serve as an accurate and minimally invasive screen, improving the comfort level of patient care when assessing candidacy for antireflux surgery.

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Assessing the Predictive Value of the Brief Addiction Monitoring Tool for Patients with Opioid Use Disorder at a Community Health Center

Abstract:
The COVID-19 pandemic led to a huge shift to telemedicine during 2020. Even now in 2021, telehealth visits have continued to be used in various specialties of medicine, including for treatment of opioid use disorder (OUD). Patients with OUD are commonly started on the Medication-assisted treatment (MAT) program to help them in their recovery. With the shift of MAT to telehealth visits, we thought that there should be some tool to evaluate the success of the program. We used the Brief Addiction Monitor (BAM) to evaluate the success of the MAT program at North Shore Community Health Center in Gloucester. We administered the survey over a three-week period and compared the results with urine toxicology reports within 90 days of the survey. We were not able to obtain a significant number of patients to administer the survey to. However, of the patients surveyed, we did find that the BAM responses correlated with the urine toxicology reports. Patients with higher risk, higher use, and lower protection scores were more likely to have unexpected urine results. In addition, we asked patients whether they ever had any problems filling their Suboxone prescriptions at the pharmacies. Many healthcare providers at the Gloucester Family Health Center cited stigmatization at pharmacies as a constant obstacle for their patients. One-third of the patients reported experiencing issues. This study raises further questions in the future of how best we can support our patients in the recovery process of opioid and other drug use disorders.

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Nutrition Optimization Before Bariatric Surgery: Does Required Dietitian Follow-up Improve Patient Outcomes?

Abstract:
“Obesity is one of the biggest epidemics facing the modern world today. In the U.S. alone, the prevalence of obesity is 42.4%. Bariatric surgery is one of the options presented to patients when diet, exercise and other non-invasive interventions have failed in long term weight reduction. However, bariatric surgery increases risk for nutrition-related complications. Not only is a nutrition evaluation by a registered dietitian required for clearance to surgery, but also a valuable tool to assess nutrition-related complications and increase the chances of long term, durable weight loss. The purpose of this study is to identify differences in perioperative outcomes between patients who received nutrition optimization at nutrition evaluation and those who were placed on nutrition hold at nutrition evaluation. Additionally, this study aims to identify differences in perioperative outcomes including weight loss (pre-operative and post-operative), post-operative complication rates, post-operative follow-up rate, and preoperative phase duration between patients who received nutrition optimization at nutrition evaluation and those who were placed on nutrition hold at nutrition evaluation. A retrospective chart review was performed on a sample size of 335 adult (18-75 years of age), obese (BMI≥ 35 kg/m2) patients who underwent Roux-en-Y Gastric Bypass (RYGB) or Vertical Sleeve Gastrectomy (VSG) from August 1, 2017-December 31, 2019. Of the 335 patients a majority were white (73.4%) females (82.7%) with a mean BMI of 45.5 kg/m2. 51.3% of patients received Roux-en-Y Gastric Bypass (RYGB) while 48.7% received Vertical Sleeve Gastrectomy (VSG). Patients had a mean weight of 284.15 at nutrition evaluation prior to bariatric surgery, with 57.6% in the Morbid Obesity category (BMI of 40.0-49.9 kg/m2). Of the 335 patients 9.9% were put on a nutrition hold status with the primary reason being lack of nutrition education (4.5%). Preliminary results showed no statistical significance (p=.464) in mean BMI at nutrition eval between those on nutrition hold and those with a no hold for surgery at nutrition evaluation. Results also revealed statistical significance (p=0.001) in time to surgery with the no hold group undergoing surgery approximately 30 days faster than patients put on hold. In addition, there was statistical significance (p=0.002) of time in surgery (sxtime) between hold and no hold patients, as well as significance (p=<0.001) in length of stay (sxlos) between hold and no hold patients, both being longer in duration for no hold patients. There was no statistical significance in weight change (loss or gain), at both pre and post-operative points in time between hold and no hold patients. Lastly, there was no statistically significant difference in follow up between the two groups at 1, 3, 6,13,16,24 month follow up visits, with both groups declining in number of visits as time went on. While these are preliminary findings with more statistical analysis to be completed, it has shown thus far patients who have undergone and been cleared by the nutrition optimization protocols appear to have quicker recovery times and less time spent in surgery. With no statistically significant difference in weight change between the two (hold and no hold) groups, it raises interest and warrants further exploration into the following: why changes are not seen thus far, how to improve upon the nutrition optimization program, and what reasons are there for the decline in patient follow up. Further data analysis and future studies are needed.

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Expression of members of the multi-protein SAGA chromatin modifying complex in blastocoel fluid-conditioned media from IVF-generated human embryos is associated with positive implantation status

Abstract:
“Objective: To identify molecular markers in blastocoel fluid-conditioned media from IVF-generated embryos that could aid in providing improved embryo selection criteria.

Materials and Methods: Blastocoel fluid-conditioned media was collected from day 5 human embryos undergoing PGT-A. cDNA was synthesized from individual media samples. Real-Time qPCR was then performed to obtain mRNA levels for genes of interest, relative to the housekeeping gene GAPDH. The gene expression data was analyzed in regards to implantation outcomes of the embryo via Welch's t-test.

Results: Statistically significant increased expression of MYSM-1, USP22, UPS28, and USP34 in media from embryos associated with a positive implantation status versus a negative implantation status (p<0.05) was detected. UBR5 also showed significant expression in positive status embryos (p<0.1). KAT2A expression was also higher in positive implantation embryos versus negatives.

Conclusions: MYSM-1, USP22, UPS28, and USP34 are deubiquitinating enzymes (DUBs). DUBs often play a role in protein degradation, DNA repair, chromatin remodeling, cell cycle regulation among other functions. KAT2A is a histone acetyltransferase as part of the multi-protein complex SAGA and acts as a ubiquitination catalyst along with USP22. Both decreased levels of USP22 and KAT2A have shown embryonic lethality in mouse models. It is possible that decreased expression of KAT2A could nullify the DUB subunit of SAGA. Therefore assessing the levels of both USP22 and KAT2A (or others members of SAGA), could potentially serve as a molecular indicator of embryo viability.

Impact Statement: Measuring SAGA member expression levels in blastocoel fluid-conditioned media may serve to improve the selection criteria for IVF-embryo selection.

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Appendectomy resource utilization: Does it correlate with severity of disease

Abstract:
“Introduction: Acute appendicitis is one of the most common emergent surgical procedures performed in the world. There are varying degrees of presentation, ranging from mild appendicitis to gangrenous appendicitis with perforation. Most appendectomies are now performed laparoscopically, but the technique and utilization of instrumentation varies between surgeons. With this variation comes variations in direct cost to the healthcare institution.

Purpose: The goal of this study is to investigate whether the resource utilization costs associated with laparoscopic appendectomies correlate with the severity of appendicitis based on pathologic findings.

Methods: The electronic health record for Prisma Health was queried for all laparoscopic appendectomies performed from January 1, 2020 through December 31, 2020. Additional retrospective chart review will search for patient demographics, comorbidities, operative time, perioperative and postoperative complications, and pathology reports for the disease state of the removed appendix. In addition, direct supply costs of each procedure will be obtained. Pearson correlation will be performed between perioperative supply costs and the severity of the disease state of the appendix. A p value of <.05 will be determined to be significant.

Results: Data collection is still ongoing.

Conclusions: Though the project is still in the data collection state, we expect there to be no correlation between perioperative supply costs and the increasingly severe disease state of the removed appendixes. If so, this will allow standardization of a laparoscopic appendectomy preference card across the Prisma Health System.

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Summer Research funded by the Department of Surgery
Carotid Artery Calcifications in Patients 30-60 years of age: important indicator for radiologists to report?

Abstract:
“Introduction
Internal carotid artery calcification (ICAC) is part of the atherosclerotic process occurring in vessels throughout the body, putting individuals at greater risk for cardiovascular disease (CVD) and stroke. The ubiquitous nature of head CT scans, as well as their ability to image the intracranial internal carotid arteries, makes them ideal for screening for ICAC.

Methods
Non-contrast head CTs were evaluated for patients aged 30-59 stratified by decade at a single institution (6/16/20-6/7/21) for the presence of ICAC. Clinicopathologic data and CT scan results were analyzed blinded to one another. Radiologist's reports were also analyzed for mention of carotid artery calcification.

Results
Overall, 125 head CT scans were analyzed with 40 patients aged 30-39, 34 40-49, and 51 50-59. Stratification revealed increasing calcification with age (10% 30-39; 24% 40-49; 45% 50-59); unilateral calcifications were more common in younger decades (n=12, 75%) and bilateral calcifications were more common in the older decade (n=23, 57%). For the 50-59 stratification, calcifications were associated with diabetes (30%), hypertension (61%), hyperlipidemia (30%), hypercholesterolemia (26%), vitamin D deficiency (17%), and kidney disease (35%). While 27.3% of patients in the study showed calcification, only 5.6% of cases were mentioned in the radiology report.

Conclusion
Due to the connection between ICAC and CVD and stroke, and the apparent worsening of calcification with age, it would be prudent for radiologists to comment on the status of ICAC in head CT scans in patients aged 30-59 and appropriately document in the impressions section of the report to facilitate clinician follow-up.”

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Steps to Validation of Interferon Alpha Inducible Protein 27 (IFI27) Knock Outs in Human Lung Epithelial Cells

Abstract:
“The recent pandemic of severe acute respiratory syndrome-related coronavirus 2 (SARS-Cov-2) has placed a large burden on global health systems and poses a significant threat to individuals worldwide. Preliminary investigation of the intracellular immune response to SARS-CoV-2 has identified a series of interferon stimulated genes (ISGs) that are highly upregulated. Many of the functions and mechanisms of these ISGs are unclear, one of which is IFI27. We propose to investigate the role of IFI27 in response to double stranded RNA (dsRNA), a common immunostimulatory molecule in coronavirus infections. Plasmids encoding Cas9 and guide RNA sequences (sgRNA) to IFI27 were transfected into wild type (WT) A549 (human lung) cells in order to create IFI27 knockout cell lines. Genetic mutations of IFI27 will be confirmed by genomic PCR and protein expression by western blot as compared to WT A549. Real-time PCR has shown regulation of IFI27 mRNA expression indicating protein expression of IFI27 can be confirmed via western blot. However, western blotting has revealed off target antibody binding. As such, we are pursuing an IFI27 forced expression plasmid with a myc tag to confirm protein size and binding on western blot. Once IFI27 knockouts have been confirmed, cells will be exposed to a viral RNA mimic and IFI27 gene expression will be measured using qRT-PCR as a prelude to examination of cellular responses in the absence of IFI27.

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When the Shift Hits The Fan: Investigating Burnout in Local EMTs and Paramedics

Abstract:
Emergency Medical Service (EMS) providers are a unique population due to the nature of their work environment. EMTs/Paramedics work arduous hours and provide first line medical attention where patients live. Difficult living conditions, high stress situations and poor patient outcomes can all lead to an increase in cynicism and a decrease in emotional bandwidth. Greenville County EMS, a large agency that runs 80,000 calls per year in the Upstate of South Carolina, has had consistently low morale and high turnover among the field staff. Burnout is most commonly defined as a three-dimensional syndrome consisting of emotional exhaustion, depersonalization and reduced personal accomplishment. The aim of this research sought to examine characteristics related to burnout in Greenville County EMS providers. This study was composed of 20 paramedics and 10 EMT’s who were evaluated 30 minutes prior to and immediately following the conclusion of their shifts. Participants were assessed on burnout using the Maslach Burnout Inventory to assess characteristics related to depersonalization, emotional exhaustion and reduced personal accomplishment. Results from our participant population indicated that the primary source of burnout was from reduced personal accomplishment, followed by depersonalization. Emotional exhaustion was the least reported component of burnout among participants. Burnout levels did not vary by gender or certification levels. This assessment indicates lower levels of burnout than expected based on other research conducted with EMS personnel. Future research could use multiple burnout assessments, like the CBI or OBI in conjunction with the MBI, to elaborate on factors related to burnout.

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SOMG Summer Research Scholar funded by the Sargent Foundation
Identifying Patient Therapeutic Goals and Preferences to support Patient-Centered Care: A Qualitative Study

Abstract:
“Background: Women with metastatic breast cancer (MBC), a currently incurable cancer, may have access to multiple therapeutic treatment options, that can both prolong life and reduce symptom burden. However, these therapies include a different probability of success and risk, exemplified by different side-effects and toxicity. Therefore, patient-centered care requires practitioners to integrate women’s informed preferences into MBC treatment to advance patient-centered outcomes. A mobile application may advance patient preference into clinical decision making at the point of care, however, few studies to date explore feasibility.

Objectives: This study will: 1.) assess existing breast cancer mobile apps’ effectiveness as a treatment preference integration medium, and 2.) identify the goals and preferences of women with MBC regarding symptom and side-effect management.

Methods: Social cognitive theory was applied to evaluate mobile application functionality for assisting treatment decisions through identification of goals and preferences. Women’s preferences for symptom and side effect management were gathered through qualitative, semi-structured interviews.

Results: Current apps for breast cancer lack specific functions dedicated to the identification of patient goals and preferences. Women with MBC value outcomes allowing them to continue working or engaging in family activities.

Implications: Results encourage continued innovation in mobile application development to better encourage preference-based care.

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Investigation of the polyol pathway in Entamoeba histolytica

Abstract:
Entamoeba histolytica is an anaerobic parasitic amoebzoan which causes amoebic dysentery in many developing countries. However, the specific energy metabolism of this organism is still unknown. This study investigates the involvement of the polyol pathway, which consist of aldose reductase, sorbitol dehydrogenase and fructokinase as a possible solution to the energy imbalance in E. histolytica’s glycolytic pathway. Previous studies of E. histolytica’s genome have confirmed genes corresponding to aldose reductase and fructokinase, however, any corresponding to sorbitol dehydrogenase are not apparent. In order to address this inquiry E. histolytica DNA was extracted from mixtures grown at temperatures that mimicked environments similar to those found in the human body to confirm the presence of aldose reductase and sorbitol dehydrogenase activity. Additionally, fructokinase genes were cloned into RNAi to investigate the role of fructokinase as a part of the polyol pathway.

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Scholarship/Donor Information:
Summer Research funded by the Clemson EPIC Mentor NIH T35 Program
Abstract:
Stress is the body’s response to physical and psychological pressure. For medical students, the stress response is triggered by pressure from academic performance, excessive workload, and personal life events. Inadequate stress management in medical school foreshadows future problems for physicians, which in turn may negatively impact patient care. This study was designed to assess physiological and perceived stress in medical students, measured by salivary cortisol and the Medical Student Stressor Questionnaire (MSSQ), respectively. Thirty first and second year medical students, ages 21-26, were recruited from UofSCSOMG and assessed once on both physiological and perceived stress between 9 and 10 AM. Previous research outlines the relationship between salivary cortisol levels and chronic stress, stating that chronically stressed subjects show increased cortisol levels in comparison to healthy subjects. These studies align with our results, which indicate that both male and female medical students have significantly higher than normal levels of salivary cortisol. A 1-sample t-test showed that male medical students (t(11) = 7.925, p < 0.001) and female medical students (t(17) = 4.431, p < 0.001) had higher than normal levels of cortisol, where male medical students had much higher cortisol. Additionally, 10% of students scored high on the MSSQ while the remainder scored in the mild to moderate ranges. These findings may help medical students better recognize their stress and develop countermeasures. Furthermore, adequate stress management in medical school may help resolve problems for future physicians and improve their health care delivery.

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Faculty Advisor: Lauren Fowler, PhD Department: BMS
Identifying Patient Therapeutic Goals and Preferences to support Patient-Centered Care: A Qualitative Study

Abstract:
Trypanosoma brucei is a Kinetoplastid parasite that causes Human African trypanosomiasis, better known as African Sleeping Sickness. These parasites contain vital peroxisome-like organelles called glycosomes that house multiple metabolic pathways. Proteins are targeted to glycosomes by the soluble receptors, PEX 5 and PEX 7 that bind PEX 13 and PEX 14 contained in the docking complex. PEX5 and PEX7, each detect a peroxisome targeting sequence (PTS sequence) on proteins destined for the glycosomes and interact with the docking complex. Kinetoplastid parasites have two PEX13s, PEX13.1 and PEX13.2, both containing a N-terminal YG-rich region that interacts with PEX5 and PEX7. PEX13.1 differs from PEX13.2 in that it contains a C-terminal SH3 region. The PEX13.1 YG region has conserved serine residues while the PEX13.2 YG region has conserved leucine residues that we believe play a role in the binding affinity of the PEX5 and PEX7 interactions. These unique regions have potential as prospective drug targets. We have transformed the gene construct for the PEX13.1 YG region, PEX 13.2 YG region, and PEX13.1 SH3 region into M15 strain of E. coli for protein purification. In this work, we explored several expression and purification conditions but were unable to find conditions that supported protein expression. We have transformed expression constructs into a different strain of bacteria, BL21, and future studies will focus on assessing whether proteins are expressed in these cells. Once purified, these recombinant proteins will be employed in future experiments to study the binding affinity with PEX 5 and PEX 7.

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Summer Research funded by the Clemson EPIC Mentor NIH T35 Program
Abstract:
This study seeks to identify the association between illness perception and diabetes (type 2) control, as measured by HbA1c. Current literature suggests favorable illness perceptions have been associated with better health outcomes, while unfavorable illness perceptions have been associated with worse outcomes. The Illness Perception Questionnaire (IPQ-R) assesses a patient’s positive and negative beliefs about their illness by scoring eight dimensions—identity, timeline (acute/chronic), consequences, personal control, treatment control, coherence, cyclical, and emotional representations. It is hypothesized that more negative beliefs regarding a patient’s diabetes will correlate with a higher HbA1c, while more positive beliefs regarding a patient’s diabetes will correlate with a lower HbA1c. From these results, a multifaceted, patient-centered approach that might include behavioral, educational, and psyc

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Summer Research funded by the Department of Medicine
Molecular Characterization of Cancer Patient Samples using Mutational Analysis and Glycomic Profiles

Abstract:
Galectins are a family of β-galactoside binding proteins which are involved in many cellular pathways and are upregulated and aid in cancer pathologies. Neoplasms are caused by accumulated mutations that allow a cell to undergo unregulated growth. Personalized treatment of these cancers involves mutation-specific medications. Tumor glycobiology is also altered and specific glycans are used as markers of tumor progression. Our study investigates galectin, mutation, and glycomic profiles in an effort to create molecular signatures for cancer types and stages. The serum levels of five galectins (-1, -3, -7, -8, and -9) in 35 breast and 39 lung cancer patients were determined using ELISA assays. We analyzed the patients’ mutation information from a 50 cancer-critical gene panel. The galectin levels were analyzed in reference to gene mutations, and by the affected cellular pathway of the mutation to find correlations. Second, a comprehensive glycomic profile of 40 breast cancer patient neoplasms and adjacent healthy tissues is being analyzed using MALDI TOF mass spectroscopy. Our current findings show that patients with mutations in the FLT3 and KIT genes have significantly different levels of serum galectin-1 than other cancer patients. Work is currently underway for the survey of glycomic profiles. Together, these three molecular profile sets (gene mutations, glycomic profiles, and serum galectin levels) can potentially provide signatures for stages of cancer and will also inform the personalized care of the patients of the Prisma Health Cancer Institute.

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Elucidating the Hemocompatibility of Nanoparticles

Abstract:
The tremendous potential of nanomedicine is reflected by the 300 applications the FDA has received in the last 10 years for drugs utilizing nanoparticles.1 Unfortunately, there remains an incomplete understanding of the effect of these nanomaterials on blood, and a lack of robust protocol standardization for their testing and approval.2 Polyethylene glycol-b-polylactic acid (PEG-PLA) and polyethylene glycol-poly(e-caprolactone) (PEG-PCL), are copolymers composed of FDA approved polymers.3 This study will examine their effects on whole blood and individual blood components. Hemolysis, coagulation, and complement activation will be studied in vitro adopting protocols from the Nanotechnology Characterization Lab of the National Cancer Institute.4 Additionally this study aims to characterize the relationship between nanoparticle characteristics and hemocompatibility.

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Faculty Advisor: Jessica Larsen, PhD Department: Clemson Bioengineering
Racial Disparities and Outcomes of Patients Undergoing Ventral Hernia Repair

Abstract:
“Background: Disparities in surgical outcomes have been linked to race, insurance status, and even median household income. There is a paucity of data on the effect of disparities on outcomes after ventral/incisional hernia repair. We hypothesize that race, insurance status and median household income will be directly correlated with surgical outcomes.

Objectives: Use data from two distinct ventral hernia repair databases and analyze correlation between race, insurance status, and median household income with ventral hernia repair surgical outcomes.

Methods: A retrospective case study will be performed utilizing the Prisma Health Hernia Database and the Abdominal Core Health Quality Collaborative (ACHQC) Database. Patients who underwent ventral/incisional hernia repair from 2010-2021 will be analyzed for Surgical Site Occurrence (SSO), Surgical Site Infection (SSI), Surgical Site Occurrence/Infection Requiring Procedural Intervention (SSOPI), Length of Stay (LOS), hernia recurrence and 30-day readmission. Controlling for medical comorbidities, comparisons will be made on surgical outcomes between race, insurance status, and median household income. Median household income for each zip code was established using 2019 data from the United States Census Bureau.

Expected results: These research findings will highlight differences in disparities and hernia repair outcomes. However, other factors may also contribute to racial disparities in postoperative outcomes after a ventral hernia repair. Further investigation into racial disparities and surgical outcomes is necessary.

Keywords: Disparities; Race; Ethnicity; Ventral hernia repair; Postoperative outcomes

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The Role of Medical Student Notes within the Emergency Department Team

Abstract:
“Background:
The purpose of medical school is to develop competent physicians, and one of the most fundamental skills is the ability to document a clinical encounter. Previous research, however, revealed most students lack proficiency as less than two-thirds were allowed to use the electronic medical record (EMR). A common perception among physicians existed that teaching medical students was an additional burden. A 2018 change by the Centers for Medicare and Medicaid allowing student notes in the official medical record offers an opportunity for increased EMR student education and participation in the patient care team.

Methods:
The study will examine the impact of medical students on emergency department productivity, as well as their perceived value. Student activities and perceptions will be tracked through observation shifts, in which a medical student’s activities will be thoroughly documented. Upon completion of the shift, the student and attending will be surveyed on the following areas: documentation, helpfulness, and observed student activities. Survey responses will also be gathered at the conclusion of non-observation shifts to expand the dataset.

Results/Conclusion:
Physician burnout has often been associated with documentation obligations. Due to this fact, we believe the CMS policy change encourages physicians to engage students in the note-taking process. Students can minimize the burden of documentation and in return receive feedback for their efforts. Consequently, we expect to see an increase in EMR student engagement and a positive change in physician perception.”

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Models of Access to Care for Immigrant Children

Abstract:
“Background: Structural barriers such as language access services, transportation, health insurance eligibility, education and the complexity of health information impede access to healthcare for children in immigrant families. Political determinants of health, such as restrictive immigration policies, impede access to funding for inclusive healthcare delivery models, particularly for undocumented immigrant children and their families. All children, regardless of family or personal immigration status deserve access to high quality health care. Therefore it is essential to identify best practices and effective models of care delivery.

Methods: With the assistance of a medical librarian, a literature review search was conducted with structured search terms to investigate the published models of care for immigrant children and families. Terms were selected to identify models of care provision for immigrant children including “models of care,” “charity care,” “immigrant health,” “undocumented,” and “uninsured.” Results were then filtered for references to children and being within the United States. The models of care and strategies of providing care to immigrant children were then catalogued.

Results: The majority of the literature review results were published in or prior to 2010. The literature describes various models of care including traditional FQHCs; state, city or county funded health insurance; hospital sponsored charity care; and school based or free/mobile clinics often arising from partnerships between the community and academic centers. Strategies to reach the immigrant population were also described and included the use of existing infrastructure for current medical programs, connections made through the school system, and ensuring that care hours were accessible for working parents. Recurrent themes of successful programs included language services, cultural competence/humility, overcoming barriers to accessing technology and the adaptation of programs to fit the needs of the population. Multiple programs also described the roles of lay community health workers, such as Promotoras, along with professional advocates.

Conclusion: Various models of health care provision for immigrant children and families have been described in the literature along with methods to ensure adequate enrollment and access, however more recent research is lacking including associated health outcomes. Additionally, different immigrant populations such as unaccompanied minors may face other barriers and require specific strategies be adopted to meet their needs. As an increasing number of immigrant families and unaccompanied children seek safety in the US, it is crucial that best practices for health care access be developed to reach these populations using approaches specific to each community’s sociopolitical context.

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Female Sexual Dysfunction in Patients with Abnormal Uterine Bleeding

Abstract:
There is minimal research in medical literature regarding the relation between female sexual dysfunction (FSD) and abnormal uterine bleeding (AUB). Both FSD and AUB can wreak havoc on the lives of patients. This case-control study was designed to determine what correlation exists between FSD and AUB. Gynecology patients at the Prisma Health Upstate - OBGYN Center and Prisma Health Midlands OBGYN - Sunset Drive are given the opportunity to enroll in the study if they are between the ages of 18 and 55, pre-menopausal, and sexually active. Patients are excluded if they meet any of the following conditions: age less than 18, post-menopausal, history of hysterectomy, pathological diagnosis of endometriosis, diagnosis of irritable bowel syndrome, diagnosis of pelvic floor dysfunction, or history of sexual assault, as these conditions can affect sexual function. Enrolled patients are given the Female Sexual Function Index-6 (FSFI-6) questionnaire, which consists of 6 questions regarding desire, arousal, lubrication, orgasm, satisfaction, and pain. Each question is scored using a Likert Scale; then, the responses are summed and a score of \( \leq 19 \) is diagnostic for FSD. Other demographic information obtained from the patient’s chart include race/ethnicity, age, BMI, obstetric history, last menstrual period, marital status, hormone replacement therapy, birth control method, and use of antidepressants. The diagnosis of AUB is then looked at to see if it is ultrasound proven, which is further categorized by the PALM-COEIN classification system. The project is still in its early stages and patients are being enrolled continually; therefore, we do not have any results to share yet.

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Improving Radiographic Data Capture for the Prisma Health Comprehensive COVID-19 Registry

Abstract:
COVID-19 is a highly contagious acute respiratory disease that was declared a global pandemic by the World Health Organization (WHO) in March 2020. Given its novelty, it is important to collect data about the disease to understand how it affects patient populations, its progression, and to evaluate patient outcomes. The Prisma Health Comprehensive COVID-19 Registry was created to allow for analysis of COVID-19 related data. This registry supports local research efforts and allows for collaboration with external partners, such as Viral Infection and Respiratory Illness Universal Study (VIRUS), an international COVID-19 registry. However, radiographic data are difficult to incorporate into registries as its narrative-like reports require manual abstraction. The purpose of this project is to implement quality improvement practices to make the process of radiology data abstraction more uniform and systematic to contribute to the Prisma Health registry. Data from chest x-rays (CXR), chest CT, lung ultrasound (US) and echocardiograms were manually abstracted from patient’s electronic medical records on EPIC and entered into REDCap. An abstraction manual was created in order to ensure reliability of data entry between team members. To date, 5,220 COVID-19 positive patients received a total of 5,676 radiographic imaging between March 1 and August 31, 2020. 2,584 of these images have had their interpretation extracted.

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Abstract:
“Platelet-activating factor (alkylacetylglycerolphosphocholine; PAF) is a potent signaling phospholipid which has been found in numerous cell types. In reproduction, PAF is found to have a variety of roles ranging from ovulation to sperm function. PAF is produced by two distinct pathways namely: de novo pathway, and the remodeling pathway which requires the production of 1-alkyl-2-lyso-sn-glycero-3-phosphocholine (lysoPAF) via the enzyme phospholipase A2. This is then followed by the transfer of an acetyl residue to lyso-PAF to produce PAF. It is not known if sea urchins contain an acetyltransferase enzyme capable of acetylating Lyso-PAF to PAF. As a first step to identifying this enzyme, this research aimed to determine if sea urchin embryo extracts contain acetyltransferase activity towards synthetic Lyso-PAF. Individual Lytechinus variegatus sea urchins were injected with 0.5 mL KCl (0.5M) to induce gamete shedding and pooled accordingly. Oocytes were inseminated with spermatozoa in synthetic sea water and cultured (for approximately 90 minutes) to produce two-cell stage embryos. The two-cell stage embryos were selected and cultured in synthetic sea water for 24-hours at 22ºC. Embryos were then frozen subsequently thawed three times to induce cellular lysis. Lyso-PAF (Cayman Chemicals) was dissolved in deuterated water. Lyso-PAF alone, Lyso-PAF with XuM Acetyl-CoA, Lyso-PAF with XuM AcetylCoA and embryo extract, and Lyso-PAF with embryo extracts were all assessed with H1 NMR and C13 NMR after a 30-minute incubation at room temperature. These spectra were obtained via a 500mHz NMR. Initial results revealed that the acetyl-CoA peak on the NMR resides in the same location as where we expect the acetylated Lyso-PAF peak to reside. Therefore, additional experiments are planned to try and resolve these two peaks.
Future directions for this research will include bioinformatics analysis of the annotated sea urchin genome to try and identify the acetyltransferase gene that could be responsible for Lyso-PAF acetylation.”

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Summer Research funded by the Prisma HSC Seed Grant
Stakeholder Perceptions on Screening and addressing the social determinants of health at the Internal Medicine Clinic

Abstract:
“Background: Social determinants of health (SDoH) are defined by the Center for Disease Control and Prevention to be the “conditions in the places where people live, learn, work, and play that affect a wide range of health risks and outcomes”. Experts suggest that social factors outweigh medical care in contribution of premature mortality, highlighting that the health of the populations cannot be improved only within the medical settings. Prisma Health plans to implement universal SDoH screening in primary care, but little is known on provider and patient perspectives on this rollout. Methods: Semi-structured interviews were conducted to collect qualitative data from clinicians and patients to gauge their perspectives on this screening and resource connection pathway as part of planning cycle for process improvement. Results: The results were coded for basic themes in order to evaluate overall trends in feedback. Themes that emerged in conversation with patients and staff regarding the impact of the screening tool include improvements in SDoH and resource awareness, greater resource support, an enhanced resource referral network, improved resource infrastructure, and strengthened SDoH monitoring. Conclusions: Overall, there has been positive sentiment from both the patient and staff demographic. There is an appreciated need and motivation to include SDoH screening into patient care. Future Steps: Launch in clinical practice of a screening tool to identify patients within Prisma Health’s Internal Medicine Clinic with SDoH needs and connect them with the appropriate resources via the NowPow digital referral platform.”

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Faculty Advisor: Meredith Eicksen, MD Department: Medicine
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Summer Research funded by the Department of Medicine
Disparities in perinatal mood disorder screening and prevalence

Abstract:
“Introduction: Perinatal mood disorders (PMD) are the most common complication in pregnancies and can have significant impacts on both the mother and child. It is recommended that screening for PMD occur at least once during pregnancy; however, the overall rate of screening for depression in pregnant and postpartum women is low. Racial and socioeconomic disparities exist in the screening of depression in non-pregnant patients, so in this study, we aim to assess if racial, language, or insurer disparities exist in the screening and prevalence of PMDs.

Methods: A retrospective cohort study was conducted using a sample of women who received perinatal care, had no prior psychiatric diagnoses beyond depression/anxiety, and delivered at one of two urban hospitals during a six month period.

Results: When analyzing screening in the perinatal period, 87.8% of pregnant women were screened at least once with 15.59% of those screening positive for PMDs. There was a significant difference in screening prevalence by type of clinic (teaching or private), ethnicity, and insurer. There was also a significant difference in PMD prevalence by ethnicity and language. Within the prenatal period, there was a significant difference in screening prevalence by race, ethnicity, language, insurer, and clinic type. Within the postpartum period, there was a significant difference in screening prevalence by ethnicity and clinic type.

Conclusion: The main driver of screening was clinic type. This conclusion is consistent with previously published literature.

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Outcomes of Subsequent Abdominal Operations after an Initial Ventral Hernia Repair

Abstract:
“Introduction: There are several potential planes for mesh placement when performing a ventral hernia repair (VHR), and this choice can affect the outcomes of subsequent abdominal operations (SAO). Previous studies show that intraperitoneal mesh (IPOM) placed during a VHR leads to longer operative times in a SAO as well as increased risk of enterotomy, surgical site infection/occurrence (SSI/SSO), and a greater amount of adhesions to mesh. We evaluated a large cohort of SAO after prior VHR to compare outcomes.

Methods: A retrospective chart review was performed in Epic within Prisma Health/Greenville Memorial Hospital of patients with VHR between 2005 and 2020. For these with reoperations, indication for surgery, adhesions, operative time, and complications were collected. Data will be presented using mean values with standard deviation.

Results: We identified 405 patients with an SAO after VHR. For mesh placed retro-muscularly, 42.7 % of SAOs were due to hernia recurrence or wound complication. The rate of enterotomy was 0.6 %, and a high category of difficulty score in lysis of adhesions to mesh was 3.2 %. In comparison to mesh placed IPOM, 57.4 % underwent SAO due to hernia recurrence or wound complication. The instance of enterotomy was 2.8 %, and high grade lysis of adhesions occurred in 8.3 % of reoperations. Upon further data review we plan to compare the whole group of mesh placement in different planes of the abdomen to the IPOM group.

Conclusion: From preliminary results, our data will support prior literature that mesh placed in a location other than IPOM will result in better outcomes for the patient when it comes to a SAO.

“

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Summer Research funded by the Department of Surgery
A Comparison of H. Pylori Detection Methods

Abstract:
“Background: Helicobacter pylori (H. pylori) infects over 50% of the world's population and can lead to gastric cancer if left untreated. An estimated 26,000 gastric cancer cases will occur in the United States in 2021 with 40% of cases becoming the primary cause of death. Invasive and non-invasive techniques are used to diagnose H. pylori infection, however, there is controversy regarding what technique should be considered the “’gold standard’’ for diagnosis.

Objective: To evaluate the efficacy of H pylori invasive detection methods: stained biopsy and Rapid Urease test [RUT])

Methods: 200 patients (100 H. pylori + and 100 H. pylori -) from a single institution that underwent gastric biopsies were retrospectively evaluated for H. pylori status. Demographics and clinicopathologic data were collected including diagnostic tests performed, treatment, and outcomes.

Results: When histology was identified as positive, RUT was also positive (92.5%), likewise, when histology was negative, RUT was negative (93.9%, Table 3). Disparate results occurred in 7% of samples with n=2 (6.1%) of histology positive when RUT was negative and n=3 (7.5%) histology negative but the RUT test was positive (p<0.001). Of those that were H. pylori positive, 60% had a post-treatment test completed. Gastric cancer developed in 3 patients (1.5%), all of which were H. pylori positive.

Conclusions: This study found that histology and RU testing yield similar results, therefore, there is no efficacious reason to run both tests. Since histology has a greater sensitivity (>95%), it should be considered the “’gold standard’’ as the literature suggests.

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Faculty Advisor: Christine Schammel, PhD Department: Pathology
Youth Infant Characteristics and Laboratory Findings Associated with a Positive FilmArray Meningitis/Encephalitis PCR Panel

Abstract:
“Background: Meningitis and encephalitis are associated with significant morbidity and mortality. Early identification of viral and bacterial etiologies of meningitis can influence management and outcomes. The current gold standard for bacterial meningitis diagnosis is cerebrospinal fluid (CSF) culture. However, Meningitis/Encephalitis (ME) CSF PCR panels are being used more frequently to detect both bacterial and viral pathogens in a timelier fashion. ME PCR panels have been studied in an array of patient populations, but few studies have focused on young infants (≤90 days).

Objective: To describe the clinical and laboratory characteristics associated with a positive ME PCR panel in young infants evaluated in the Emergency Department (ED) or the hospital setting.

Methods: A single-site retrospective chart review is being conducted. The focus patient population is young infants evaluated in the ED or hospital setting where a ME PCR panel was ordered during the initial evaluation. De-identified patient demographics, clinical characteristics, laboratory evaluation, imaging, treatment provided, hospital course, and outcomes will be collected from patient charts and recorded into REDCap.

Results: 1118 patient charts have been identified to review, with some patients having multiple ME PCR panels ordered, resulting in a total of 1209 encounters for review. Descriptive statistical analysis will be conducted after data collection is completed.

Conclusions: The data collected from this study will hopefully contribute to understanding the differences between ME panel positive and negative patients may guide quality improvement efforts to utilize the ME panel in a targeted approach to identify young infants more likely to have meningitis.

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Faculty Advisor: Nicholas Potisek, MD Department: Pediatrics

Scholarship/Donor Information:
Summer Research funded by the Department of Pediatrics
Connect for Health Pediatric Weight Management Program Patient Experience with Care Survey

Abstract:
Childhood obesity is a national healthcare priority, placing an increased risk of morbidity and decreased quality of life for pediatric patients affected by obesity. Obesity treatment recommendations from the United States Preventive Services Task Force are rarely utilized by physicians and have been found to have low patient satisfaction. Therefore, standard care is often inadequate. A need for pediatric weight management programs that are readily utilized by physicians, enhance patient experience, and improve standard practice for pediatricians and family physicians remains. The aim of this study is to evaluate patient/parent experience within a pediatric weight management program, Connect for Health. Connect for Health is an evidence-based program that equips physicians, patients, and parents with resources to improve family-centered health outcomes for high-risk children with obesity. Implementation of the Connect for Health intervention is occurring at three diverse healthcare sites and includes a patient population of over 30,000 children ages 2-12 who have a Body Mass Index ≥ 85% percentile. Patient experience is collected by distributing a Patient Assessment of Chronic Illness Care survey to parents of participants. Data will be collected in RedCap and evaluated by Massachusetts General Hospital to determine how/if the program affected behaviors and the usefulness of family-centered tools in meeting behavior change goals. Results of this study will be used to improve the strategies within Connect for Health weight management program; and therefore, potentially create a novel and successful way of delivering treatment to pediatric patients with obesity in the clinical setting.

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Scholarship/Donor Information:
Summer Research funded by the Department of Pediatrics
Conner Horne

Synthesis of a Novel Antimicrobial Siderophore

Abstract:
Antibiotic resistance occurs when bacteria obtain the ability to metabolize, destroy, or otherwise mitigate the drugs specifically designed to treat resultant infections. These evolutionary tactics allow bacteria to become unresponsive to treatment and able to spread within the host unchecked. This process is an ever-growing threat to medicine and patient health; making certain infections more difficult, if not impossible, to treat. To counteract this evolutionary advantage, researchers have previously successfully utilized siderophore-based iron acquisition, a mechanism of bacterial iron scavenging, as a method to deliver antibiotics into bacteria. Additionally, gallium, an element that disrupts redox-driven biological reactions has also been utilized previously as an antimicrobial. The goal of this project is to combine these two proven methods into a combination antimicrobial therapy to overcome antibiotic resistance. Synthesis occurred utilizing modern synthetic chemistry techniques following a previously published chemical synthesis of a precursor compound to an iron-containing siderophore compound. Step 5 product of the 6-step synthesis was successfully isolated and purified as confirmed by H1 NMR analysis, indicating that the desired product can be made in the future. Following successful synthesis, isolation, and purification of molecule 6 of the 6-step synthesis, gallium will be introduced into the synthesis instead of iron, thus creating an active moiety of the novel drug which will advance into anti-microbial testing studies, which if effective will serve as another weapon in the arsenal to fight microbes and the diseases they cause.

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Faculty Advisor: Steven Fiester, PhD Department: BMS

Scholarship/Donor Information:

SOMG Summer Research Scholar funded by the Sargent Foundation
Complications after reverse shoulder arthroplasty lessening over time: 
A Retrospective Review of Complications

Abstract:
“Background- Reverse shoulder arthroplasty (RSA) has gained popularity for its expanded indications, such as rotator cuff arthropathy, irreparable rotator cuff tear, proximal humerus fracture, arthritis with glenoid deformity, and failed hemiarthroplasty or anatomic total shoulder arthroplasty. Despite concerns about reported high complication rates, the complication rates may be less than originally reported. The goal of this study was to compare types and rates of complications after RSA over time at a single tertiary referral center. Our hypothesis was that the types and rates of complications have shown a statistically significant reduction over time.

Materials and Methods- Two six-year consecutive series of patients who underwent RSA were included. The first group consisted of 183 shoulders with RSA performed between 2003 and 2008. The second group consisted of 355 shoulders with RSA performed between 2009 and 2014. Patient demographics, preoperative diagnosis, and post-operative data, such as range of motion and patient reported outcome measures were collected at the minimum two-year follow up.

Results- In the first group, there were 30 complications in 183 shoulders (16%). Infection (5%), instability (3%), and mechanical component failure (3%) were the most common complications. In the second group, 12 complications occurred in 355 shoulders (3.4%). Instability (1%) and infection (1%) were the most common complications.

Conclusion- A significant reduction in complication rate was found over time. Infection and instability remain the most common complications, while implant failure seems to be lessening.

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Faculty Advisor: Stephen Pill, MD Department: Orthopedics

Scholarship/Donor Information:
SOMG Summer Research Scholar funded by the Sargent Foundation
Social Determinants of Health Impact on SARS-CoV-2 and RSV Incidence and Severity in Upstate South Carolina

Abstract:
“Respiratory Syncytial Virus (RSV) and Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) are viruses that cause acute respiratory infection. In the US, over 700,000 children have tested positive for SARS-CoV-2 and RSV infection which could result in ~100,000 pediatric hospitalizations each year. However, minimal data is available on how community-level socioeconomic factors and health disparities impact pediatric severity and infection risk from SARS-CoV-2 and RSV. The current study was designed to evaluate the impact of social drivers of health on the incidence and severity of pediatric SARS-CoV-2 and/or RSV infection and to assess the correlation of community health factors on clinical outcomes in children with SARS-CoV-2 and/or RSV infection. The study will collect data from Prisma Health patient medical records from April 1, 2019, to March 31, 2021, with specific query criteria to isolate the SARS-CoV-2 and RSV population. Community socioeconomic data will be obtained from the US Census Bureau and the 2017 American Community Survey. Statistical models will be used to determine associations between patient demographics, community factors, and infection risk or severity. Aeronautical Reconnaissance Coverage Geographic Information System will be used to conduct hotspot analyses to identify potential locations that are susceptible to infection with SARS-CoV-2 or RSV. The data obtained from this study may be used to improve the care of children in Upstate South Carolina during respiratory infection outbreaks. Understanding the effect of social drivers on health may address the disparities and create new policies that could lead to equitable outcomes across a diverse population.

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Faculty Advisor: Brooks McPhail, PhD Department: BMS
Scholarship/Donor Information:
Summer Research funded by the Prisma HSC Seed Grant
Robotic Resection of Mediastinal Parathyroid Masses

Abstract:
“Hyperparathyroidism is a condition in which the parathyroid glands oversecrete parathyroid hormone (PTH), resulting in hypercalcemia. Treatment involves a cervical parathyroidectomy, but in the rare case of a mediastinal gland, more invasive approaches may be needed. Thoracoscopic approaches have limitations and have not been widely accepted. Robotic mediastinal parathyroid gland resection has not been well studied in the literature. Our study evaluates our outcomes utilizing robotic mediastinal parathyroid gland resection for hyperparathyroidism and hypercalcemia.

After IRB approval, a retrospective review of the thoracic surgery database was performed from June 2011-July 2021 for mediastinal masses. 46 patients who had a mediastinal mass were found, with four patients having a mediastinal parathyroid gland. All four patients underwent a robotic resection. We reviewed the patients’ charts to determine the complication and success rates for resection. All patients had hyperparathyroidism with preoperative PTH levels ranging from 162-416pg/ml (normal: 9-77pg/dL), and hypercalcemia with preop calcium levels ranging from 11.1-12.6mg/dL (normal: 8.4-10.4mg/dL). There were no intraoperative complications. Postoperatively patients had short hospital stays with a 1.75-day average length of stay. No mortalities were seen. Postop complications included one patient developing atrial fibrillation with rapid ventricular response on Postoperative day(POD) 1. Postoperative PTH levels returned to normal with ranges from 19-59pg/mL @ 10 minutes. Postoperative calcium levels also returned to normal with ranges from 8.2-10.1mg/dL. No patients had recurrence of their hyperparathyroidism or hypercalcemia.

We found the robotic approach to resecting mediastinal parathyroid glands to be a safe, and effective approach for resection of mediastinal parathyroid glands.

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Faculty Advisor: William Bolton, MD Department: Surgery
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SOMG Summer Research Scholar funded by the Sargent Foundation
Incidence of COVID-19 infection related to school district policy.

Abstract:
“The onset of the COVID-19 pandemic during the South Carolina school year presented a challenge to education officials. As a result, South Carolina school policies related to COVID-19 evolved over the course of the pandemic. The goal of this research is to determine if school policies such as mask requirements and virtual learning decreased the rate of COVID-19 infection in the pediatric population (<18 years old).

In this study, the South Carolina Department of Health and Environmental Control (DHEC) database will be queried from March 1, 2020 to May 31, 2021 for COVID-19 cases confirmed in the pediatric population via positive PCR or antigen tests. Data sets will be collected from pediatric patients located in the following SC counties: Anderson, Greenville, Oconee, Pickens, and Spartanburg. School district policies regarding COVID-19 will be obtained from official school websites. Weekly cases and policies will be compared to determine if these policies significantly decreased COVID-19 infection rates.

The current study hypothesizes that school district policies which encouraged students to wear masks or transition to remote learning may decrease the rate of COVID-19 infection in the school age population. Determining the contribution of school policies on the rates of infection in children will provide a measure by which new plans and procedures can be developed. Understanding how policies impact the rate of infection could encourage students and education officials to improve practices in the future, as well as grant insight into how communities can prepare for and respond to future pandemics.”

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Scholarship/Donor Information:
Summer Research funded by the Prisma HSC Seed Grant
Abstract:
“Entamoeba histolytica is a food and waterborne parasite that causes 50 million cases of amoebiasis annually. Despite such prevalence, little is known about the parasite’s divergent genome. One-third of putative genes encode proteins that are unique to Entamoeba. Studying such hypothetical proteins may reveal novel drug targets. E. histolytica exhibits a 2-stage life cycle that includes the infectious amoeba and environmentally stable cyst. Due to the difficulty of inducing cyst formation of E. histolytica in vitro, many laboratory studies are conducted with a related reptilian pathogen, E. invadens, which readily forms cysts in vitro. We previously characterized a hypothetical protein in E. invadens (EIN_059080) and found that it regulates encystation and phagocytosis. Since these are important virulence functions, the goal of this project is to characterize the E. histolytica homolog of this protein (EHI_056700). To isolate the gene, E. histolytica genomic DNA was purified and used as a PCR template with gene-specific primers that also added BglII and XhoI restriction enzyme sites to the ends. The PCR-amplified gene was subcloned into a Trigger plasmid, which facilitates reduced expression of genes by RNA-interference (RNAi) and confers resistance to the antibiotic, G418. DNA sequencing was used to confirm the correctness of the gene in the Trigger plasmid. E. histolytica cells were transfected with the Trigger plasmid using the reagent, Lipofectamine 3000 (Thermo Fisher). Transfected cells were selected by adding G418 to the medium. Future studies will include confirming gene knockdown of expression by RT-PCR and characterizing virulence functions in transfected cells.”

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Faculty Advisor: Lesly Temesvari, PhD Department: Clemson EPIC
Scholarship/Donor Information:
Summer Research funded by the Clemson EPIC Mentor NIH T35 Program
Abstract:
The purpose of this project is to determine if there is a patient preference for the use of telehealth visits for routine prenatal healthcare in a socioeconomically and racially diverse patient population. Considering that prenatal care standards developed in the late 1800s remain relatively unchanged in today’s practice of medicine, it is important to identify effective strategies to deliver prenatal healthcare in the context of modern society. With the rising use of technology in the medical field, telehealth has gained momentum with the possibility of restructuring the delivery of prenatal health care. In response to the COVID-19 pandemic, the opportunity to incorporate these visits into the maintenance of care for pregnant women has increased, allowing for an analysis of patient preference, accessibility, and health outcomes. This cross-sectional study will include postpartum women at an urban delivery hospital who have received at least one telehealth visit over the course of their pregnancy. An electronic survey will be administered to English and Spanish-speaking patients to determine patient satisfaction and utilization of telehealth for prenatal care. Following data collection, REDCap (Research Electronic Data Capture) statistical software will be used to evaluate the effectiveness of telehealth as a mode of delivery for prenatal healthcare.

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Analysis of deubiquitinating enzyme (DUBs) expression in blastocoel fluid from IVF-generated embryos may serve as a biomarker to aid in reducing miscarriages

Abstract:
As the prevalence of infertility cases continue to increase, the use of in vitro fertilization (IVF) has become more frequent. Therefore, the importance of selecting viable IVF-generated embryos for uterine transfer has become paramount. This study aims to identify molecular markers in blastocoel fluid that could serve as potential biomarkers for reducing miscarriage rates. Blastocoel fluid was collected from day-5 human IVF-generated embryos immediately following trophectoderm biopsy. Media from 25 embryos with known implantation outcomes were analyzed for gene expression levels of selected DUBs (MYSM1, USP22, USP28, and USP34) and an additional 17 samples were also analyzed for USP34 alone. Aggregate DUB mRNA expression levels were compared in embryos associated with positive vs. negative implantation outcomes via a Welch's t-test. Additionally, DUB activity was assessed in an additional 21 individual blastocoel fluid-conditioned media samples with a fluorescent DUB Activity Assay Kit (Cayman Chemicals). This analysis revealed expression for DUBs MYSM-1, USP-22, USP-28, & USP-34 was increased in blastocoel fluid from implanted embryos vs nonimplanted embryos (p < 0.05). mRNA detected in the blastocoel fluid likely originates from the cytoplasm of embryonic cells that underwent apoptosis. A potential mechanism for increased DUB levels could be that more viable preimplantation embryos exhibit tighter regulatory control thereby increasing apoptosis of cells with upregulated DUBs, which are known to be pathogenic. In conclusion, this study shows that analysis of mRNA expression of DUB genes in blastocoel fluid could be used as an additional tool when selecting the most viable embryos in IVF patients.

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SOMG Summer Research Scholar funded by the Sargent Foundation
Abstract:
Actinic Keratoses (AKs) are rough, erythematous scaly skin lesions that pose a risk of progressing into invasive squamous cell carcinoma (iSCC). AKs are one of the most common dermatological problems seen in a clinical setting accounting for more than 5 million office visits per year. Yet, current treatment guidelines are limited to recommendations based on size of treatment area. In this paper, we expand on current U.S. guidelines by taking a real-world approach and making treatment recommendations based on various clinical scenarios. Using a systematic literature review, we analyzed data from clinical studies on currently available treatment options to determine the best treatment course for 7 distinct challenging clinical cases. The recommendations for use of cryosurgery, surgical interventions, or topical treatment options varied based on lesion characteristics (i.e. number, location, severity) and patient-specific factors (i.e. history of iSCC, recurring AK lesions, special populations). This analysis is based on the best available evidence at the time it was conducted, thus recommendations are bound by limited data of real-world treatment outcomes and long-term follow-up data. Despite these limitations, we simulate true clinical decision-making dilemmas associated with challenging cases and current FDA-approved treatment options.

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Faculty Advisor: Todd Schlesinger, MD Department: Dermatology
Investigating the Anti-Parasite activity of Diazacyclobutenes

Abstract:
“The long journey of drug discovery may be a process many do not consider. This tedious process is extremely important in creating favorable outcomes for patients. The journey of a new drug can start in many different fashions. (1) In this case, it happens to be a random side effect of a chemical compound developed by organic chemist. Recently, the Clemson lab discovered a novel method to synthesize a group of compounds, the diazacyclobutenes. (2) Creating a method of synthesis for these compounds that is efficient and cost-effective is important to consider when the goal is drug discovery. Certain derivatives of the diazacyclobutenes, have shown promise as a compound that can kill certain parasites, including Trichomonas vaginalis. T. Vaginalis infected around 2 million individuals in the United States in 2018. (4) The goal is to expand the library of novel diazacyclobutene derivatives and investigate their therapeutic effect against T. Vaginalis. This process is completed by a 2 or 4 step process depending on if you want to change the bottom or top positions, respectively. The positions are manipulated by changing the substrates used in the reactions (2). The library of novel DCB derivatives has successfully been expanded; however, due to COVID - the testing against T. Vaginalis has been halted. It is encouraging that the library of compounds to test against the parasites has been expanded; but, until the parasites and molecules can be cultured together, the anti-parasitic activity of the certain derivatives will not be known at this time.

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Scholarship/Donor Information:
Summer Research funded by the Clemson EPIC Mentor NIH T35 Program
Creating A Medical School-Oriented Map of Immunologic Processes

Abstract:
During non-clinical years of medical school, students learn about the human body's immune system and how it goes through the process of protecting individuals from foreign entities and abnormally acting "self" cells. While the materials that are taught on this subject are extensive, they differ in focus compared to what is covered to earn/work after attaining a graduate degree in immunology. Because of this, many immune system map resources are not helpful for medical students. This results in students needing to spend significant time sifting through the presented information to determine what is relevant for their studies and what is outside the scope of their learning objectives. In this project, we are aiming to create a mind map/concept map of immunologic processes that only incorporates the information medical students need without the extraneous details found in other online mapping resources. Various applications are currently being tested to determine the optimal method and organization for mapping immunologic concepts. After the map has been completed, medical student feedback about the usefulness, alignment of information to school and STEP 1 learning objectives, ease of use, and visual presentation of the map will be sought. We intend to develop an optimized and medically-relevant immunology map for use in medical education.

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Does Stroke Severity Influence Sensory Feedback Needed for Reaching?

Abstract:
In this study, we looked at comparing reaching performance of individuals with different impairment levels post-stroke. Our aim was to see if one relied more heavily on sensory feedback to complete a reaching task increased as stroke impairment levels increased. We used 3-D motion analysis with 12 cameras, 33 reflective markers, and 16 EMG sensors to get kinematic data of the participant while reaching. In a neurologically typical person, a reach velocity is a bell-shaped curve. Equal time is spent in both the feedforward and feedback phases of the reach. Feedforward is processing external stimuli and executing a motor plan. During the feedback phase of a reach, the participant processes additional external stimuli (movement speed, trajectory, angles, etc.) and makes corrections to the initial plan as needed. We measured two independent variables. The first was percent at which peak velocity (PPV) occurs (peak velocity /total movement time), which corresponds to how much of the movement is preplanned and continuous. Another variable is time post peak velocity (TPPV), which shows alterations in the original motor plan based on sensory feedback (increased TPPV = increased reliance on sensory feedback). We found that PPV was significantly (p<.05) decreased in moderate and severe impairment groups when compared to the control. Additionally, TPPV was significantly larger in the severe group when compared to the control. These findings reinforce the reliance a stroke survivor has on sensory feedback to execute a motor task and may guide therapeutic interventions to improve outcomes.

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Abstract:
The cause-of-death (COD) on death certificates (DCs) impacts epidemiology tracking, research, public health interventions, insurance payouts, and justice. Despite the availability of national resources, most physicians have not received formal training regarding DCs, resulting in errors. We completed a retrospective sampling of DCs in a single institution between 1/1/2019 and 12/31/2019 to evaluate the frequency of errors in COD reporting. Cases were excluded if final DCs could not be obtained or if the decedent’s medical record contained limited past medical history. COD reporting errors were categorized as minor and major. Minor errors did not affect the interpretation of COD, while major errors did affect the interpretation of COD. Major errors included, but were not limited to, non-specific COD, omitted significant conditions, and inaccurate underlying sequence of events. Overall, 125 patients met the criteria for the study. When considering errors, only one DC had no minor or major errors (0.8%), 22 (17.6%) contained minor errors only, and 114 (91.2%) contained at least one major error (22 major errors only, 92 with both minor and major errors, 40 with multiple major errors). Regarding major errors, non-specific COD was noted in 23 DCs (18.4%), other significant conditions were omitted in 103 (82.4%), and 57 (45.6%) contained an inaccurate sequence of events. While educational initiatives exist, they are lengthy and outdated. Creation of a revised, condensed learning module with a summary sheet for the learner upon completion is in development to assist with the efficacy of finalizing DCs within the requisite 24-hour period.

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Faculty Advisor: Christine Schammel, PhD Department: Pathology
Scholarship/Donor Information:
SOMG Summer Research Scholar funded by the Sargent Foundation
Error Occurrence in Death Certification: A Single Health System Based Review

Abstract:
The purpose of death certification extends beyond functioning as a legal document. The cause-of-death (COD) statement affects epidemiology, funding research, public health policies and initiatives, and ultimately impacts the prevention of disease processes; however, the frequency of inconsistencies and errors remain high. We completed a retrospective sampling of death certificates in a single institution between 1/1/2019 and 12/31/2019 to evaluate the frequency of errors in the COD reporting. Cases were excluded if final death certificates could not be obtained or the decedent's medical record contained limited past medical history. COD reporting errors were categorized as minor and major. Minor errors did not affect the interpretation of COD while major errors did affect the interpretation of COD. Major errors included, but were not limited to, non-specific cause of death, omitted significant conditions, and inaccurate underlying sequence of events. Overall, 124 certificates were examined and stratified by type of error: 22 (17.7%) contained minor errors only, 10 (8.1%) contained major errors only, and 92 (74.2%) contained both major and minor errors. However, when evaluating the specific class of error between groups, all classes of errors were significantly different. Class IA (multiple COD on a single entry), IB (typographic errors) and IC (omitted intervals) were only identified on the death certificates that had both major and minor errors, p = 0.03, 0.001, 0.0005 respectively. The widespread distribution of major errors indicates a need to educate physicians on death certification to accurately specify COD.

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Faculty Advisor: Christine Schammel, PhD Department: Pathology
Characterization of the Anti-Apoptotic Effects of IFIT3 During the Innate Antiviral Immune Response in an IFIT3 Knock-Out Cell Line

Abstract:
Interferon Stimulated Genes (ISGs) are upregulated during the innate antiviral immune response, though their specific functions are largely unknown. One such gene, Interferon Induced Protein with Tetratricopeptide Repeats 3 (IFIT3) is presumed to inhibit apoptosis of infected cells during the antiviral immune response. However, this has not been confirmed and the mechanism by which IFIT3 could inhibit apoptosis is not yet clear. In the present study, we have made CRISPR-Cas9 plasmids with guide RNA for IFIT3 to generate genomic mutations in the A549 cells to knock out IFIT3. Knockout cell lines were confirmed with genomic PCR and Western Blotting, while cell lines that did not successfully knock out IFIT3 were identified to be utilized as a control. By treating the knockout and control cell lines with Poly I:C, a mimic of viral RNA that stimulates an immune response, we anticipate observing an increase in apoptotic biomarkers in the cells lacking IFIT3 expression. Determining the effect that IFIT3 has on apoptosis during the antiviral immune response will provide us with a better understanding of how the body responds to and fights RNA viruses such as Respiratory Syncytial Virus, Dengue Virus, and SARS-CoV-2.

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Waist-Height Ratio (WHR) may predict loss of nocturnal dip on Ambulatory Blood Pressure Monitoring (ABPM)

Abstract:
“Introduction
30% of obese children have associated hypertension (HTN)-a risk factor for cardiovascular disease (CVD). Loss of nocturnal dip on ABPM is associated with CVD and chronic kidney disease (CKD) in adults. Abdominal obesity (visceral fat) is associated with cardiovascular risk. Sagittal abdominal diameter (SAD) and waist height ratio (WHR) are measures of visceral fat. There is no data about SAD/WHR and HTN in overweight/obese children.

Methods
Children between ages 4-18 referred to Pediatric Nephology due to elevated blood pressure were recruited. We measured WHR as defined in the NHANES manual. SAD was measured with Kahn caliper (Seritex). Demographic and anthropometric measures were obtained along with office BP. ABPM findings were recorded if available. Statistical analysis: Pearson's correlation coefficient was calculated with p<0.05 as significant. Spearman's Rho was calculated where applicable. Linear regression coefficients were calculated for BMI, SAD and WHR compared to office SBP.

Results
20 participants were studied. At the time of this report, only 5 had completed ABPM. 75% were male. Average age was 13.1 yrs (6-17). 80% had BMI >95th percentile. SAD and WHR was not correlated to office BP (P=0.338, P=0.539). WHR was negatively correlated to nocturnal dip (significant at p=0.034). See Figures.

Conclusion
SAD/WHR may be better predictors of office BP and ABPM dip than BMI. A larger cohort should be studied to determine the value of these anthropometric measures in pediatrics. Pediatricians must pay attention to visceral fat measures and not just BMI when counseling families about risk of CVD/HTN with obesity.

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Faculty Advisor: Sudha Garimella, MD Department: Pediatrics
Abstract:
Carotid endarterectomy (CEA) and carotid artery stenting (CAS) are standard procedures for managing carotid atherosclerotic diseases that lead to plaque embolism and eventual ischemic stroke. Transfemoral carotid artery stenting (TFCAS) and Transcarotid artery revascularization (TCAR) makeup the two common CAS procedures. Our study population was comprised of patients 18+ years of age who underwent a procedure for a carotid stent performed at Prisma Health-Upstate Vascular Surgery at Memorial Hospital. The number of consecutive patients were 244 dating from 2010 to present. This number was adjusted to 142 patients based on the inclusion criteria of patients who received an emergency and/or elective CAS internal carotid artery stent placement. We postulated that there are complications that are “procedure” specific that were not captured in the carotid database registry but the exact quantity of these is yet to be determined. Of the 146 CAS procedures reviewed, our preliminary results show that older patients (>77yrs) were more likely to undergo TCAR over TFCAS, and TFCAS had a higher stroke (7 vs 5) and lower overall associated death outcome (10 vs 13). Additionally, TFCAS showed lower incidences of restenosis (7 vs 10), access site complications (3 vs 8), and geographic stent placement inaccuracies (1 vs 6); however, TFCAS patients appeared to require more post-stent follow-up imaging (CT, MRI) compared to the TCAR population. Reasons behind these additional testing are yet to be identified. Nevertheless, completed results from this study will help inform the carotid stent committee of longer-term patient outcomes from these procedures.
The effects of prescribed psychotropic medications on patient baseline to end PHQ-9 and GAD-7 scores compared to the scores of patients that were not prescribed psychotropic medications within the Collaborative Care Model

Abstract:
This study was developed to determine if prescribed psychotropic medications can better improve PHQ-9 and GAD-7 scores in patients enrolled in Collaborative Care. Our objectives, include determining the effects of prescribed psychotropic medications on depression and anxiety and comparing the baseline to end PHQ-9 and GAD-7 scores of patients that took prescribed psychotropic medications for their depression or anxiety and those who did not while enrolled in Collaborative Care. Our methods will include collecting PHQ-9 and GAD-7 scores from deidentified patients and graphing them statistically to compare the data over time. Additionally, the data analysis will include collecting PHQ-9 and GAD-7 scores from baseline to completion of all patients enrolled during our selected time period in the Collaborative Care Program. We will then separate patients who took prescribed psychotropic medications from those who did not. Finally, we will compare their scores over time. We hypothesize that if patients take prescribed psychotropic medications while completing the Collaborative Care program, then they will have more improved PHQ-9 and GAD-7 scores for their depression and anxiety compared to patients who complete The Collaborative Care Program without additional psychotropic interventions.

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Faculty Advisor: Karen Lommel, DO
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Scholarship/Donor Information:
Summer Research Funded by UofSC SOMG
Handle with Care: Associating Empathy and Stress Among Emergency Medical Services

Abstract:
Empathy has been shown to improve patient outcomes by directly reducing patient anxiety, increasing adherence to treatment, and making it easier for patients to share sensitive information about their condition and lifestyle with their provider. Unfortunately, high levels of stress are common among EMT-paramedics (EMS) which may be related to their level of empathy. For critical patients, their first point of contact with the hospital system is typically EMT-paramedics (EMS), with this relationship establishing the patient's perception of the treatment they are about to receive. The purpose of this study is to examine the relationship between empathy and stress among EMS. Thirty full-time EMS before their shifts completed the Perceived Stress Scale (PSS), the Jefferson Scale of Physician Empathy (JSPE) to measure cognitive empathy, the Toronto Empathy Questionnaire (TEQ) for emotional empathy and gave saliva samples before and after their shift to measure cortisol for physiological stress. Results show a significant positive correlation between pre-shift cortisol and both JSPE and TEQ, indicating that higher empathy is associated with increased stress, but PSS was not related to either cortisol or empathy. These results contradict previous studies among physicians and nurses which showed a negative correlation between empathy and PSS. While it may be an important trait for effective communication, the fact that empathy is related to stress highlights the need to limit stress on EMS workers, especially since these highly empathetic individuals possess the exact quality desired.

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Faculty Advisor: Lauren Fowler, PhD Department: BMS
Abstract:
According to the CDC, 12.7% women have received infertility services, including in vitro fertilization (IVF). Beyond the psychological and emotional cost of IVF, the median out-of-pocket expenses for one cycle are $16,069 with many patients needing additional cycles. Currently, preimplantation genetic testing (PGT) is used to identify euploid embryos based on sequencing of genomic DNA obtained from 5-7 trophectoderm cells from the day 5 IVF-embryo. PGT allows REI physicians to help patients select the IVF embryo for uterine transfer but this does not yield 100% success rates. Other embryo quality metrics are needed for improvement. Our project seeks to identify molecular markers associated with implantation outcomes found in blastocoel fluid obtained from IVF-embryos. Expression of USP28, USP22, KAT2A, UBR5, USP 34, and MYSM1 via Real-time PCR were assessed in these fluid samples from 4 mothers (total of 17 samples). Preliminary results from Patient 1, age 28 with 4 embryos, suggests no or low expression of USP34 could indicate positive implantation outcomes. From this data, we looked further at USP34 prevalence in 15 samples from mothers also under age 35. When comparing expression of USP34 in implantation positive versus implantation negative, we found no statistically significant difference between these groups (p=0.123). Since we utilized a limited sample size, we plan to continue to analyze USP34 expression in more fluid samples. Our initial findings also suggest a need to assess the expression of more genes in blastocoel fluid when looking for indicators of potential implantation success.

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Abstract:
Treatment for blunt splenic injury (BSI) has been splenectomy; however, removal is associated with post-operative intra-abdominal infections and development of potentially fatal overwhelming post-splenectomy infection (OPSI), which has a mortality rate of 33%. A non-invasive procedure, splenic artery embolization (SAE), is reported to increase success rates of splenic preserving, non-operative management (NOM) of splenic injury to 86-100%. The optimal methodical approach to SAE in regard to embolization location is actively debated. This study retrospectively compared proximal, distal, and combined SAE in patients with blunt splenic injury from a single institution between 3/1/2016 and 12/31/2020. Typical clinicopathologic data to include outcomes was collected. Stratification included location and BSI grade. Overall, 91 patients were evaluated. When considering location of embolization, usage of the amp plug (proximal 46.5%), coil (distal 75%) and plug and coil (combined 31.25%) was significantly different (p<0.001). Most of the patients had high grade injuries (n=77; Grade III/IV/V) and thus required significantly more intervention (p=0.01); however, the major and minor complications were not significantly different between cohorts. As expected, the mean age of the high-grade group was also significantly younger than those with lower grade injuries (p=0.01). Overall, SAE proved a 100% technical success, 94.5% primary clinical success, and a major complication rate of 6.6%, which was not statistically different between embolization location or BSI grade. Only 2.2% of patients ultimately underwent splenectomy due to major complication. This study highlights the value of SAE for BSI regardless of severity and is safe for all patients regardless of clinical status.

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Faculty Advisor: Christine Schammel, PhD Department: Pathology
Let’s Talk About Sleep: Correlations of Self-Reported Sleep, Actigraphy, and Disease Activity in Patients with Rheumatoid Arthritis

Abstract:
“Background: Poor sleep is a common complaint among patients with rheumatoid arthritis (RA), but few actively discuss the problem with their rheumatologist. Challenges include the lack of standardized sleep measures within clinical care, and conflicting evidence as to their relationship with disease activity. Currently, it is unclear whether a relationship between sleep and RA associated pain and fatigue exists.

Objectives: The objective of this study was to identify correlations between sleep measures assessed through self-report and actigraphy (i.e. wrist movement) with disease activity for patients with RA.

Methods: In a prospective, cross-sectional study, participants diagnosed with RA were recruited through convenience sampling. Consenting participants were asked to self-report sleep quality and disease activity using the Pittsburgh Sleep Quality Index (PSQI) and the Routine Assessment of Patient Index Data 3 (RAPID-3). Participants’ sleep quality was also measured using actigraphy which monitors wrist movement by wearing a watch. Actigraphy measures of sleep efficiency, latency, and fragmentation were averaged over the 6 nights. Actigraphy measures were correlated to the PSQI and RAPID-3 through Spearman correlations.

Results: The sample was mostly Caucasian women with an average age of 55 years, generally reflective of the population with RA. The results demonstrated low to moderate correlations between actigraphy measure (average sleep efficiency, latency, the fragmentation index) and self-reported measures of sleep as well as with disease activity.

Implications: Actigraphy may be a useful tool in facilitating patient-rheumatologist communication; however, further research is needed to demonstrate its ability to clinically identify sleep disorders.

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Faculty Advisor: Melanie Cozad, PhD Department: BMS
Defects in renal papillary repair after reversible ureteric obstruction

Abstract:
“Background: Ureteric obstruction (UO) is a common clinical problem that results in chronic renal defects, but the cellular repair processes post-UO reversal are unclear. Using a mouse model of reversible unilateral UO (RUUO), our lab previously saw a decrease in urinary concentrating capacity 3 months post-RUUO, suggesting persistent defects in renal papillary (RP) function, which normally regulates urine concentration. The following studies evaluated the extent and kinetics of RP repair using RUUO mice.

Methods: a) Kidney sections were examined by immunofluorescence microscopy using antibodies and lectins detecting RP urinary concentrating structures: Loop of Henle (LOH) AQP1; collecting duct (CD) AQP2; Distal CD and CD-intercalated cell, LTL-Lectin; b) cell repair in normal controls, 0, 3, 7, 14, and 28 days post-RUUO, using Ki67 antibodies to detect proliferating cells. Immunofluorescence was quantified post-blinding by surface area (AQP1/AQP2/LTL), and cell numbers (Ki67), on proximal and distal renal papilla (PRP/DRP) images using ImageJ and QPath software.

Results: a)DRP showed decreased AQP1/AQP2 and consistent LTL expression at day 28. By day 84 DRP AQP2 was restored but AQP1 remained decreased; b) Ki67+ cells peaked at day 7 in PRP, however, DRP Ki67+ cells peaked earlier from days 0-7.

Conclusions: Transient AQP2 loss and persistent AQP1 loss in the DRP suggests complete repair of CD but partial repair of LOH post-RUUO. Earlier induction of Ki67-marked cellular repair in the DRP vs. PRP suggests different repair mechanisms. Further work is planned to study the mechanisms of repair of DRP vs. PRP.

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Cerebrospinal fluid neopterin: potential marker for central nervous system inflammation in Sudden Infant Death Syndrome (SIDS)

Abstract:
Sudden infant death syndrome (SIDS) is the sudden death of an infant under 12 months of age that remains unexplained after a complete autopsy and death scene investigation. SIDS is likely multifactorial with the pathogenesis related to varying biological vulnerabilities, risk factors, and stressors or triggers of sudden death. Risk associations in SIDS have been linked to infection, with a subpopulation of SIDS infants having a history of acute illness preceding death. To test the hypothesis that SIDS involves central nervous system inflammation, we analyzed the levels of neopterin and the cytokine interferon-gamma (INF-γ) in the cerebrospinal fluid (CSF) of 66 SIDS infants and 15 non-SIDS controls dying of acute causes. Neopterin is produced by monocytes and macrophages upon stimulation with INF-γ and is considered a specific marker for central nervous system inflammation. While there was no overall statistical difference in SIDS and controls in neopterin, 7 SIDS cases showed neopterin levels greater than 2 standard deviations above the mean of the controls, levels considered as clinically significant for CNS inflammation. In controls cases, neopterin and INF-γ levels correlated suggesting appropriate immune response to INF-γ. However, SIDS cases with high levels of neopterin generally had INF-γ levels within the control range, a finding that suggests an inappropriately heightened immune response. Given the role of microglial in immune activation, we are beginning to examine microglial phenotypes in SIDS using droplet-based single nuclei RNA sequencing. Preliminary data show differing expression patterns of microglial genes, including genes related to microglial activation and function.

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Resolution of symptoms following surgical resection of meningiomas

Abstract:
Meningiomas account for approximately one-third of all primary central nervous system tumors, with an estimated 29,000 new cases in the United States annually. Increasing grade (I-III) has an understood correlation with worsening prognosis. While there are a variety of treatments, surgical resection is often considered the gold standard for treatment in symptomatic individuals. A retrospective evaluation of surgically resected meningiomas at a single institution between 1/1/2007 and 12/31/2016 was completed. Patients without complete records and those with spinal meningiomas were excluded. Typical demographic and clinicopathologic data were collected to include treatments, recurrences, outcomes and five-year follow up. The cohort was stratified by grade and preoperative and postoperative symptoms were evaluated. There were 178 patients: 135 grade I (76%), 36 grade II (20%), and 7 grade III (4%). The most common symptoms across all grades were headache, seizure, gait disturbance and limb weakness. Grade I patients experienced statistically significant symptom improvement postoperatively across the board. Headaches decreased 25% (p<0.0001), seizures 17.6% (p=0.0002), gait disturbances 10% (p=.03), and limb weakness 17% (p=0.0019). Interestingly, Grade II participants had increasing symptoms post operatively: seizure (13%), gait disturbances (7%), limb weakness (4%) except for improved headaches (18%). Grade III patients experienced symptom improvement in headaches (15%), seizures (29%) and limb weakness (43%) but saw no change in gait disturbances (29%). These data suggest that, regarding symptoms, careful consideration for surgical resection of all grades, but specifically grade II lesions, may be warranted and other treatment options for this cohort may optimize patient outcomes.

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Faculty Advisor: Christine Schammel, PhD Department: Pathology
Understanding Ovarian Cancer Patients by Applying Text Mining to Online Health Communities

Abstract:
“Introduction: Unlike more prevalent cancers such as breast cancer or lung cancer, patients with ovarian cancer (OvCa) lack a plethora of resources to learn about their cancer and to seek community. OvCa patients often turn to online health communities (OHC) to seek information, address their concerns, and find community. We aimed to apply text mining to explore contents being discussed in postings submitted to the National Ovarian Cancer Center’s (NOCC) OHC.

Methods: Postings from 2010 through 2020 were extracted for annotation with various topics, such as chemotherapy, symptoms, etc. Postings annotated as ‘Treatment: Chemotherapy’ were selected, and pre-processed for the analysis. Then, we analyzed with Python using text mining to determine which words and phrases appeared most frequently in these postings.

Results: We analyzed 147 postings annotated as ‘Treatment: Chemotherapy’. We identified 20 frequently used terms, and the top frequently used terms included “week”, “anyone”, and “surgery” after removing the obvious words/ phrases (e.g. ovarian cancer, chemotherapy, etc.).

Discussion: Our result suggests that many patients are curious if certain treatments worked for “anyone” else or how patients decided between “chemotherapy” or “surgery” or both. Patients often are anxious about the timeline of their treatment plan. Using computational analysis for these postings can provide new insights for personalized patient care and allow clinicians to learn about the unmet needs of patients with OvCa from the patients themselves. Further study would include the entire postings with advanced techniques such as natural language processing. “

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SOD1 expression in blastocoel fluid-conditioned media from IVF-generated embryos may serve as a biomarker for pregnancy outcomes

Abstract:
The success rate of IVF for women under the age of 35, on the first egg retrieval attempt is 55%, but this number drops steadily as the age increases. This has prompted new screening methods to be developed for selecting the most viable IVF-generated embryos for uterine transfer, like Preimplantation Genetic Testing for Aneuploidies (PGT-A). In our study, we analyzed the molecular components of blastocoel fluid-conditioned media, which were collected from IVF-generated embryos. Our study measured reactive oxygen species (ROS) levels, as well as SOD1 and HIF-1α expression levels within this media. Real-Time qPCR was used to assess expression levels of HIF-1α and SOD1 (TaqMan Gene Expression Assays) in 53 media samples with known embryo PGT-A status and/or embryo implantation outcomes. H2O2 levels were also measured using individual media samples using a H2O2 fluorescence assay (Abcam) with a Tecan fluorescent plate reader. We found a positive correlation between SOD1 expression and positive pregnancy outcomes (p<0.12) but no correlation was found between HIF-1α and pregnancy outcomes. An even stronger correlation was observed between SOD1 expression and euploid embryos (p<0.064). The H2O2 fluorescence assay confirmed the presence of H2O2 within individual media samples. We hypothesize that SOD1 expression in this conditioned media could serve as a means for cells in the preimplantation embryo to combat ROS, and those cells that could not combat sufficient ROS levels then underwent apoptosis. This study proposes SOD1 levels as a possible biomarker for positive pregnancy outcomes, however more research is needed.

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Scholarship/Donor Information:
Summer Research funded by the Prisma HSC Seed Grant
Needles in a Haystack: Key Insights on Cancer in the Upstate

Abstract:
We analyzed the demographic data of 6474 patients collected from the years 2012-2021 and stored in the biorepository at the Institute for Translational Oncology Research at the Health Sciences Center of Prisma Health Upstate. Our goal was the better understand the role race and gender play in the cancer disease course. The data represents information from individual tumor biopsy samples including the race, age, gender, tissue site, cancer stage, etc. of patients who underwent an oncological surgery. Our results revealed that significant racial disparities were not present in the data set related to representation and treatment. However, we did find that a significantly higher (p<0.001) number of surgeries were performed for women over men. Additionally, for all non-reproductive related cancers, we found that men had significantly more surgeries for kidney and skin cancer than women. These findings align with national cancer statistics from the American Cancer Society. Women had been treated significantly more for stomach cancer than men. This is contrary to nationally reported data, which suggests a regional difference could be impacting our findings. Our analysis sheds light on an area that requires greater attention: the role gender plays in cancer incidence and progression. These factors may be influenced by differences in sex hormone concentrations, inherent biology, exposure to occupational hazards, and lifestyle. Future research in cancer, especially of kidney, skin, and stomach, that delineates between male and female populations is critical to generating more informed treatments and preventative measures to ensure positive outcomes in cancer care.

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Scholarship/Donor Information:
SOMG Summer Research Scholar funded by the Sargent Foundation
Socioeconomic disparities in pediatric patients with gastrostomy tubes

Abstract:
“Gastrostomy tubes are placed due to a patient’s inability to take adequate nutrition, fluids, or medications by mouth. Pediatric patients from lower socioeconomic households have limitations to healthcare access including: transportation, distance to hospital, parent’s ability to take time off of work, ability to pay for visits, and access to health insurance. These limitations can affect gastrostomy tube management, including the length of time the tube remains in place. The purpose of this study is to investigate how social disparities relate to the length of time a gastrostomy tube remains in a pediatric patient after it is no longer medically necessary.

A retrospective chart review evaluated pediatric patients with gastrostomy tubes placed between 2011 and 2020. Inclusion criteria were (1) less than 18 years old when the procedure occurred and (2) tube placement at one of two designated hospitals. IRB approval was obtained through Prisma Health. An EPIC data retrieval produced 796 gastrostomy tube procedures. Demographic information, indication for gastrostomy tube, and clinical visits were entered and analyzed using a REDCap form. Length of time was calculated by comparing (a) the date a physician recorded the tube was no longer being used and (b) the date the tube was removed. This length of time will be evaluated alongside the patient’s socioeconomic status to explore potential disparities. Results are pending. This study will be used to guide management of gastrostomy tubes in Upstate South Carolina.”

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Faculty Advisor: Robert Ricca, MD Department: Surgery
Comparing The Efficacy of Biliary Brushings to that of SpyGlass-Directed Biopsies in the Evaluation of Biliary Strictures

Abstract:

“Background: Traditionally, Endoscopic Retrograde Cholangiopancreatography (ERCP), was limited to histologic brushing under fluoroscopic guidance to obtain biopsies of biliary strictures. Due to limitations, the SpyGlass DS system was developed to obtain direct visualization of the biliary tree, allowing for the observation of the structural features of the biliary ducts in great detail and obtain biopsies using SpyBite forceps. To date, the literature is void of histologic comparisons of samples obtained using these two techniques.

Methods: A retrospective analysis comparing the histologic findings of tissue obtained from biliary brushings with those from SpyGlass-directed biopsies between 3/1/2016 to 5/31/2021 at a single institution was completed. Patients without corresponding data of the two procedures, as well as those without complete charts, were excluded from this study.

Results: From the 40 pairs of tissue samples being compared, 15 pairs rendered dissimilar diagnoses between the biliary brushing and SpyGlass biopsies. Of these 15, 9 of the SpyGlass biopsies rendered definitive diagnoses where brushings produced indeterminant results.

Conclusion: From these results, it is evident that SpyGlass-directed biopsies produce more accurate and definitive diagnoses than biliary strictures when used to determine the etiology of biliary strictures.

“

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Faculty Advisor: Christine Schammel, PhD Department: Pathology
Scholarship/Donor Information:
SOMG Summer Research Scholar funded by the Sargent Foundation
Empathy Behind the Scenes: Training future healthcare providers to treat opioid use disorder with a focus on patient narrative through forum theatre

Abstract:
“Introduction: Future healthcare professionals commonly draw a great deal of their knowledge from didactic instruction and hands-on training, but focus continues to shift to the value of placing learners in innovative settings in order to hone their skills and better relate to the patients they treat. Rather than working with standardized patients in clinical settings, this study allowed students to observe and participate in a staged play outlining the challenges faced by a character named Joey who is in early recovery from opioid use disorder. Following medication for opioid use disorder case training, students followed Joey in a live one-hour performance via Zoom. Students were not only exposed to the unique obstacles of recovery but were also able to insert themselves into the action, transforming from passive observers into active participants. This content-based instructional method utilized forum theatre methodology to enable learners to “rehearse for reality.” The purpose of this qualitative study is to explore the impact of forum theatre as a medical education training modality.

Methods: Following the performance, in-depth interviews were conducted with n=12 students in order to determine whether these “spect-actors” had derived insight into the challenges faced by those in recovery and the stigma of addiction. The data are currently being analyzed thematically.

Results: Data are currently being analyzed. However, preliminary results will be presented in the poster presentation.

Conclusions: Upon completion of data analysis, results will be disseminated and used to provide direction for education opportunities for future health providers.”

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Scholarship/Donor Information:
Summer Research funded by the Department of Medicine
Abstract:
“Background: Cancer patients undergoing chemotherapy are known to develop skeletal muscle mitochondrial dysfunction and subsequent cachexia due to massive treatment related oxidative stress, increasing the risk of chemotherapy-related morbidity and mortality. The timeline is unknown as to when this dysfunction starts to occur and is traditionally measured via invasive muscle biopsy. This adds additional burden to the patient and makes tracking of cachexia difficult.

Purpose: To assess the effects of differing chemotherapy regimens on skeletal muscle mitochondrial function throughout treatment in breast cancer (BC) patients, using near infrared spectroscopy (NIRS).

Methods: Non-metastatic BC patients will be recruited prior to the initiation of chemotherapy involving taxanes, anthracyclines, and/or trastuzumab. Mitochondrial function of the vastus lateralis muscle will be measured during activation, noninvasively, by assessing changes in oxygenated and deoxygenated hemoglobin using the NIRS PortaMon device. Within 5 days prior to every infusion, participants will perform moderately intense exercise on a stationary ergometric bike. Data will be analyzed by one-way ANOVA to detect differences in mitochondrial oxidative capacity between chemotherapy regimens as well as between treatment time points within each individual regimen. Between treatment differences will be considered statistically significant at < 0.05.

Discussion: The results of this project will further provide insight into how different chemotherapy regimens impact mitochondria at a cellular level, potentially further informing oncology practice regarding the costs and benefits of a chemotherapy regimen. This is a novel way to noninvasively assess mitochondrial function during treatment in a cancer population, which has not yet been previously studied.”

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Faculty Advisor: Jennifer Trilk, PhD
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Scholarship/Donor Information:
SOMG Summer Research Scholar funded by the Sargent Foundation
Feasibility and Limited Efficacy of a Tandem Cycling Community Exercise Program on Physiological Health, Functional Health, Therapeutic Relationships, and Quality of Life in Persons and Care Partners affected by Parkinson's Disease

Abstract:
“Background: Given the specific physical limitations that individuals with Parkinson's Disease (PD) are often affected by, forced exercise programs have proven most effective at allowing PD patients to achieve higher intensities of exercise that significantly improve their motor function. To investigate the ways in which such an exercise program could affect both PD patients and their respective care partners, the feasibility and limited efficacy of an 8-week tandem cycling program will be examined.

Methods: 5 PD patients and 5 care partners will undergo an 8-week, community-based, virtual reality tandem cycling program in which each PD patient and their respective care partner will share a tandem cycle and engage in biweekly cycling sessions together. With the exception of physiological function, which will only be assessed in PD patients, physiological health, psychosocial health, quality of life (QOL), and therapeutic relationships will be evaluated for both PD patients and care partners.

Results: By implementing an exercise intervention that prioritizes psychosocial elements in addition to physiological ones, we expect to achieve a broader range of benefits for our PD patients and their respective care partners. We hypothesize that physiological health, psychosocial health, QOL, and interpersonal relationships will improve in our PD patients and care partners, as well physiological function in our PD patients, after completing the tandem cycling intervention.

Conclusion: This study will provide information on both the practicality and effectiveness of a tandem cycling program involving both PD patients and their respective care partners in order to inform future studies and determine if such a program is likely to benefit a larger population sample.”

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Faculty Advisor: Jennifer Trilk, PhD Department: BMS
Utilization of Patient-Reported Outcomes Measurement Information System (PROMIS) to Identify and Address the Needs of Adolescent and Young Adults (AYAs) With Cancer

Abstract:
“Introduction: Adolescent and Young Adult (AYA) cancer patients are identified as high-risk for experiencing long-term, negative health effects. AYA cancer treatment programs have made attempts to develop assessment tools to readily identify areas of need. We aimed to demonstrate the feasibility and utility of PROMIS, a patient-centered evaluation, within a clinical program to improve patient care.

Methods: AYA patients were referred by adult or pediatric oncology to this newly developed AYA program where the PROMIS-29 v2.0 assessment was administered. The 29-question form was administered to patients at point of care; surveys were self-reported and completed by hand. The domains assessed include physical function, anxiety, depression, fatigue, sleep disturbance, ability to participate in social roles/activities, pain interference, and pain intensity.

Results: 134 patients completed the survey. Key demographics were age (16 Early AYAs, 34 Young Adults, and 84 Late AYAs), cancer type, gender (93 Female, 41 Male), ethnicity, and treatment styles (surgery and/or therapy). The average T scores were collected and we found that anxiety was the only domain that had mild impairment across all groups. Individually, early AYAs had mild physical function impairment, traditional AYAs had no significant impairment, and late AYAs had both mild fatigue and physical function impairment.

Conclusion: The PROMIS survey provides a foundation when considering the potential barriers that affect AYA oncology patients. The information collected from the surveys demonstrates the potential usefulness of identifying population trends and specific services that may be of benefit to individual patients.”

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Summer Research funded by the Department of Pediatrics
Intelligent Pervasive Augmented reality (iPAL) Therapy

Abstract:
“Background. The percentage of adults with obesity in South Carolina has increased for more than two decades now, reaching up to 35.3% in 2019. Given that obesity is associated with other comorbidities and strongly affected by lifestyle habits, it is crucial to improve health education and disease prevention strategies. This study analyzes the effectiveness of a novel lifestyle intervention for patients with obesity, the specific barriers that Greenville patients face in adopting a healthier lifestyle, and the use of medical students as program facilitators.

Methods. Over the course of 12 weeks, 10 patients with obesity (BMI>30) were enrolled in the lifestyle improvement program. Each patient began the intervention by meeting with the program facilitator to discuss their individual health-related goals, receive the handouts for the coming sessions, and complete the pre-study survey. Then, every week the facilitator held a 45-minute session over the phone with each patient, discussing the specific health-related topic for that week. During the sessions, patients could ask questions and reflect on their progress while the facilitator recorded notes to compare themes among patients. At the end of the program, a post-study survey is given to each patient.

Results/ Summary. Preliminary observations suggest that surveys given to patients must be adjusted according to their education level, and that education over the phone can be an effective method of reaching patients. The study also reveals the importance of a patient's initial motivation to change their lifestyle in light of participation in and adherence to the intervention.

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Investigating the Effects of Heat-Labile Enterotoxins in a Respiratory Immunization Model

Abstract:
With a rise in opioid related hospital illness and death rates higher than other chronic diseases, OUD outweighs current capabilities to combat the issues of opioid use. The socioeconomic, geographic and insurance barriers to current therapies have made the need for a more widespread, accessible, affordable and personalized treatment of OUD more evident. This qualitative research study aims to integrate intelligent Pervasive Augmented reaLity (iPAL) into a mobile device in order to provide OUD interventions that will help people manage cravings and prevent further use or overdose. To better understand cravings and create a personalized approach to this strategy, an in-depth qualitative interviews were conducted to explore cravings (e.g., triggers, management, experiences) and the participants opinions on the use of technology to manage cravings. This data will be used to inform the functioning, utility, and user experience of the smart app. Seven adults, 4 males and 3 females ages 18-75 currently receiving Suboxone treat their opioid use disorder participated in the study. Preliminary findings from a content analysis of the seven in-depth interviews reveal that individuals with opioid use disorder associate cravings several experiences: physiological (e.g., withdrawals), cognitive (e.g., ruminations), emotional (e.g., low mood, anxiety), and urges. They associated triggers with stressful events, negative experiences with loved ones, and anxiety. They reported they manage cravings through distractions, cognitive reasoning (e.g., negotiating the pros and cons of using drugs to carve the urge), and seeking support. However, treatment with Suboxone was perceived to be the most effective way to manage cravings.

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Fatigue Risk Management Strategies to Mitigate Elevated Levels of Fatigue in the Emergency Department

Abstract:
“The increasing prevalence of antibiotic-resistant bacterial infections calls for the investigation of innovative vaccine and therapeutic strategies. This study aims to elucidate the immune modulating potential of heat-labile Type II enterotoxins as vaccine adjuvants. Type II enterotoxins are secreted bacterial proteins with immunostimulatory capabilities that are distinct from those of current adjuvant and antimicrobial therapies. To investigate the effects of enterotoxin-mediated immunostimulation on respiratory specific immune responses, cell cultures of the human lung epithelial A549 cell line were stimulated with Type II enterotoxins, LT-IIa, LT-IIb, and LT-IIc. These enterotoxins were also studied for their ability to modify the effects of LPS, a known stimulator of the inflammatory immune response. To test for the impact of enterotoxin exposure on cell structure, viability, and immune gene regulations, flow cytometry and qRT-PCR analysis were performed. The results of this work will provide insight into new therapeutic strategies for combating pathogens.”

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Summer Research funded by the Prisma HSC Seed Grant
Expression and Purification of Glycosomal Proteins from Trypanosoma brucei

Abstract:
“Background: Fatigue poses significant consequences in healthcare settings for both physicians and patients. A fatigued state can slow reaction times, reduce attention spans, impair memory, and cause decreased productivity. These are critical aspects for the ability of the Emergency Department (ED) to function most efficiently. Based on both previous objective and subjective measures there is an evident need for fatigue risk management strategies in the ED.

Materials & Methods: Once the need for fatigue risk management strategies was established by this lab, an extensive literature review identified strategies that are effectively utilized in other professions and could be applied in the ED. Although these systems have been extensively implemented in other industries and countries, they are not typically used in medicine in the U.S.

Results: Assessment of fatigue in the ED at Prisma shows that some physicians worked during a dangerously high fatigued state. After discussing fatigue with ED physicians, it became clear that there is a minimal fatigue risk management system currently present in the hospital. Fatigue countermeasures can be tailored specifically to the needs of the ED, and can include strategic caffeine use, strategic napping, fatigue risk reporting, and physician training on sleep hygiene, circadian scheduling, and fatigue identification.

Conclusion: Studies show that implementing a fatigue risk management system from both a systemic and individual level can be very beneficial. Future research should analyze the specificities of these fatigue mitigation strategies in regards to both their optimal application and impact on the ED.
“

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The effect of patient-centered lifestyle interventions on health knowledge and self-empowerment in patients with obesity

Abstract:
Trypanosoma brucei is a kinetoplastid parasite that is prevalent in sub-Saharan Africa and causes the disease African Sleeping Sickness. T. brucei relies mainly on glycolysis for energy and the enzymes needed for this are stored within specialized peroxisomes called glycosomes. Proteins needed for glycolysis must be imported in and two major proteins referred to as PEX 13 and PEX 14 make up a docking complex on the surface of the glycosome where transport proteins bind and allow for protein import. There are two similar versions of PEX 13, PEX 13.1 and 13.2. Both have N-terminal YG rich regions and 13.1 has a C-terminal SH3 region. It is hypothesized that the reason for the slight differences between these two proteins is differing binding affinities for the transport proteins PEX 5 and PEX 7. The goal of this project was to express recombinant versions of PEX 13.1 and 13.2 YG rich regions, PEX 13.1 SH3 region in E. coli cells, and to purify these proteins to allow for binding assays with PEX 5 and 7. The M15 version of these cells produced no expression of the proteins, leading us to move forward with attempts to express protein in the BL21 strain of these cells.

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Post-operative Pancreatic Fistulas: A single institution review of definition relevancy.

Abstract:
“Post-operative pancreatic fistulas (POPF) are a complication of pancreatic resections, particularly distal pancreatectomies (DP) and pancreaticoduodenectomies (PD). POPF have a 1.23% mortality rate. The 2016 POPF definition requires a drain fluid amylase level >3 times the serum amylase necessitating a clinically relevant alteration in treatment, which ultimately determines the POPF grade (B or C).

A retrospective evaluation of pancreatic resection patients from a single institution between 3/1/2016 and 5/1/2021 was completed. Typical demographic and clinicopathologic data were collected to include POPF indicators. Patients for whom complete records were unavailable were excluded.

Overall, 156 patients were included in the study, of which 31 patients had clinically relevant POPFs. There were 25 grade B and 6 grade C POPFs. Grade C POPFs are defined by organ failure, reoperation, or death. Grade B POPFs are diagnosed by any of the following treatments/combination: antibiotic management (56%), somatostatin analogues (36%), persistent drainage for >3 weeks (64%), or additional drain placement (32%). Grade B POPF patients who only had persistent drainage for >3 weeks had an average length of stay of 6.8 days, which is shorter than all patients who underwent PD or DP (10.5). Grade B POPF patients who received TPN had a mean length of stay of 22.75 days.

In evaluating Grade B POPFs, it is apparent that the current grading system is exceedingly broad and does not stratify patients meaningfully. It is crucial to further investigate Grade B POPFs, create more useful subcategories, and implement these subcategories to better assess clinical outcomes.”

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Influential Factors for Meningioma Recurrence

Abstract:
“Each year there are approximately 29,000 meningioma diagnoses. Factors are known to contribute to meningioma formation; however less in known regarding factors that contribute to recurrences. An evaluation of all meningiomas surgically resected and/or treated at a single institution between 1/1/2006 - 12/31/2016 was completed. Patients who had spinal meningiomas and those for whom complete records were unavailable were excluded. Typical demographic and clinicopathologic data were collected to include numbers of recurrences, treatments, and overall outcomes.
Overall, 30 recurrences were noted in the cohort with a mean age of 55 (range 15-82); 57% were female (n=17) and 43% male (n=13) and 60% were White (n=18) and 40% Black (n=12).
For grades, 26.7% of individuals had grade I, 50% grade II, 6.7% grade III, and 16.7% were not documented. The mitotic rate for the cohort was 6.2 per 10HpF (range 0-26) and 28.6% had a low Ki-67 (0-5), 42.9% were 6-10, 14.3% 11-15 and 14.3% had a high index (16-20). When comparing those with recurrences to those without, none of the demographics were significantly different except for race (p=0.0175). Regarding grade, recurrences were typically grades II and III (56.7%) compared to no recurrences (17.4%; p<0.0001). Likewise, the mitotic rate (recurrence 6.2; no recurrence: 2.12; p=0.0019) and Ki-67 (p=0.033) were significantly different between groups. Regarding surgical resection, gross total resection was significantly lower in those with recurrences (p=0.0037).
It appears that the profile for individuals with recurrences is dependent on histological markers. Expansion upon this could be useful assigning a “recurrence risk score”.”

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Mechanisms of SARS-CoV-1 Non-Structural Protein-1 (Nsp-1)-mediated Immune Regulation

Abstract:
Immune evasion by severe acute respiratory syndrome-associated coronavirus (SARS-CoV) using non-structural protein 1 (nsp1) has been a topic of interest since the 2003 epidemic. It has been suggested that nsp1 is responsible for a delayed and disorganized activation of the immune system leading to worse clinical outcomes. Nsp1’s known functions include antagonizing antiviral pathways that would otherwise limit viral replication and blocking eukaryotic translation crucial for host defense. During viral infection, nsp1 localizes in cells to boundaryless aggregates of cell machinery called stress granules. Interestingly, in stress granules, nsp1 may interact with ADAR1, a regulator of retinoic acid inducible gene I (RIG-I)-like receptors (RLRs), which specialize in detecting viral infections. Our lab created mutated versions of nsp1 lacking one or both nsp1 functions or enhanced antiviral activity using site-directed mutagenesis and confirmed our mutants using sanger sequencing. Using fluorescent microscopy, we hope to visualize the effect of distinct nsp1 functions on ADAR cellular localization in human epithelial lung cells. We will assess potential downstream effects via qRT-PCR on RLR-inducible genes and inflammatory cytokines associated with the antiviral response. The results from this study will provide a better understanding of nsp1 function and hopefully provide therapeutic targets to support detection and clearance of SARS-CoV infection by the immune response.

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SOMG Summer Research Scholar funded by the Sargent Foundation
Non-alcoholic steatohepatitis (NASH) Elastography versus Liver Biopsy

Abstract:
Non-alcoholic steatohepatitis (NASH), defined as hepatic fat accumulation (steatosis) with inflammation, hepatocyte injury, and often fibrosis, is increasing in incidence alongside obesity and diabetes. Untreated NASH leads to cirrhosis, which emphasizes the importance of early diagnosis. Historically, diagnosis has relied on liver biopsy; however, elastography is a noninvasive means of identifying NASH characteristics. A single institution retrospective correlation of biopsies and elastography between 3/23/16 and 3/9/21 on patients with NASH was completed. Those on NASH studies and those with incomplete records were excluded. Typical demographic and clinicopathologic data were collected to include imaging and histology findings. Overall, 25 patients were included in the study. Of these patients, 88% were white, and 60% were female (40% male). The average age of our cohort was 56.6 (35-73). Mean BMI was 31.80 (24.06-42.20), and 60% of patients were obese or morbidly obese; 72% had diabetes. Regarding elastography, while none of the imaging definitively noted steatosis or inflammation, 80% revealed fibrosis. For histologic analysis, steatosis was identified in 88% of specimens. Inflammation was apparent in 92% of specimens, and 96% of histology evaluated fibrosis. Overall, 80% of patients had fibrosis recognized by both histology and elastography, 16% by histology but not elastography, and 0% by elastography but not histology; 4% had no fibrosis on either methodology. These data reveal that histology more readily confirmed fibrotic liver tissue, while elastography posed difficulty differentiating fibrosis and biologic confounders, supporting histology as the gold standard for diagnosing NASH.

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Characterization of Negative Outcomes in Pediatric Acute Respiratory Infection

Abstract:
Respiratory Syncytial Virus (RSV) is an RNA virus that causes acute respiratory infection in the pediatric population (< 18 years old) with the greatest burden of disease on children who were born prematurely or have chronic medical conditions. The seasonal pattern of RSV infection has been interrupted by another RNA virus, Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which can cause similar acute respiratory symptoms. These infections can lead to hospitalization and/or death, which demonstrates the critical need for research to support treatment decisions. The current study aims to assist health care teams in identifying signs and symptoms commonly associated with SARS-CoV-2 and RSV in the pediatric population. In this study, data will be collected and classified in pediatric patients based on disease severity to determine variables which are associated with favorable outcomes. Prisma Health Upstate health records will be queried for pediatric patients with a positive RSV or SARS-CoV-2 laboratory test. Variables of the clinical course, such as physical exam findings, temperature, oxygen saturation, medication administration, and use of positive-pressure ventilation (PPV) will be analyzed to examine their association with death, readmission, long-term follow-up, and new chronic disease(s). The current study predicts that greater levels of intervention during hospitalization will be associated with more negative outcomes. Establishing traits that are associated with the severity of RSV and SARS-CoV-2 could improve the lives of children affected by respiratory infection and the outcomes associated with future respiratory disease outbreaks.

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Misidentification of small bowel NET via 68Ga-Dotatate PET/CT

Abstract:
Neuroendocrine tumors (NET) have had a 6.4 fold increased incidence rate between 1973 and 2012 with most found in the lungs, GI tract, rectum, and pancreas. The use of 68 Ga-Dotatate PET/CT to specifically identify NET has promoted early diagnosis with 83%-100% sensitivity depending on the anatomic region. Here, we present a 68 year old male with a suspected small bowel obstruction which by CT was identified as a mass with enlarged mesenteric nodes. 68 Ga-Dotatate PET/CT showed avidity in both the mass and the nodes, suggestive of NET. Upon surgical resection, the mass was not consistent with NET texture and the intra-operative frozen section revealed pancreatic necrotic fat. Analysis to rule out an inflammatory process for IgG4-related disease was negative. Surgical resection was difficult and unnecessary; therefore, subsequently aborted. A comprehensive literature review revealed 11 rare reported misidentifications of lesions by 68 Ga-Dotatate. The most frequent misidentification occurred in older patients with a past history of NET and the most frequent 68 Ga-Dotatate avid tissues were noted in lymph nodes, pancreas, and prostate. Our case is the only reported misidentification of a necrotic lesion. Even with the 68 Ga-Dotatate PET/CT imagining modality’s high sensitivity and specificity, the presented case begs the question of how much can practitioners rely solely on 68 Ga-Dotatate PET/CT without subjectively evaluating patients based on criteria such as age, past medical history, and comorbidities. Exercising caution, in turn, will result in less unneeded treatment and invasive procedures that present with their own risks.

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