

Practicum Abstracts 2024

Degree: MPH-45

Field of Study: Quantitative Methods

Project Title	Project Summary or Abstract
The Association Of Intraoperative Opioid Dosage On Postoperative Delirium: A Retrospective Cohort Study	Postoperative delirium (POD) is associated with postoperative adverse events and long-term decline in functional status. The administration of opioids to facilitate pain control has long been a mainstay in anesthesia for surgery. However, opioid overdose is associated with a higher incidence of POD. Delirium precipitated by opioids is frequently reversible with the change of opioid or dose reduction. While opioids should be prescribed with caution, this should be tempered as untreated severe pain can trigger delirium. At present, the association between opioid-free anesthesia and POD is still unclear. We hypothesize that intraoperative opioid use is dose-dependently associated with POD, potentially demonstrating a U-shaped relationship where opioid-free or high-dose opioid administration may be associated with a higher incidence of POD. This study offers an important perspective on opioid administration for the clinical care team and mitigating the risk of postoperative delirium.
HIV serostatus and all-cause mortality among older people living with HIV in Uganda in the antiretroviral therapy era	Following the introduction of highly effective anti-retroviral therapy (ART), the number of people living with HIV has grown. In 2001, only two percent of people living with HIV (PLWH) across the globe were receiving anti-retroviral therapy, but by 2015 that number increased to 40% (representing 15 million people), and more recent data now suggests that more than 80% are now receiving ART. There has been limited research that has explored whether, as PLWH age beyond 50, lowered AIDS-related mortality in the ART era will translated into PLWH mortality comparable to uninfected HIV patients. This project aims to address this gap by using an observational, retrospective, open cohort study design to compare mortality among older PLWH and uninfected peers in rural Uganda.

<p>Impact of a Physician, Nursing and Emergency Medical Service Pediatric Education Initiative on the Cheyenne River Health Center</p>	<p>Background: Boston Children's Hospital's (BCH) Indigenous Health Program Initiative (IHPI) has developed a partnership with Cheyenne River Health Center (CRHC) in Eagle Butte, SD. Healthcare workers expressed interest in enhancing pediatric clinical knowledge and skills. IHPI is implementing a year-long pediatric education initiative for healthcare workers. The curriculum includes short courses and case-based simulation.</p> <p>Methods: We conducted a quasi-experimental study assessing changes in knowledge and confidence after educational courses. Pre and post-course surveys were designed and administered, including multiple-choice knowledge assessment and self-perceived competence and confidence ratings assessed on a Likert scale. Course evaluations were also gathered. Statistical analysis was conducted in RStudio Team.</p> <p>Results: We analyzed the impact of two courses, Pediatric Trauma Fundamentals (PTF) and Neonatal Resuscitation Program-Plus (NRP+). There were 9 pre and 6 post-surveys for PTF and 16 pre and 15 post-surveys for NRP+. For both classes, knowledge increased significantly on the post-test when analyzing matched scores. After PTF, aggregate confidence ratings increased for 3 questions related to pediatric general and abdominal trauma and burns. After NRP+, matched confidence ratings increased significantly for all questions. 100% of respondents agreed that the teaching offered was easy to understand, relevant and customized to the setting.</p> <p>Conclusions: This pediatric education initiative increased knowledge, self-perceived confidence and competency of healthcare workers related to pediatric trauma and neonatal resuscitation. Additional courses, data collection and analysis are ongoing. Continuing education initiatives offered in partnership with pediatric academic centers are an effective way to support and strengthen rural/tribal healthcare systems.</p>
<p>Characterization of the Transcriptomic Shift Seen in Sex-Specific Differences in Immune Cell Subpopulations in a Glioma Model</p>	<p>Cancerous malignancies present the second most common cause of death in adults in the United States, further constituting the most common mortality cause in adults under the age of 65. Notably gliomas, a group of tumors of the central nervous system, present enigmatic adversaries for treatment and research alike. One mechanism by which gliomas sustain their growth and evade treatment is via their extensive immune landscape. Differences in immune-</p>

	<p>cell-subpopulations are also postulated to constitute one contributing factor to the stark differences in glioma incidence between the sexes. Much of the research centered on immune cell subpopulations relies on basic science analyses on the genetic level, notably via scRNAseq. While this provides a high level of detail on the individual-cell level, it does not allow for a direct quantification of differences between cells of different conditions. Novel pipelines that seek to quantify this transcriptomic shift offer an avenue to elucidating these differences.</p> <p>To better understand these aspects of gliomagenesis, patient-derived scRNA sequencing datasets (from the TISCH2 Genomics database) were analyzed via a novel differential state analysis pipeline (scDist) and differential abundance prediction methods (Augur, Daseq). In our analyses, notably M1-macrophages, oligodendrocytes and monocytes were found to differ starkly in gene expression between the sexes in (notably high grade) glioma. These changes were driven by similar subsets of genomic modulators of the immune response and were largely concordant between differential state and abundance analyses. Additional preliminary analyses further suggest notable differences in specific tumor-cell-lineages based on glioma subtype and molecular profile.</p>
<p>Age and Incidence of Metastatic Prostate Cancer</p>	<p>Metastatic cancer is defined as secondary malignant tumor growth in distant organs. The burden of metastatic cancer is a key gauge of cancer morbidity. Population-based registries only record the incidence of cancers that are “de novo” metastatic (M1) at initial cancer diagnosis. The missing classification of metastasis at diagnosis (Mx) are such that absolute counts of M0 or M1 cancers are an underestimate and can only be inferred from patient records. Another concern is that cancer progression is not documented, thus metastatic recurrences of initially nonmetastatic tumors (M0) are not captured. As the population level burden of metastatic disease is a key gauge of cancer morbidity and mortality, absent or unclear data limit our understanding of the natural history of the disease and the success or failure of preventative efforts.</p> <p>Age is a crucial factor around decisions in screening, diagnosis & treatment of prostate cancer. The link between increased age and higher incidence of prostate cancer in men is well documented. (American Cancer Society) Yet the association between age and metastatic prostate cancer remain ambiguous due to underestimation of metastatic incidence.</p> <p>The incidence of metastatic prostate cancer increases with age, and a large share of</p>

	<p>metastatic prostate cancer is missed by cancer registries that only focus on M1 prostate cancer as the measure of population burden.</p>
<p>Predicting Acute Graft-versus-Host Disease in Allogeneic HSCT: A Microbiome-Based Approach</p>	<p>Objective: This study aims to develop a predictive model incorporating quantitative microbiome parameters to identify patients at increased risk of developing acute graft-versus-host disease (aGVHD) following allogeneic hematopoietic stem cell transplantation (HSCT)</p> <p>Public Health Impact: Enhancing the prediction of aGVHD post-transplant can significantly reduce morbidity and mortality, providing a framework for targeted preventive strategies and potentially improving overall patient outcomes in hematological malignancies.</p> <p>Background: Allogeneic HSCT is a critical therapy for hematological malignancies but carries a high risk of aGVHD, a major factor in post-transplant mortality. Current predictive models for aGVHD lack the necessary accuracy and detail to effectively guide clinical interventions.</p> <p>Methods: The study utilizes retrospective and prospective data from the PREDICT cohort at Boston Children’s Hospital, including clinical outcomes and microbiome profiles from stool, nasal, and skin swabs. Microbiome diversity is assessed using the inverse Simpson index, with higher diversity potentially correlating with better clinical outcomes. The analysis categorizes patients into higher and lower microbiome diversity groups, based on the median alpha diversity values during the peri-engraftment period. To ensure robust statistical inference, hazard ratios for clinical outcomes are calculated per unit increase on a log10 scale of inverse Simpson index values, with adjustments for multiple testing using the Benjamini-Hochberg procedure.</p> <p>Results: To rigorously evaluate the association between microbiome diversity and clinical outcomes, we employ Cox proportional hazards models that are both overall and cause-specific, incorporating potential confounders to ensure accurate risk assessment. Furthermore, all statistical analyses, including subgroup analyses and interaction tests, are subjected to multiple testing corrections to control for false discovery rates, enhancing the reliability of our findings. As the sequencing data required to further validate our predictive model is still pending, we do not currently have preliminary data. Once available, the data will allow us to refine our predictions and enhance the model's accuracy.</p>

	<p>Conclusions: This study anticipates that enhanced microbiome-based predictions will improve the management of aGVHD, leading to reduced incidence and severity of this condition. Pending the receipt of the sequencing data, we will further analyze the correlation between microbiome diversity and patient outcomes to substantiate these predictions.</p>
<p>A higher age of onset of rheumatoid arthritis is associated with a higher risk of incident bone erosion</p>	<p>Objectives: The association between age of onset or rheumatoid arthritis (RA) and joint erosions has remained unclear. We investigated the effects of age of onset of RA on the incidence of joint erosion and the progression of radiographic findings.</p> <p>Methods: Patients diagnosed with RA within 2 years of enrollment in a large single-center RA registry were included. The age of onset was categorized into young (less than 45y), middle-age (45-65y), and old (greater than 65 y). Modified total Sharp scores (mTSS) were obtained at baseline, year 2, and year 5, and the incident joint erosion was defined as an erosion score greater than 0. The adjusted odds ratio (OR) of incident joint erosions within 5 years of enrollment and the adjusted change in the mTSS by age category during the 5-year follow-up period were assessed.</p> <p>Results: 284 patients with RA diagnosed within 2 years were identified. The adjusted OR of incident joint erosion in the middle-age, OR 4.0 (95% CI 2.2 - 7.5), and the older onset groups, 8.2 (95% CI 3.6 - 19.2), were elevated compared with the young onset group. Compared with the young RA onset group, the adjusted change in mTSS in the middle-age group, 2.8 (95% CI 0.20 – 5.4), and the older onset groups, 1.9 (95% CI -0.26 – 4.1), were elevated.</p> <p>Conclusion: The odds of incident joint erosion and change in the mTSS were increased among patients with RA onset at older ages. These results suggest that the age of onset may define different RA phenotypes.</p>
<p>Risk of Spontaneous Abortion and Congenital Malformations after Maternal or Paternal Periconceptual Mycophenolate Exposure</p>	<p>Mycophenolic acid (MPA) is a potent immunosuppressant primarily used in transplant and systemic lupus erythematosus (SLE) patients. Several case reports and series have signaled MPA's teratogenic and abortifacient effects when used by either parent around conception. However, evidence from controlled studies in humans was lacking.</p> <p>We assessed the effect of maternal and paternal use of MPA during the periconceptual period on the risk of pregnancy loss (spontaneous abortions or termination) and congenital malformations in the offspring.</p>

	<p>We conducted a population-based pregnancy cohort study utilizing the Merative MarketScan Research Database (MarketScan, 2011 - 2022). Exposure was defined as MPA dispensations from the last menstrual period (LMP) to 90 days after LMP for the mother and from 90 days before maternal LMP to LMP for the father. We considered three reference groups: unexposed pregnancies with indications for MPA (primary reference), discontinuers (MPA dispensations 180 days to 90 days before LMP but not during the exposure window), and active comparator (azathioprine dispensations during the exposure window). We estimated the relative risk of pregnancy losses and, within livebirths linked to the mother, of major congenital malformations. Poisson regression models with robust variance were used to estimate adjusted relative risks (aRR) and 95% confidence intervals (CI).</p> <p>Among 82 pregnancies with maternal MPA exposure, 44 (53.6%) resulted in pregnancy loss compared to 7,673 out of 44,498 (17.2%) in unexposed pregnancies with similar indications for MPA (aRR 2.53; 95% CI 2.01, 3.17). Among 525 pregnancies with paternal MPA exposure, 157 (29.9%) resulted in pregnancy loss compared to 21.2% of pregnancies in fathers without MPA dispensations (aRR 1.30; 95% CI 1.11, 1.53). The aRRs were similar when using the other reference groups. The number of congenital malformations in the maternal MPA exposed cohort was too small to draw conclusions; there was a notably high number of intestinal malformations after paternal MPA exposure.</p> <p>Both maternal and paternal use of MCA around conception was associated with an elevated risk of pregnancy losses. We did not identify an increased prevalence of specific malformations among those that survive until birth after maternal periconceptional exposure. However, a potential signal of intestinal anomalies after paternal exposures warrants further evaluation.</p>
<p>Metabolomic profiling of lipids and ceramides over 2 years following sleeve gastrectomy in adolescents and young adults</p>	<p>Clinical studies have revealed associations between sphingolipids, particularly ceramides, and metabolic disorders such as type 2 diabetes mellitus, hepatic steatosis, and coronary heart disease. Preclinical models have provided mechanistic insights, demonstrating that elevated ceramide levels contribute to hepatic steatosis, insulin resistance, beta cell dysfunction, and apoptosis. This longitudinal observational study aims to investigate the impact of sleeve gastrectomy (SG) on ceramide metabolomic profiles over a two-year period in adolescents and young adults with obesity. Participants, aged 14 to 25, with moderate to severe obesity, were enrolled, with surgical participants undergoing SG being age-matched to non-surgical controls. Through comprehensive assessments including anthropometric measurements, body composition analysis, MRI scans, CT scans for fat content, and blood sample analysis for</p>

	<p>ceramides and metabolic markers, our study aims to elucidate associations between SG, ceramide levels, and metabolic health parameters. Statistical analyses involved assessing changes over time within and between groups, employing methods like descriptive analyses, correlation analysis, multivariate regression analyses, and general linear mixed effects model based repeated measures analyses. We identified specific changes in ceramide metabolism post-SG, and explored correlations with improved metabolic health markers, and establishing temporal patterns of these changes. This research endeavors to provide insights into the metabolic implications of SG in adolescents and young adults, aiming to inform future interventions and personalized healthcare strategies for severe obesity in this demographic.</p>
<p>Mutational Profiles of Colorectal Cancers According to Detailed Tumor Location</p>	<p>According to the World Health Organization, colorectal cancer is the third most common cancer worldwide. It is important to study the molecular pathology and immune mechanism of colorectal cancer by analyzing the data of immune cells from the specimens. Therefore, we hypothesized that distributions of mutational profiles of colorectal cancer might gradually change along detailed sublocations.</p>
<p>Laptis: An end-to-end web platform to find, evaluate, and book substance use treatment services</p>	<p>Laptis is a software platform aiming to streamline access to substance use treatment centers for healthcare, legal, and social services professionals and their clients. Substance use addiction presents a significant public health challenge, with fragmented treatment options complicating the process for patients and care providers. Through extensive research and customer interviews, the team identified inefficiencies in the current system, including outdated websites and cumbersome processes. To address these issues, we developed an end-to-end platform using NextJS, React, Django, and Python, enabling online booking of treatment centers. Users can filter results based on patient-specific criteria, such as demographics and insurance information. The platform is currently undergoing a pilot program with Suffolk University Law School's public defenders program, where data is being collected to assess its impact. Initial expectations suggest a 75% decrease in the time required to book clients into appropriate facilities. Overall, the platform aims to improve the speed and quality of access to crucial substance use treatment services, potentially addressing key challenges in public health and resource allocation.</p>

<p>WHO Brain Health Unit: Encephalitis Technical Brief</p>	<p>Objective: Conduct a scoping review and a gap analysis, map products and evidence, lead internal and external stakeholder consultations and develop a WHO technical brief on encephalitis.</p> <p>Public Health Impact: WHO technical briefs provide technical advice to the Member States on targeted actions to improve care for selected conditions. The intended audience are policymakers, health system managers and planners, public health professionals, healthcare providers and researchers, particularly in low- and middle-income countries.</p> <p>Background: 1.5 million people develop encephalitis each year, 100,000 die from it and 20-50% of survivors develop long-term, life-changing sequelae. In line with the 2022 WHO Intersectoral Global Action Plan on epilepsy and other neurological disorders, targeted actions are needed to reduce the burden of overlooked neurological diseases such as encephalitis.</p> <p>Methods: The technical brief is developed based on a WHO-commissioned scoping review with regional gap analysis, a global landscape analysis, the WHO-organized meeting “Why encephalitis matters” and internal and external expert input.</p> <p>Results: The technical brief provides background on encephalitis and a key evidence summary, with a structured gap analysis. It also identifies the next actions and levers for change, supporting the 2022 WHO Intersectoral Global Action Plan.</p> <p>Conclusions: The technical brief raises the profile of encephalitis and provides targeted actions to address gaps for this life-threatening and highly disabling neurological condition.</p>
<p>Effect Of Citizenship Status on Adult Heart Transplant Early Outcomes and Mortality</p>	<p>Objective: To compare mortality and post-transplant outcomes between citizen and non-citizen adult heart transplant recipients.</p> <p>Public Health Impact: Non-citizen heart transplant recipients have non-inferior outcomes</p>

compared to citizens, however the geographic distribution differences in where recipients are transplanted requires additional scrutiny to see how region or center-specific factors influence where patients seek care.

Background: Immigrant and non-citizen populations face significant linguistic and socioeconomic barriers when seeking surgical care, yet the impact of citizenship status upon surgical outcomes remains underreported. Heart transplants are difficult operations with complex post-operative medication regimens and frequent follow-up; thus, their complication rates and mortality may be impacted by citizenship status.

Methods: This retrospective cohort study included 8,809 patients from 10/18/2018 to 12/31/2021 within the United Network of Organ Sharing (UNOS) database. Patients were 6+ months post-transplant. Loss to follow-up, multiorgan, and prior heart transplants were excluded. Overall survival and post-operative complications were evaluated, with propensity-matching to account for baseline differences. Analysis was completed in R software.

Results: Citizen recipients (n=8459) compared to the non-citizen recipients (n=350) were older (53.81 ± 12.76 vs. 50.80 ± 12.52 , $p < 0.001$), White (n=5400, 63.8% vs. n=99, 28.3%, $p < 0.001$), with more private insurance (n=4024, 47.6% vs. n=131, 37.4%, $p < 0.001$), higher employment (n= 2457, 29.0% vs. n=71, 20.3%, $p < 0.001$), and higher creatinine at transplant (1.22 vs. 1.07, $p < 0.001$). Non-citizens were primarily Hispanic (n=161, 46.0% vs. n=677, 8.0%, $p < 0.001$), with Government Insurance (n=194, 55.4% vs. n=4395, 52.0%, $p < 0.001$), type O recipients (n=151, 43.1% vs. n= 3378, 39.9%, $p = 0.008$) and a higher percentage of heart mass mismatch (-8.89% vs. -3.74%, $p < 0.001$). Both groups had primarily White donors, but a larger proportion of citizens had white donors (65.2% vs. 59.6%, $p = 0.006$), and a larger proportion of non-citizens had Hispanic donors (23.0% vs. 17.7%, $p = 0.006$). There were large regional differences in where non-citizens vs. citizens received transplants (region 5: 32.0% vs. 15.3%, region 9: 23.7% vs. 6.8%). Unmatched and matched outcomes (percent panel reactive antibody (PRA), acute rejection (episodes, treatment, hospitalization, and follow-up), and infection (hospitalization and follow-up)) were not significantly different between citizens and non-citizens. Matched Kaplan-Meier curves showed no significant difference in survival between cohorts ($p = 0.46$).

Conclusions: We saw no significant differences in mortality or acute post-transplant outcomes between citizens and non-citizens, with significant differences in their age,

	<p>ethnicity, insurance type, donor ethnicity, and regional distribution. The large differences in where citizens and non-citizens received heart transplants merit further analysis to assess access equity.</p>
<p>Predictors and moderators of cancer fatalism: Evidence from the Health Information National Trends Survey (HINTS)</p>	<p>Cancer fatalism – that is, the belief that cancer prevention is beyond one’s control – is associated with increased fear and worry, depleted self-efficacy, and lower adherence to preventative behaviors, like physical activity. There is some emerging evidence that media exposure – to complex or contradictory health information – may increase confusion and backlash towards health recommendations; however, it is less clear whether external variables (e.g., trust in one’s doctor) may mitigate the formation of these beliefs. In this secondary analysis of NCI HINTS data (National Cancer Institute’s Health Information Trends Survey), I examine the relationship between self-reported exposure (to information that is contradictory, evolving, or misleading) and cancer fatalism beliefs through a series of weighted multivariate linear regression models. In addition, I ask whether trust moderates the relationship between information exposure and fatalism. Information that is conflicting, evolving, or misleading is consistently associated with increased fatalism – that “everything causes cancer,” that “prevention is not possible,” and that there “are too many recommendations.” Trust in two sources – in one’s doctor and one’s friends and family – moderated the relationship between information exposure and fatalism beliefs. More specifically, those that expressed at least “a little” trust in their doctor were protected from the negative effects of exposure to misleading information; those that expressed “a lot” of distrust were far more likely to express fatalism at high levels of exposure.</p>
<p>Characteristics of Subtypes of Resilience in Chronic Obstructive Pulmonary Disease</p>	<p>COPD is a leading cause of morbidity and mortality worldwide. It is characterized by airflow limitation and is associated with cigarette smoke and biofuel exposures. In 2019, the U.S. spent nearly \$40 billion on COPD exacerbations. Gaining insight into how to treat these individuals and/or prevent severe disease is a major public health issue. Moreover, as physicians, we have noticed that not all individuals exposed to heavy smoke or biofuels develop COPD. Therefore, evaluating the clinical characteristics and all-cause mortality patterns among resilient individuals who smoke and COPD patients is crucial.</p>