

Primary Presenter: William Coburn

Project Title: *Acutely Administered Pharmacologic Interventions for Battlefield Traumatic Brain Injury: A Systematic Review*

Primary Mentor: Kathleen Flarity

Thematic Area: Public Health and Epidemiology

Abstract:

Background

Traumatic brain injury (TBI) affects military populations with high morbidity and mortality and devastating sequelae. Soldiers in the Special Operations Forces (SOF) are at increased risk of TBI due to higher operational capacity compared to conventional forces. As the United States military shifts its operational paradigm to prepare for future large-scale combat operations, the need for prolonged casualty care will grow. Identifying efficacious prehospital TBI management strategies is therefore vital. Numerous pharmacotherapies—including beta blockers, calcium channel blockers, and statins—are beneficial in the inpatient management of TBI. However, their utility in prehospital management of moderate or severe TBI is not well characterized. We performed a systematic review to elucidate agents of potential prehospital benefit in moderate and severe TBI.

Methods

We searched six databases from January 2000 through December 2021 using queries designed to encapsulate all studies pertaining to prehospital TBI management. Cochrane systematic review guidelines were followed. We identified 2142 unique articles. Seven studies met inclusion criteria.

Results

Studies that met inclusion criteria assessed tranexamic acid (TXA) (n=6) and ethanol (n=1). Of the TXA studies, three were randomized controlled trials, two were retrospective cohort studies, one was a prospective cohort study, and one was a meta-analysis. Notably absent were papers investigating therapeutics shown to be beneficial in the inpatient setting.

Discussion/Conclusions

Effective interventions for moderate or severe TBI remain lacking. Despite a robust body of evidence supporting numerous agents' efficacies in inpatient TBI management, none of these agents has been studied in the prehospital setting. TXA is the most widely studied pharmacologic

intervention and appears to offer some benefit without adverse effects in moderate TBI in the pre-hospital setting. Ethanol appears to confer neuroprotective effects in moderate TBI. Limitations of these studies include heterogeneity in outcome metrics, patient populations, and circumstances of TXA use. Further investigation into these and novel therapeutic options in the prehospital arena is crucial to improving clinical and functional outcomes of TBI.

Primary Presenter: Evan Cornish

Project Title: *Evaluating middle school students' understanding and emotional outlook on the COVID-19 pandemic*

COVID Virtual Summer Camp Project

Primary Mentor: Madiha Abdel-Maksoud

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Background and Objectives:

The COVID-19 pandemic interrupted the education of nearly 94,000 students throughout Denver Public Schools (DPS), creating academic and mental health challenges. COVID Virtual Summer Camp (CVSC) was created to educate adolescents on topics pertinent to the pandemic and to assess its effects on students' understanding and emotional outlook.

Methods:

Eighty-five middle school students (63% females) were recruited. Two identical camps took place July 13th- 24th. Curriculum topics included microbiology, immunology, health disparities, recognizing and verifying credible sources, and mental health. Content was presented using short lectures, small group discussions, and Q&A sessions with medical and public health professionals. Participants completed pre- and post-camp surveys assessing their understanding of COVID-19 topics and emotions experienced in light of the pandemic. Participants described their emotions by choosing words from a provided word bank. Each word corresponded to a position on a pleasantness vs energy intensity axis (e.g. "depressed" is low-energy and unpleasant).

Results:

Pre- and post-camp survey analysis showed a 55% increase ($p < 0.001$) in participants who felt confident discussing infectious diseases and a 48% increase ($p < 0.001$) in participants who reported knowing how infectious diseases spread. Pre- and post- CVSC, 62% and 68% of words chosen to describe emotions associated with the pandemic were in the unpleasant, high-energy quadrant, respectively.

Conclusions:

Our observations show the impact programs like CVSC may have on students' ability to understand and discuss topics pertinent to the pandemic while highlighting the challenge in addressing students' emotions associated with the pandemic. These observations may help guide future approaches to supporting students' academic success and mental health.

Primary Presenter: Ephrat Fisseha

Project Title: *Factors Associated with and Management of High Viral Loads Among Pregnant and Postpartum Women Living with HIV in Southwestern Kenya: A Mixed Methods Study*

Primary Mentor: Lisa Abuogi

Thematic Area: Global Health

Abstract:

ABSTRACT

HIV viral load among pregnant and postpartum women is impacted by a variety of factors and interventions to prevent perinatal transmission must take this into account. In this mixed-methods study, we examined the associations among biomedical and socio-behavioral risk factors and high viral load (viral load ≥ 1000 copies/mL) among 557 pregnant or postpartum women enrolled in the Opt4Mama[™]s study in western Kenya. Univariable and multivariate logistic regression analysis was used to establish predictors of high viral load. Then, a thematic analysis was conducted using 40 participant case reviews carried out by an interdisciplinary team. High viral loads were associated with younger age (adjusted Odds Ratio (aOR) 0.92, 95% Confidence Interval (CI) [0.85, 0.99]), new HIV diagnosis (aOR 3.47, 95% CI [1.59, 33.21]), depression (aOR 2.56, 95% CI [1.59, 33.21]), and lower self-reported adherence (aOR 0.03, 95% CI [0.00, 0.16]). Thematic analysis of case reviews revealed four themes related to high viral load and interventions applied: multilevel contributing factors, ART regimen change, adherence support, and psychosocial support. Thematic analysis showed that most women had multiple factors contributing to their high viral load indicating the multifactorial nature of HIV-related outcomes. All women who reported problems maintaining adherence were also reported to have psychosocial challenges. Multiple interventions were combined to address the unique grouping of contributing factors affecting women with high perinatal viral loads. A multifactorial approach to address the variety of psychosocial challenges women with HIV face is required to promote maternal health and facilitate perinatal HIV prevention.

Primary Presenter: Rachel Graham

Project Title: *Progress Towards Ethical Practices in Medical Student Participation in Global Surgery Projects: A Qualitative Analysis*

Primary Mentor: Angela Sauaia

Thematic Area: Global Health

Abstract:

Title: Progress Towards Ethical Practices in Medical Student Participation in Global Surgery Projects: A Qualitative Analysis

Background

In recent years, there has been growing interest in global surgery among medical students. Preparation for these projects is critical to ensure that these projects are conducted in ethical and sustainable manners that maximize benefits and minimize harms to host international partners. Given that the literature focuses on graduate medical trainees, there is a need to explore the role of preparation in medical student experiences.

The study aims were: 1) to evaluate the role of formal pre-departure preparation/training for global surgery projects and experiences; and 2) to explore how formal preparation can aid medical students in enjoying an enriching experience while contributing positively to the destination communities during international projects.

Methods

This qualitative study used phone interviews of volunteer key informants (n=9), from US medical schools, who participated in international global surgery projects during medical school. Semi-structured interviews were conducted and analyzed using an inductive approach to thematic content analysis.

Results

Analysis of 9 key informant interviews demonstrated methods of preparation included skills building; discussion of ethical dilemmas; environment and expectation management; cultural orientation; logistics planning; defining goals, expectations, and role clarity; and acknowledgement of needing to learn through experience. During their

experiences, three themes emerged: (1) conflicting values and practices in the clinical space; (2) ethical challenges in research; (3) navigating situations involving cultural dynamics.

Conclusions

Overall, while participants faced ethical dilemmas during their projects, they felt well prepared to navigate such challenges and demonstrated a high level of self-reflection and understanding of the ethics of global surgery. Such findings offer a hopeful perspective regarding the progress that has been made towards engaging in more ethical practices, particularly for trainees, as we work to address global disparities in surgery.

Primary Presenter: Alexander Hoffner-Heinike

Project Title: *Electromechanical discoordination is present in patients with Duchenne Muscular Dystrophy independent of tissue fibrosis.*

Primary Mentor: Scott Auerbach

Thematic Area: Clinical Science

Abstract:

Electromechanical discoordination is present in patients with Duchenne Muscular Dystrophy independent of tissue fibrosis. A Hoffner-Heinike (MD, Medical School), M Schafer, BS. Frank, DD Ivy, AJ Barker, LP Browne, M Di Maria, B Fonseca, S Miyamoto, S Auerbach, Heart Institute, Children's Hospital Colorado

Purpose: Progressive ventricular dysfunction is a cardinal symptom in Duchenne Muscular Dystrophy (DMD). Some of the earliest signs of cardiomyopathy in DMD are myocardial fibrotic deposition and Left Ventricle (LV) strain defects. Electromechanical discoordination, as measured by Systolic Stretch Fraction (SSF) and Diastolic Relaxation Fraction (DRF), has been shown to be a sensitive marker of ventricular dysfunction. The presence of this discoordination in relation to fibrotic deposition in DMD has yet to be elucidated.

Methods:

Patients with DMD (n=31)(mean age: 14 ± 4 yrs) and controls (n=20) (mean age: 15 ± 3 yrs) underwent CMR for volumetric and functional analysis as well as Gadolinium (Gd) enhancement to evaluate the presence of fibrosis. Circumferential strain and strain rate indices from each segment were used to calculate electromechanical discoordination. Strain rate data was used to calculate SSF and DRF.

Results:

Patients with DMD showed increased median LV SSF compared to controls [0.027 (IQR: 0.015-0.041) vs 0.007 (IQR:0.005-0.013), $P = 0.002$] as well as increased median LV DRF [0.371 (IQR: 0.310-0.473) vs 0.300 (IQR: 0.264-0.325), $P < 0.001$] (Figure). When comparing Gd(+) (n=14) vs Gd(-) (n=17) DMD patients, there was no difference between groups in either SSF [0.027 (IQR: 0.016-0.042) vs 0.026 (IQR: 0.008-0.040), $P = 0.929$] or DRF [0.371 (IQR: 0.309-0.537) vs 0.379 (IQR: 0.322-0.464), $P = 0.931$]. The SSF was associated with ESVi ($R=0.71$, $P<0.001$), EDVi ($R=0.65$, $P< 0.001$) and inversely associated with EF ($R=-0.63$, $P<0.001$).

Conclusion:

Patients with DMD showed increased levels of LV electromechanical discoordination independent of qualitative presence of fibrosis noted by Gd enhancement. This allows speculation that changes in electromechanical discoordination may precede visible fibrotic change in DMD.

Primary Presenter: Amanda Hunt

Project Title: *Long-term Patient Reported Symptom Improvement and Quality of Life Following Transthoracic Diaphragm Plication in Adults*

Primary Mentor: Brandon Wojcik

Thematic Area: Clinical Science

Abstract:

ABSTRACT

Introduction: Open and robotic-assisted transthoracic approaches for diaphragm plication are accepted surgical interventions for diaphragm paralysis and eventration. However, long-term patient-reported symptom improvement and quality of life (QOL) remains unclear.

Study Design: A telephone-based survey was developed focusing on postoperative symptom improvement and QOL. Patients who underwent open or robotic-assisted transthoracic diaphragm plication (2008-2020) across three institutions were invited to participate. Patients who responded and provided consent were surveyed. Likert responses on symptom severity were dichotomized and rates before and after surgery were compared using McNemar's test.

Results: 41% of patients participated (43/105 responded, mean age 61.0 years, 67.4% male, 37.2% robotic-assisted surgery), with an average time between surgery and survey of 4.1 ± 3.2 years. Patients reported significant improvement in dyspnea while lying flat (67.4% pre-op vs 27.9% post-op, $p < 0.001$), dyspnea at rest (55.8% pre-op vs 11.6% post-op, $p < 0.001$), dyspnea with activity (90.7% pre-op vs 55.8% post-op, $p < 0.001$), dyspnea while bending over (79.1% pre-op vs 34.9% post-op, $p < 0.001$), and fatigue (67.4% pre-op vs 41.9% post-op, $p = 0.008$). There was no statistical improvement in chronic cough. 86% of patients reported improved overall QOL, 79% had increased exercise capacity, and 86% would recommend surgery to a friend with a similar problem. Analysis comparing open and robotic-assisted approaches found no statistically significant differences in symptom improvement or QOL responses between the groups.

Conclusion: Patients report significantly improved dyspneic and fatigue symptoms following transthoracic diaphragm plication, regardless of open or robotic-assisted approach. The majority of patients report improved QOL and exercise capacity.

Primary Presenter: Helene Kuffel

Project Title: *Serum Biomarkers of Nutrition Pre and Post-CFTR Modulator Use in Children with Cystic Fibrosis*

Primary Mentor: Edith Zemanick

Thematic Area: Clinical Science

Abstract:

Serum Biomarkers of Nutrition Pre and Post-CFTR Modulator Use in Children with Cystic Fibrosis

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Rationale. People with Cystic Fibrosis (CF) are at risk for malnutrition and fat-soluble vitamin deficiencies due to pancreatic insufficiency and fat malabsorption. Highly effective CFTR modulators, ivacaftor and elexacaftor/tezacaftor/ivacaftor (ETI), substantially improve CFTR activity, lung function and nutritional status (weight and body-mass index) in people with CF with certain genetic mutations. Fat-soluble vitamin levels (vitamins A, D, and E) are assessed annually in children with CF. We sought to determine changes in fat-soluble vitamin levels following treatment with ivacaftor or ETI.

Methods. We performed a retrospective study of children with CF who had at least three annual evaluations including vitamin A, D, and E prior to ivacaftor or ETI start date and at least one evaluation \geq 3 months post-modulator start date. Data collected included demographics, CF diagnostic data, pancreatic status, nutritional status, and lung function. Summary statistics were calculated and vitamin levels were compared pre to post-modulator within group via signed-rank tests.

Results. There were 36 children with CF prescribed highly effective CFTR modulators who met annual evaluation criteria, 27 on ETI and 9 on ivacaftor. All individuals treated

with ETI were pancreatic insufficient, whereas 7/9 (78%) of those treated with ivacaftor were pancreatic sufficient. For children treated with ivacaftor, vitamin levels were not significantly different following treatment with mean (SD) levels before and after modulator treatment: vitamin A 41 (9.8) mcg/dL vs 48 (13.5) mcg/dL, $p = 0.05$; Vitamin D 40.8 (5.1) ng/mL vs 46.7 (18.1) ng/mL, $p = 0.50$; and vitamin E (alpha-tocopherol) 13.8 (4.4) mcg/mL vs 12.2 (1.7) mcg/mL, $p = 0.04$.

For children treated with ETI, mean Vitamin A levels increased following modulator treatment: vitamin A 38 (6.5) mcg/dL vs 45 (10.8) mcg/dL, $p < 0.01$. For vitamin D, we did not detect a difference between pre and post-modulator values: Vitamin D 35 (9.3) ng/mL vs 38.6 (16)

ng/mL, $p = 0.39$. For Vitamin E, the post-modulator average value was statistically significantly lower than pre-modulator values: Vitamin E 10.7 (2.9) mcg/mL vs 9.2 (4.4) mcg/mL, $p = 0.01$.

Conclusions. Children treated with ETI had improvement in fat-soluble vitamin A following at least 3 months of treatment. Vitamin levels did not change in those treated with ivacaftor, possibly due to small numbers, fewer pancreatic insufficient patients, or less impact on fat absorption compared to ETI. Evaluation of additional children started on ETI and longer follow-ups are needed to determine if significant changes in vitamin levels persist.

Primary Presenter: Laura Maurer

Project Title: *Pilot Project: Online Midwifery Education Aimed at Maternal Health Staff in Trifinio, Guatemala*

Primary Mentor: Amy Nacht

Thematic Area: Global Health

Abstract:

Purpose. Guatemala has one of the highest maternal mortality ratios in the world with women in rural areas, such as the El Trifinio region, being disproportionately affected by preventable maternal deaths.² Although a birthing center was opened in Trifinio in 2016 as an extension of the established clinic known as the Trifinio Center for Human Development, the lack of appropriately trained staff at the facility is a major barrier to its use and utilization by women in the local community.³ In order to enhance clinical training, the University of Colorado's maternal health team plans to create an online, self-paced midwifery training program with remote mentorship for community nurses in Trifinio. The goal of this project is to assess the feasibility of such a program in the context of this resource-limited region and gather information about the most effective educational methods among the current cohort of local staff in order to ultimately inform the maternal health team's choice of curriculum design and content within this new online midwifery education curriculum.

Methods. To determine whether such a program can be implemented in a remote setting with limited resources, literature reviews were conducted on existing skilled birth attendant training programs, the success of online education in low-resource remote settings, and the use of remote mentorship as a means of enhancing online education. A preference was given to papers with resources and socioeconomic settings similar to Trifinio.

To gather information about our target student population, a qualitative and quantitative survey was administered to the current maternal health community nursing staff in order to gain information about educational experience, learning preferences, interest in the new learning program, expectations of the program, and potential resource limitations to implementation.

The analysis of this information was presented to the maternal health team at the University of Colorado to inform the design and creation of a sustainable midwifery program. After the team determined the optimal content delivery format, a process map was created with a corresponding workbook detailing the steps in adapting a given ICM competency into a deliverable educational module. These modules will be developed by U.S.-based content experts that will be appointed by the University of Colorado in the future. Additionally, a course logistics packet was created with instructions for participating community nurses on how to access and complete the module content.

Results. The literature review within three evidence tables concluded, respectively, that there is a need for skilled birth attendants in low- and middle-income countries, online education is

feasible even in remote areas with limited Wi-Fi access, and mentorship does enhance the overall experience of students with online education in a remote environment.

Results from the pre-pilot survey indicated a high regard for program content among participants as well as a high level of interest in completing asynchronous online midwifery education with remote mentorship. Additionally, strong preferences were demonstrated for working with peer partners, receiving content via educational videos, discussions with content experts, and self-directed text with associated workbooks, as well as the use of multiple-choice and free-response questions for assessment purposes. Finally, participants indicated a high level of expectation for the mentorship assistance and availability of mentors, although there was poor consensus surrounding the amount of required communication that mentors should be responsible for.

Conclusions. Preliminary findings from the literature review support feasibility of the use of online education with remote mentorship in Trifinio. In accordance with the preferences demonstrated by participants, the remote midwifery education program proposed by the University of Colorado maternal health team will be delivered to participants asynchronously via educational videos and self-directed online text modules that are supplemented with periodic synchronous interaction with remote mentors and group discussion forums. Each educational module will be adapted from 1-2 designated ICM competencies and presented to students in a standard format on a Google Document platform that has unlimited accessibility and no subscription costs. Participants will be paired with 2-3 other similarly paced students for synchronous interactions with mentors through an established online video-chat platform, such as Zoom, and the frequency of mentor interaction will depend upon the results of a needs assessment from ongoing participant surveys. Finally, assessments will consist of remote content assessments from online multiple-choice and free-response question quizzes, as well as clinical assessments of designated ICM competencies under the supervision of the local charge nurse at the clinic. The final remote midwifery education curriculum will undergo quality improvement and modification in accordance with the feedback provided by participants.

Primary Presenter: Rouna Mohran

Project Title: *Mental Health Conditions in the Colorado Refugee and Immigrant Community*

Primary Mentor: Madiha Abdel-Maksoud

Thematic Area: Global Health

Abstract:

Abstract

Background: Upon entry to Colorado, immigrants and refugees undergo several health exams including the Domestic Medical Exam (DME) and the Refugee Health Screening-15 (RHS-15) tool, used to screen for mental health conditions (MHC). With the millions of refugees and immigrants worldwide, many of whom come from war-torn countries, there are several health issues to be expected, including mental health conditions such as depression, anxiety, and PTSD. This study aimed to assess the prevalence of mental health conditions upon entry in refugees relocated to Colorado.

Methods: A cross-sectional study of immigrants who arrived in Colorado between 2009-2020 was conducted. 17,516 immigrants were screened for physical and mental health using the DME and the RHS-15, respectively, within 90 days of entry to the US. SAS 3.8 was used to evaluate the prevalence and determinants of the presence of at least one mental health condition. Logistic regression and multivariate regression using PROC GENMOD were performed to determine which characteristics were significantly associated with MHC.

Results: Of the 17,516 subjects screened for MHC, 16,073 (91.76%) screened positive for at least one condition. Age, history of trauma, and arrival year were significant in the crude analysis. In the adjusted analysis, geographic region of origin and immigration status were significantly associated with MHC[€]™s with adjusted prevalence ratios (95% CIs) of 0.03 (0.01, 0.05) and -0.05 (-0.08, -0.04) respectively.

Conclusion: Geographic region of origin and immigration status are significant risk factors for mental health conditions. Further research on potential confounding and mediating factors should be done to understand the relationships between the determinants of MHC[€]™s upon entry, which is critical to inform screening strategies and the design, tailoring, and implementation of interventions.

Primary Presenter: Jessica Saifee

Project Title: *Addressing Refugee Health During COVID-19 and Future Pandemics*

Primary Mentor: Steven Lowenstein

Thematic Area: Global Health

Abstract:

Background: Since the declaration of the coronavirus disease (COVID-19) pandemic in March, 2020, many governments have not yet created response plans for vulnerable populations (for example, refugees, migrants, and asylum seekers) residing within their borders.

Objective: This review summarizes the current literature on refugee health in response to COVID-19 and other pandemics and highlights changes that need to occur in order to better assist this population.

Methods: We conducted a systematic literature search using the main online databases (PubMed, Web of Science, Google Scholar) with the following keywords: 'COVID-19;' 'refugee health;' 'migrants;' 'refugee camps;' 'pandemic' 'asylum seekers;' 'infectious diseases;' 'displaced person;' and 'U.S. Detention Centers.' We included publications from 21 May 2009 to 17 July 2020 that focused on understanding refugee health during pandemics, including COVID-19. Relevant articles describing the impact of other infectious diseases pandemics on refugee health were also included, Structured key informant interviews were completed with refugee patients, providers and other relevant stakeholders located in Aurora and Denver, CO, USA.

Conclusion: In order to slow the spread of COVID-19 and other easily- transmissible and deadly viruses that can lead to pandemics, governments need to implement policies that allow refugees, asylum seekers, and migrants to be fully incorporated into their respective healthcare systems so they can access acute, chronic disease and pandemic-specific healthcare without fearing for their immigration status. Interventions focused on reducing population density in refugee camps, community engagement, and broad sanitation measures, are needed to stop the spread of COVID-19 in this population.

Primary Presenter: John-Paul Tsai

Project Title: *COVID19 Pandemic Provider Burnout: A UCH Staff Study*

Primary Mentor: Madiha Abdel-Maksoud

Thematic Area: Public Health and Epidemiology

Abstract:

The COVID19 pandemic continues to cause mass disruptions to lives across the globe. Recent literature has shown an increase in the prevalence of burnout and other mental health issues like anxiety, depression, and insomnia in healthcare workers during and after the pandemic. During the first wave of the pandemic in Colorado, a survey was distributed among all faculty with appointments at the University of Colorado Hospital via their work associated email. The survey included demographic questions like age, gender, provider role, and race. Exactly 833 individuals responded to the survey. The primary aim of this study was to investigate the impact of provider role on survey responses for self-reported stress, burnout, and depression of University of Colorado Hospital employees. Additionally, effect modifiers were considered including gender, age, and race which may influence risk of burnout. Prevalence odds ratios with 95% confidence intervals were calculated by creating two by two tables and calculating the cross product with standard error estimation. The results of the study show that physicians are significantly less likely to report burnout compared to advanced practice providers, and that males are significantly less likely to report both stress and burnout compared with females. The other outcomes from this study included non-significant odds ratios, so the significance of these results is unclear. Further studies should include validated screening tools within the survey to increase validity.