



University of Colorado Anschutz Medical Campus

ANNUAL STUDENT MSA CAPSTONE PRESENTATIONS

March 2, 2021

ANSCHUTZ MEDICAL CAMPUS VIRTUAL

Poster Sessions

Session 1: 1:00 pm – 2:00 pm

Session 2: 2:00 pm – 3:00 pm

Session 3: 3:00 pm – 4:00 pm

The MSA Directors would like to acknowledge, with gratitude, the support for medical student research provided by:

The University of Colorado
School of Medicine Dean's Office
And
Undergraduate Medical Education Office

Poster Session Judges

The organizing committee wishes to acknowledge their appreciation to the following serving as judges for the MSA Capstone Presentations. Without their generous contribution of time and talent the forum would not be possible. Thank you!

Aimee Bernard	Erin Cobry	Lacey LaGrone	Patrick Henn
Alfonso Pantoja	Granville Lloyd	Lauren Wood	Paula Hoffman
Alison Shmerling	Gregary Bocsi	Leana May Moser	Ram Nagaraj
Allan Prochazka	James Maloney	Lori Walker	Rita Lee
Allison Shapiro	Jean Mulcahy Levy	Madiha Abdel-Malek	Rooban Nahomi
Amanda Law	Jennifer Hagman	Manisha Bhide	Sarah Brewer
Anna Neumeier	Jennifer Jung	Mark Deutchman	Sarah Rowan
Annette Kenney	Jennifer Patnaik	Marsha Anderson	Sarah Stella
Blair Weikel	Jeremy Long	Mary DeGroote	Sarah Stewart
Brack Hattler	Jessica Walker	Michael Clay	Shanta Zimmer
Caleb Doll	Jillian Cotter	Michele Doucette	Sharon Hunter
Caroline Tietbohl	John Tentler	Miguel Flores-Bellver	Suhong Tong
Christi Piper	Joseph Brzezinski	Monika Nuffer	Suzhao Li
Christine Ebert-Santos	Julie Harral	Nalu Navarro-Alvarez	Talia Thompson
Daniel Goldberg	Katherine Frasca	Natalie Nokoff	Tamra Mohs
David Keller	Kenneth Cohen	Natarajan Balasubramaniyan	Tina Young
David Lehman	Kim Paxton	Nicole Kelp	Tyler Coyle
Douglas Adams	Korey Wylie	Nikhil Madhuripan	Upasana Mohapatra
Edward Cetaruk	Krista Walker	Nina McHale	Victoria Mohr
Emily Lindley	Kristen Nadeau	Nirmal Banda	
Eric Zacharias	Kristin Jensen	Patricia Heyn	

Primary Presenter: Allyson Adams

Project Title: Access to family planning in rural communities primarily served by Catholic versus non-Catholic hospitals: a mystery caller study

Primary Mentor: Maryam Guiahi

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

PURPOSE OF STUDY: Catholic hospitals account for one in six acute care hospital beds. A total of 46 hospitals are considered sole community hospitals, a designation that generally refers to care in remote locations, and three are located in Colorado. Catholic hospitals are expected to follow the Ethical and Religious Directives for Catholic Health Care Services, which applies the Catholic doctrine to the practice of medicine and results in prohibition of common reproductive services. Little is known about reproductive health care access in rural communities served primarily by Catholic hospitals. The purpose of this study is to compare access to family planning service appointments in three rural communities (Grand Junction, Durango, Cañon City) that are served by Catholic sole community provider (SCP) hospitals to similar communities served by non-Catholic sole community provider hospitals (Greeley, Montrose, Sterling).

METHODS: We performed an online search of all general obstetrics and gynecology (ob/gyn), family practice, and midwifery practices in each community. For each practice, we called five different times, each one week apart, and queried about availability of (1) short-acting reversible contraception (pill, injection), (2) long-acting reversible contraception (intrauterine device [IUD], implant), (3) emergency contraception (EC), (4) tubal ligation (interval, postpartum), and (5) abortion using structured telephone scripts.

SUMMARY OF RESULTS: In comparing whether service appointments were offered in communities with Catholic SCP hospitals versus non-Catholic SCP hospitals, a lack of service appointment for DMPA injection was significant ($p = 0.01$). In comparing presumed Catholic clinics to all other clinics, lack of appointment availability for was significant for OCP ($p = 0.01$) and IUD ($p = 0.01$). Across all communities, there was of low availability of EC (14.1%), tubal ligations (20.5%), and abortions (5.1%).

CONCLUSION: There was some restriction to family planning services secondary to Catholic health care affiliation. Across all rural communities, there was little access to many forms of contraception.

Primary Presenter: Brian Adams

Project Title: Evaluating the cost of antimicrobial resistance and errors in estimates: a systematic review and meta-analysis

Primary Mentor: Leana May

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Background: As the burden of antimicrobial resistance (AMR) increases worldwide, it is important for policymakers to accurately estimate the cost of AMR infections in standardized currencies. This systematic review and meta-analysis seeks to draw from diverse AMR costing studies to determine the cost of AMR resistance, determine the prevalence of study design errors, and to examine the impact of study design errors upon cost estimates.

Methods: Pubmed, Embase, Cochrane, and Web of Science were searched for systematic reviews of AMR costing studies. Studies in English reporting patient-level AMR cost between February 1990 and 2018 based on pre-specified criteria were considered. The presence of various design errors was evaluated using pre-specified criteria, and the relationship between error types was explored using regression techniques. Meta-regression was utilized to explore the relationship between design errors and costing estimates (STATA15).

Results: Of 266 retrievals, 55 unique studies were included representing a variety of organisms, antibiotic resistance types, study populations, and geographic locations. Statistically significant differences in cost were found depending on country income ($p=0.01$), whether the study took place in the USA ($p=0.01$), the organism stain ($p=0.01$), organism type ($p=0.02$), and antibiotic type ($p=0.01$), with an overall median AMR cost of 14932.28 June 2019 USD (95% CI, 14484.31, 15380.25). The majority studies (96.4%) analyzed included at least one type of study error. No relationship was found between study error types and AMR cost estimates.

Conclusions: The disparities in AMR cost based on country economic class, organism stain, organism type, and antibiotic type reflect differences in treatment modalities and reveal the difficulty in expressing one "overall" number expressing AMR cost. The high prevalence of design errors/strong error relationships reveals many AMR costing estimates are inaccurate, highlighting the need for more accurate models taking into account the effect of confounding factors and time on resistant infections.

Primary Presenter: Elsa Alaswad

Project Title: Applications of Diffusion Tensor Imaging

Primary Mentor: David Ormond

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

1) Current Applications of Diffusion Tensor Imaging and Tractography in Intracranial Tumor Resection

In the treatment of brain tumors, surgical intervention remains a common and effective therapeutic option. Recent advances in neuroimaging have provided neurosurgeons with new tools to overcome the challenge of differentiating healthy tissue from tumor-infiltrated tissue, with the aim of increasing the likelihood of maximizing the extent of resection volume while minimizing injury to functionally important regions. Novel applications of diffusion tensor imaging (DTI), and DTI-derived tractography (DDT) have demonstrated that preoperative, non-invasive mapping of eloquent cortical regions and functionally relevant white matter tracts (WMT) is critical during surgical planning to reduce postoperative deficits, which can decrease quality of life and overall survival. In this review, we summarize the latest developments of applying DTI and tractography in the context of resective surgery and highlight its utility within each stage of the neurosurgical workflow: preoperative planning and intraoperative management to improve postoperative outcomes.

2) Biopsy Confirmed Glioma Recurrence Predicted by Multi-Modal Neuroimaging Metrics

Abstract: Histopathological verification is currently required to differentiate tumor recurrence from treatment effects related to adjuvant therapy in patients with glioma. To bypass the complications associated with collecting neural tissue samples, non-invasive classification methods are needed to alleviate the burden on patients while providing vital information to clinicians. However, uncertainty remains as to which tissue features on magnetic resonance imaging (MRI) are useful. The primary objective of this study was to quantitatively assess the reliability of combining MRI and diffusion tensor imaging metrics to discriminate between tumor recurrence and treatment effects in histopathologically identified biopsy samples. Additionally, this study investigates the noise adjuvant radiation therapy introduces when discriminating between tissue types. In a sample of 41 biopsy specimens, from a total of 10 patients, we derived region-of-interest samples from MRI data in the ipsilateral hemisphere that encompassed biopsies obtained during resective surgery. This study compares normalized intensity values across histopathology classifications and contralesional volumes reflected across the midline. Radiation makes noninvasive differentiation of abnormal-nontumor tissue to tumor recurrence much more difficult. This is because radiation exhibits opposing behavior on key MRI modalities: specifically, on post-contrast T1, FLAIR, and GFA. While radiation makes noninvasive differentiation of tumor recurrence more difficult, using a novel analysis of combined MRI metrics combined with clinical annotation and histopathological correlation, we

observed that it is possible to successfully differentiate tumor tissue from other tissue types. Additional work will be required to expand upon these findings.

Primary Presenter: Jaclyn Anderson

Project Title: Educational Case: Invasive Melanoma

Primary Mentor: Miriam Post

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Diagnosing invasive melanoma can be challenging with the various subtypes and benign mimics. Many pitfalls in obtaining biopsies and pathology evaluation can occur that may obscure the definitive answer. Melanoma progression is on a spectrum from superficial spreading types to vertical growth phase seen in nodular melanoma. To address these concerns, we developed a continuing medical education piece for medical students and pathology residents describing the clinical presentations of melanoma and common benign conditions (such as lentiginosis, seborrheic keratosis, keloid scars, etc) and the benign and malignant pathologic differential diagnosis (spritz nevis, atypical melanocytic nevus, irritated nevus, superficial spreading melanoma, and lentigo maligna melanoma, etc) that should be considered with a possible case of invasive melanoma. Articles for the continuing medical education piece were found using Google Scholar and PubMed. These papers were inspected for relevant research studies relating to the clinical presentation, clinical differential diagnosis, pathologic diagnosis, pathologic differential and various diagnostic tools used to confirm a melanoma diagnosis. 145 articles and texts related to melanoma diagnosis and differential were reviewed and incorporated into this work. Four malignant melanoma subtypes and six benign lesions that were pathologically similar to invasive melanoma are described. Additionally, common pitfalls are discussed and explored.

Primary Presenter: Kelsey Andrews

Project Title: Healthcare Providers Interactions and Attitudes Regarding Patients Who Use Intravenous Drugs

Primary Mentor: david Elwell

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Purpose: With the current opioid crisis and rise in recent years in the number of patients who use intravenous drugs, it is important that providers are able to provide unbiased, competent care to these individuals. The goal of the study was to assess provider attitudes and biases held when caring for patients known to use illicit intravenous drugs. This study also aimed to assess provider confidence in providing treatment and patient centered care to this patient population at a large tertiary academic safety net hospital.

Method: A thirteen questions, five point likert scale was disseminated via email to providers working in the internal medicine or emergency medicine departments of a large academic safety net hospital in Denver, Colorado. Responses were recorded anonymously using REDCap.

Results: Respondents included physicians, nurse practitioners, and physician assistants with 71 surveys were returned, with 6 incomplete. Providers noted that treating patients who use intravenous drugs was more challenging, more likely to result in a patient leaving against medical advice, and that these patients were perceived to be less likely to adhere to recommended treatment plans. Providers noted that they felt their colleagues treated patients who use intravenous drugs differently than non-drug using patients, and that their colleagues were more likely to recommend a different treatment plan for the same condition to patients who use intravenous drugs. Providers overall felt confident in their ability to manage patient withdrawal symptoms and to develop a medication assisted therapy plan for their patients including recognizing the importance of naloxone prescriptions to those that use intravenous drugs.

Conclusions: Patients with substance use disorder continue to be a large subset of patients treated both in inpatient and outpatient settings across the United States. With providers coming into regular contact with these patients, it is important to address biases and attitudes held that may affect the care these patients receive. It is essential that healthcare providers feel confident in their ability to collaborate with these patients, manage withdrawal symptoms, and be able to connect patients with ongoing supporting resources within their communities. The study has shown that providers are becoming more confident in their ability to medically manage withdrawal and to collaborate with patients to provide care. Yet, significant biases still exist that can affect the medical care those that use IV drugs receive including perceptions of medication adherence, violence and baseline participation in treatment plans. Moving forward, education needs to be continually disseminated to healthcare providers specifically regarding unique care

aspects of those that use IV drugs along with continual assessment and retraining surrounding implicit bias.

Primary Presenter: Yaa Asare

Project Title: Quality Improvement of Data Collection and Utilization of Health Information from Dhulikhel Hospital Outreach Centers

Primary Mentor: Geoffroy Fauchet

Secondary Mentor(s):

Thematic Area: Global Health

Abstract:

The Dhulikhel Hospital in Nepal has established 16 outreach centers in nine districts to serve communities that do not have access to healthcare facilities. However, there was no method for tracking the changes in health status and therefore no efficient means of creating interventions that target specific needs of the community. The objective of this project was to develop a questionnaire with which the providers serving the outreach centers could collect data on the health status of their patients. Content of the questionnaire was informed by interviews with two pediatric outpatient providers, documented pediatric diagnoses between January-June 2018, and a literature review. Target population was 6-16 year-old students. Evaluation of pediatric diagnostic data revealed that a majority of concerns involved pulmonary and gastrointestinal systems. Pneumonia and other pulmonary conditions comprised 28.5% of diagnoses, and gastrointestinal concerns such as dysentery was 25.7%. Components of the questionnaire included personal and family health history, nutrition, and hygiene, and review of systems that emphasize commonly affected organ systems.

Primary Presenter: Riannon Atwater

Project Title: Medicaid Acceptance in Specialty Care: Discussion of contributing factors and solutions for low access to specialty care among Medicaid patients

Primary Mentor: Rita Lee

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Medicaid is the number one health insurer in the United States, insuring more than 1 in 5 Americans (Henry J Kaiser Family Foundation, 2018), or 67,305,506 individuals (Medicaid.gov Keeping America Healthy, 2018). This also holds true for Colorado where Medicaid insures over 1.1 million Coloradans (Colorado Health Institute, 2017). With the expansion of Medicaid under the Affordable Care Act (ACA), enrollment in Medicaid and the Children's Health Insurance Program (CHIP) increased 29% (Henry J Kaiser Family Foundation, 2018). As of March 2018, Colorado had experienced the fourth largest jump in Medicaid enrollment, with a 71% increase since the beginning of the ACA (Henry J Kaiser Family Foundation, 2018).

A significant and recurring issue that Medicaid patients face is that, despite the program insuring an immense number of people, many medical practices do not accept Medicaid patients (Bisgaier J, 2011). This creates a gap in access to health care. In states such as Colorado that have expanded Medicaid, the gap in access to care has become even larger. Practices that do accept Medicaid have become saturated and unable to cope with the increased demand. One of the largest gaps in the Denver Metro area is access to specialty care, with only a limited number of specialty physicians accepting established adult Medicaid patients, and even fewer accepting new adult Medicaid patients according to a preliminary survey of physicians in the area by Mile High Health Alliance.

There are numerous reasons that specialty physicians cite for not wanting to accept more Medicaid patients into their practices. These include issues related to the billing process (low reimbursement rate, increased wait time for reimbursement, added complexity of billing for Medicaid), and impressions that Medicaid patients are socially complex, medically complex, and non-compliant with treatment plans (Niess MA, 2018). These attitudes show that not only are there systemic problems with how Medicaid is functioning, but there are stigmas that come with being a patient covered by Medicaid. These stigmas are not wholly based in fact, but are prevalent among healthcare professionals.

There are numerous facets to the problem of low specialty acceptance of Medicaid patients, none of which can be solved in one simple step. The proposed solutions outlined here are a threefold process. First is to increase care coordination and patient navigation services for Medicaid patients. This will assist the patients in accessing resources that will allow them to make the most of their specialty appointments. Over time, this may help alleviate some of the provider biases about the social complexity of Medicaid patients by helping the patients navigate some of their socioeconomic barriers and adhere to their appointments and treatments. The second step is to

focus on policy change. Some practices feel that accepting Medicaid patients causes them to lose money and time. Therefore, the recommendations are: to increase reimbursement rates, speed up reimbursement times, and create a billing platform that is equivalent to that of Medicare. Additionally, new policy needs to address reimbursement for transportation to and from appointments, telemedicine, and e-consults. Policy and finance changes can be enacted more easily, whereas stigma can take generations to reverse. This is why the third recommendation is to change the format of medical education to teach about Medicaid as an insurance and educate on social responsibility and how to manage one's own biases.

Currently healthcare reform is a huge point of contention in our state and country. We are at a pivotal point, and it is important as we reform our system to make sure that the changes made will increase access and decrease stigma associated with being a patient of a lower socioeconomic class. This three-pronged approach of how to proceed will not be an overnight solution to the issue of specialty acceptance for Medicaid patients, but will open a dialogue between patients and providers and will get us one step closer to health equity.

Primary Presenter: Ellen Awoniyi

Project Title: The "So What" Learning Series - Lessons on Leadership Pilot Program

Primary Mentor: Regina Richards

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Community involvement and leadership skills aimed at our youth are paramount in our local communities. The purpose of this project was to create a pilot summer leadership series aimed at teenagers (12-18 years old) within the cities of Aurora and Denver, Colorado. Our main aim as a pilot series was to determine our youth's needs and find ways to implement a curriculum that was easy to understand, age-appropriate, creates a sense of purpose and self-efficacy, and is overall beneficial for the individuals who took the course. Youth empowerment is a vital aspect of the program, and students were encouraged to take ownership of their thoughts and ideas and create a safe space for them to express themselves productively. The initial program was a once-a-week course that lasted for four weeks. Pre- & post surveys are given at each session to gauge the student's perspectives on the leadership lessons and see the areas we need to improve on as we work towards a complete curriculum. The analysis of the program's impact was measured by the feedback provided by the students. Overall, the feedback that we have received indicates that community involvement and leadership skills aimed at our youth is a gap that needs to be bridged in their curriculums and a necessity in our local communities.

Primary Presenter: Lyndsey Babcock

Project Title: My-DST Drug Assay to Optimize Therapy for Multiple Myeloma

Primary Mentor: Tomer Mark

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

The treatment for multiple myeloma has evolved in recent years from traditional chemotherapy to newer therapies such as monoclonal antibodies, proteasome inhibitors, and immunomodulatory agents in addition to autologous stem cell transplant. While survival outcomes have generally improved, these new agents are also associated with additional toxicities and significant cost. The treatment of patients with cancer is fraught by a delicate balance of targeting the disease while avoiding treatment-related complications. Further complicating treatment decisions is that myeloma is a heterogeneous disease with great genetic diversity, thus while there is much data on the efficacy of particular antimyeloma agents in large clinical trials, it is not typically clear how individual patients will respond to the different classes of therapy. “Personalized” or “precision” medicine approaches can ease this problem of finding the right treatment for the right patient regardless of tumor genetic complexity. Multiple myeloma epitomizes the struggle to balance treatment options and their complications, for it is an incurable disease afflicting a predominantly aged population, and treatment is administered on a continuous schedule with little or no breaks. Over the last two decades, advances in drug development have improved outcomes for younger, fit patients, but elderly and frail patients haven’t realized the same benefit. This could be related to the benefits of three drug combinations which are recommended as initial therapy in myeloma, whereas frail patients can often tolerate only two drugs at a time due to excess toxicities. To address the unmet need for personalized medicine in myeloma, we developed a functional approach by profiling the sensitivity of individual patients’ myeloma to clinically available drugs with an ex-vivo assay. We here present a patient’s case and corresponding drug sensitivity profile to illustrate how personalized treatment may lead to an improved disease course. Personalized treatment could provide the greatest survival improvements to elderly patients with cancers, such as multiple myeloma, through avoiding undertreatment, limiting attrition through subsequent lines of therapy due to toxicity, reducing exposure to ineffective drugs, and streamlining the management of relapses through re-testing. Exploring these avenues is imperative to closing the gap in cancer-related mortality in the elderly and frail.

Primary Presenter: Eliza Baird-Daniel

Project Title: Autophagy inhibition increases chemosensitivity to MEK inhibition in NF1 mutated Tumors

Primary Mentor: Jean Mulcahy-Levy

Secondary Mentor(s):

Thematic Area: Basic Biomedical Science

Abstract:

Autophagy inhibition is an area of active investigation as treatment for central nervous system (CNS) tumors. It is thought that autophagy, a heavily regulated process by which cellular waste is transferred to lysosomes for degradation and processing, is an integral part of tumor cell survival under stressful conditions. While the efficacy of autophagy inhibition has been demonstrated in CNS tumors including those with BRAFV600e mutations, it has yet to be explored in other tumor types with MAPK pathway dysregulation such as NF1-mutated tumors. Here, we describe increased autophagic dependence of NF1 mutated tumors and demonstrate increased tumor sensitivity to autophagy inhibition both alone and in combination with MEK inhibition. These findings show that autophagy inhibition via chloroquine (CQ) may be an effective adjunctive treatment for NF1 mutated tumors, and suggest that diverse tumor types with MAPK pathway dysregulation are more susceptible to autophagy inhibition.

Primary Presenter: Alla Balabanova

Project Title: Quality Improvement of Data Collection and Utilization of Health Information from Dhulikhel Hospital Outreach Centers

Primary Mentor: Geoffrey Fauchet

Secondary Mentor(s):

Thematic Area: Global Health

Abstract:

The Dhulikhel Hospital in Nepal has established 16 outreach centers in nine districts to serve communities that do not have access to healthcare facilities. However, there was no method for tracking the changes in health status and therefore no efficient means of creating interventions that target specific needs of the community. The objective of this project was to develop a questionnaire with which the providers serving the outreach centers could collect data on the health status of their patients. Content of the questionnaire was informed by interviews with two pediatric outpatient providers, documented pediatric diagnoses between January-June 2018, and a literature review. Target population was 6-16 year-old students. Evaluation of pediatric diagnostic data revealed that a majority of concerns involved pulmonary and gastrointestinal systems. Pneumonia and other pulmonary conditions comprised 28.5% of diagnoses, and gastrointestinal concerns such as dysentery was 25.7%. Components of the questionnaire included personal and family health history, nutrition, and hygiene, and review of systems that emphasize commonly affected organ systems.

Primary Presenter: Sarah Bardwell

Project Title: Patient Companion Project: A pilot model extending opportunities to pre-health students and healthcare partnership to older adults

Primary Mentor: Janna Hardland

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

INTRODUCTION: Volunteer and clinical experiences are important for matriculation to health professional programs yet obtaining these experiences can be difficult for many students. Additionally, older patients are at increased risk of isolation, mood disorders and experience a large burden of illness and healthcare utilization. Pairing these groups offers an opportunity to benefit students by increasing exposure to vulnerable older adults and clinical patient experience and to older adults by providing companionship, goal setting and appointment navigation. The Patient Companion Project was created to provide meaningful volunteer opportunities to undergraduate pre-health students while benefiting patients living in a long-term care setting. This program emphasizes communication skills, rapport building and the basics of healthcare systems and policy, while providing companionship and appointment navigation to long term care patients.

METHODS: Students commit to participation for a minimum of 24 months and visit patients twice per month, logging each visit including, attendance at medical appointments, and progress on patient goals. Students and leadership meet every month for didactics on various topics related to healthcare for older adults and for reflection on their experiences as companions. Surveys were used to collect information about student volunteer and leadership experiences.

RESULTS: Only 12% of companion visits included healthcare appointments. About 20% of visits included companion interactions related to healthcare appointments. At about 50% of visits goal related topics were discussed. Surveys revealed that volunteers reported that the program improved their comfort with older adults, increased their exposure to clinical medicine and improved the strength of their application to healthcare professions programs. Surveys also revealed difficulty in volunteer attendance of healthcare appointments and problems with leadership and communication.

CONCLUSION: A patient companion model has the potential to positively influence the pre-health experience of undergraduate students and healthcare experience and quality of life for older adults. However, such a model would require significant institutional or organizational support to ensure a consistent and high-quality experience for all participants.

Primary Presenter: Holly Baumgarten Weil

Project Title: Performance of the GI PCR Assay in Hospitalized Adults

Primary Mentor: Bruce McCollister

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: The BioFire FilmArray GI Panel Assay is a PCR-based diagnostic test capable of detecting 22 different gastrointestinal pathogens. However, the majority of pathogens detected by the GI PCR assay in hospital-acquired gastroenteritis is largely due to *Clostridium difficile* and Norovirus, both of which can be assayed individually with less expensive tests. Previous studies favor a cost-saving "3-day rule," that instructs laboratories to discontinue GI PCR tests ordered on inpatient adults following the 3rd day of hospitalization. However, the previous studies performed a limited analysis of pathogens (viruses, EPAC, and cryptosporidium were not considered), and certain high-risk patients may go undetected if the 3-day rule were enforced. Thus there is a need to identify certain patient characteristics that would indicate when breaking the 3-day rule and ordering a full GI panel assay is warranted.

Hypothesis: The aim of this study was to define the appropriate use of the GI panel assay for the evaluation of hospital-acquired diarrhea in adult patients. We hypothesized there would be a decreasing yield in the detection of gastrointestinal pathogens (excluding *C. difficile* and Norovirus) by the FilmArray GI Panel assay when testing hospitalized adult patients more than 3 days following hospital admission, compared to those tested within the first 3 days of hospitalization or those tested as outpatients.

Methods: This is a two-part study. Part one is a retrospective study of the yield of the FilmArray GI Panel in detecting GI pathogens in adults who have been hospitalized for > 3 days and tested between June 2016 and May 2017 at the University of Colorado Hospital Molecular Laboratory. Part two is an observational study intended to analyze the patient subset from part one who were positive for pathogens after 72 hours. We used Fisher's exact test to compare proportions of positive and negative tests among inpatient and outpatient patients, patients who were or were not immunocompromised, and patients with or without medical co-morbidities.

Results: We found that of the 586 tests that were performed on adults hospitalized for > 72 hours, 486 were negative for all pathogens, and 125 analytes were positive from 118 tests (due to tests positive for more than one enteropathogen). Of the 118 positive tests performed, 85 were positive for *C. difficile* and Norovirus, and 26 were positive for pathogens other than *C. difficile* and Norovirus.

Conclusion: Based on the results of our retrospective study, the University of Colorado Hospital implemented restrictions on the use of the BioFire FilmArray GI PCR panel in 2018, that conformed to a "3-day rule," which instructs laboratories to discontinue GI PCR tests ordered on inpatient adults following the 3rd day of hospitalization. A subsequent observational study to determine the clinical significance of the GI PCR findings is presently underway.

Primary Presenter: Hannah Benjamin

Project Title: 3D-Printed, Anatomy-Based Model for Patient and Caregiver Education in a Multidisciplinary Aerodigestive Clinic

Primary Mentor: Emily DeBoer

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Background: Understanding the pathophysiology of aerodigestive disease is contingent on understanding the close anatomical relationship of the respiratory and digestive tracts. Consent for diagnostic aerodigestive endoscopies highlight the importance of understanding aerodigestive anatomy for families making medical decisions for children with complex medical disease. Previous implementation of a computer-based digital model has been challenging due to technical inefficiencies and tablet availability. The goal of this project is to assess a 3D-printed version of the model for caregiver education. The primary aims are to create a model that is relevant and applicable to medical conditions seen in clinic and to collect open-survey responses from caregivers to understand the impact of the model on clinic visits and understanding.

Methods: This quality improvement project follows a PDSA cycle design. Our study population is twenty caregivers of patients seen in a multidisciplinary Aerodigestive clinic. A questionnaire will be collected at the conclusion of the family 's visit to assess primary outcomes.

Results: The results of this work will help to identify the value, as perceived by caregivers and their children, of a 3D-printed, anatomy-based model for patient education of aerodigestive anatomy and procedures in a multidisciplinary Aerodigestive clinic. Preliminary results show that the model is applicable, stimulates interest in pediatric patients, and positively impacts clinic visits for families.

Conclusions: Implementation of the 3D-printed model has less limitations than a digital model. Results will inform future directions for a 3D-printed educational resource that is both easy for provider use in clinic and beneficial for families.

Primary Presenter: Dylan Bergstedt

Project Title: Combinations of Autoantibodies Improve the Prediction of Timing of Onset of Future Rheumatoid Arthritis

Primary Mentor: Kevin Deane

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Purpose: Published data suggest that combinations of Anti-citrullinated protein antibodies (ACPA) and Rheumatoid Factor (RF) are highly predictive of future rheumatoid arthritis (RA) as well as predictive of onset of RA within a relatively short time period. We have evaluated the role of combinations of ACPA and RF testing, and change over time, in predicting the time of onset of future clinically apparent RA.

Methods: Using the Department of Defense Serum Repository we identified 214 RA cases. A mean of 3 pre-RA and 1 post-RA diagnosis serum samples were tested for RF immunoglobins (Ig) A, IgG, and IgM and anti CCP 2, 3, and 3.1. The timing and trajectories of elevations of autoantibodies were evaluated. A gap-time cox regression model was used to develop hazard ratios for the risk of developing RA. Restricted mean time in state was also determined to predict time until RA diagnosis.

Results: Controlling for age, gender, RFIgA and RFIgM status, if a subject had a positivity for either CCP2 or CCP3.1, they were at 3.3 times greater risk/hazard of developing RA compared to a subject who was not positive for either CCP2 or CCP3.1 ($p < 0.001$). Similarly, a subject positive for RFIgA or RFIgM was at 1.6 times greater risk/hazard of developing RA ($p = 0.002$). These effects mean that a subject testing positive for either CCP test and either RF test would be at 5.4 times greater risk than one who tested positive for neither. Testing positive for CCP3 and any RF resulted in a restricted mean time of 2.16 years compared to 3.59 for only CCP3 positive and 4.27 when negative for CCP3 and all RF isotypes.

Conclusion: If a subject has more positive markers it is more likely they will develop RA, and the time until onset of clinically apparent RA symptoms will likely be shorter as the number of positive markers increases.

Primary Presenter: Nicholas Bianchina

Project Title: Healthcare Providers Interactions and Attitudes Regarding Intravenous Drug Users

Primary Mentor: David Elwell

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Purpose: With the current opioid crisis and rise in recent years in the number of patients who use intravenous drugs, it is important that providers are able to provide unbiased, competent care to these individuals. The goal of the study was to assess provider attitudes and biases held when caring for patients known to use illicit intravenous drugs. This study also aimed to assess provider confidence in providing treatment and patient centered care to this patient population at a large tertiary academic safety net hospital.

Method: A thirteen questions, five point likert scale was disseminated via email to providers working in the internal medicine or emergency medicine departments of a large academic safety net hospital in Denver, Colorado. Responses were recorded anonymously using REDCap.

Results: Respondents included physicians, nurse practitioners, and physician assistants with 71 surveys were returned, with 6 incomplete. Providers noted that treating patients who use intravenous drugs was more challenging, more likely to result in a patient leaving against medical advice, and that these patients were perceived to be less likely to adhere to recommended treatment plans. Providers noted that they felt their colleagues treated patients who use intravenous drugs differently than non-drug using patients, and that their colleagues were more likely to recommend a different treatment plan for the same condition to patients who use intravenous drugs. Providers overall felt confident in their ability to manage patient withdrawal symptoms and to develop a medication assisted therapy plan for their patients including recognizing the importance of naloxone prescriptions to those that use intravenous drugs.

Conclusions: Patients with substance use disorder continue to be a large subset of patients treated both in inpatient and outpatient settings across the United States. With providers coming into regular contact with these patients, it is important to address biases and attitudes held that may affect the care these patients receive. It is essential that healthcare providers feel confident in their ability to collaborate with these patients, manage withdrawal symptoms, and be able to connect patients with ongoing supporting resources within their communities. The study has shown that providers are becoming more confident in their ability to medically manage withdrawal and to collaborate with patients to provide care. Yet, significant biases still exist that can affect the medical care those that use IV drugs receive including perceptions of medication adherence, violence and baseline participation in treatment plans. Moving forward, education needs to be continually disseminated to healthcare providers specifically regarding unique care aspects of those that use IV drugs along with continual assessment and retraining surrounding implicit bias.

Primary Presenter: Erin Biringen

Project Title: Psychotropic Medications in Oncology

Primary Mentor: Elissa Kolva

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Context: Psychological distress is common in patients with cancer, and oncology providers are often tasked with utilizing psychotropic medications to treat such symptoms.

Objective: The aim of this study is to characterize how oncology providers prescribe psychotropic medications and to assess their comfort level with prescribing these medications.

Methods: A cross-sectional survey was sent to oncology medical doctors, nurse practitioners, and physician assistants who prescribe psychotropic medications to patients with cancer at a large academic medical center in the Mountain West. The survey included questions regarding provider subspecialty, degree, comfort with prescribing psychotropic medications, and factors that influenced and limited their prescribing.

Results: Oncology providers (n = 65) reported equal proportions of comfort and discomfort with prescribing psychotropic medications. The medication class with the most prescribers was benzodiazepines, with 89.2% (n = 58) of respondents prescribing those medications. The least prescribed category was mood stabilizers, with 4.6% (n = 3) prescribing this category. Prescribers identified that the most significant barriers to their comfort included difficulty connecting patients to follow-up care with mental health professionals and inadequate mental health education for providers. Providers responded that continuing mental health education and increasing patient access to mental health resources would increase their prescribing comfort.

Conclusion: Prescribers may benefit from focused mental health education during their formal training years as well as continued education throughout their oncology careers. A clinical care pathway for prescribing psychotropic medications and resources to connect patients to long-term mental health care may also increase prescribing comfort.

Primary Presenter: Neil Bishop

Project Title: Clinicopathologic Correlation of Histoplasmosis Postoperative Endophthalmitis

Primary Mentor: Paula Pecen

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

This report presents a case of postoperative histoplasmosis endophthalmitis with multimodal imaging and histopathology. The patient was not from an endemic area and did not show signs of systemic infection. Diagnostic and treatment methods which led to improved and preserved visual function are discussed.

Primary Presenter: Zachary Blea

Project Title: Antibiotic Prescribing Patterns for Sinusitis Within a Direct-to-Consumer Virtual Urgent Care.

Primary Mentor: Christopher Davis

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Background: Direct-to-consumer virtual visits are increasingly popular across both for-profit and nonprofit healthcare systems.

Introduction: Virtual visits offer a convenient affordable way for patients to obtain medical care for simple conditions such as sinusitis and uncomplicated urinary tract infections. However, virtual visits have been associated with increased antibiotic utilization when compared with traditional in-person care.

Methods: In this retrospective cohort study, antibiotic utilization for acute sinusitis was compared between patients treated through a direct-to-consumer virtual urgent care versus a matched cohort treated through traditional urgent care.

Results: Fifty-seven patients were treated for acute sinusitis within the virtual care cohort, whereas 100 patients were treated in the traditional care arm. Antibiotic utilization for acute sinusitis was lower when care was delivered virtually using live-interactive video (67%) than when using traditional urgent care (92%) ($p < 0.001$). When care was delivered virtually, age, gender, and care delivery modality (telephone vs. video) were not associated with antibiotic utilization for acute sinusitis.

Discussion: Concerns have been raised that care delivered virtually does not meet expected quality standards when compared with traditional care. Antibiotic utilization has been used as an example of this quality gap. In this study, we demonstrate that antibiotic utilization was lower in a virtual care cohort than when care was delivered by emergency medicine physicians based in an academic setting. This suggests that awareness and sensitivity to prescribing guidelines may be more important than care delivery modality as it relates to antibiotic utilization.

Conclusions: It is possible to deliver care virtually for acute sinusitis without increasing antibiotic utilization.

Primary Presenter: Nikki Bloch

Project Title: The Ancient Roots of Modern Medicine: Development of an Interdisciplinary, Undergraduate Pre-Health Course

Primary Mentor: Jackie Elliott

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

BACKGROUND: Recent years have seen a vehement push for the integration of humanities in medical education to develop professionalism, empathy, innovation, communication, and critical reasoning skills among clinicians in training. Ancient Greek and Latin language, literature and medicine, which lie at the root of modern Western medical terminology and practice, offer an opportune avenue to the study of medical humanities. While many undergraduate programs offer courses in medical etymology, few courses in history, culture, and ethics of ancient Greco-Roman medicine exist; those that do are often higher-division courses targeted to students in the field of Classics.

OBJECTIVES: To create a 36-100 student, lower-division, 3-credit course on the ancient roots of modern medicine, including in etymological, historical, cultural, and ethical terms, and targeted to undergraduate, pre-health students at the University of Colorado, Boulder.

METHODS: Course learning objectives were formulated. Twelve medical etymology textbooks were reviewed and rated on a 4-point utility-scale to identify a main textbook. Thirteen primary sources (ancient texts) and 49 secondary sources (modern scholarship) on ancient and modern medicine were reviewed. Chapters of J. McKeown's *The Hippocrates Code* (HP), chosen as main textbook, and supplemental readings were annotated and coded by themes derived from content presented. HP chapters and supplemental readings were selected to fit a 15-week, Monday-Wednesday-Friday, 50-minute class schedule. Mon/Wed classes were dedicated to etymology content, Fri classes to discussion of culture, ethics, and history of ancient medicine and the relation to modern Western medicine. Fri readings were organized into thematic units: *Conceiving Medicine* (week 1-3); *The Body & the Ethics of "Knowing"* (week 4, 6); *The Practice of Medicine* (week 7-9, 11); *Professional Identity & the Physician* (week 12-14). Lesson learning objectives and discussion questions for supplemental readings were formulated and grading distribution determined: midterms(2) "30%, final "25%, pop quizzes(6) "10%, online quizzes(weekly) "20%, and attendance/participation "15%.

RESULTS: "CLAS 2030 *The Ancient Roots of Modern Medicine* • was approved as a Classics course and Arts and Humanities General Education Distribution Requirement. Course will be offered starting in Fall 2022.

DISCUSSION: Capitalizing on modern medical terminology etymology, this Classics course explores modern medicine's ancient roots, beyond just language, and aims to foster humanistic

skills invaluable to the field of medicine. Course will be evaluated in its ability to meet stated learning objectives by students who complete course.

Primary Presenter: Rachel Bohling

Project Title: Safety & Efficacy of Alkali Therapy on Vascular Function in Kidney Transplant Recipients: A Pilot Randomized Cross-Over Study

Primary Mentor: Jessica Kendrick

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background and objectives: Metabolic acidosis is associated with cardiovascular events, graft function and mortality in kidney transplant recipients (KTRs). We examined the effect of alkali therapy on vascular endothelial function, a predictor of cardiovascular events, in KTRs.

Methods: We performed an 18-week, randomized, double-blind, placebo-controlled crossover pilot study examining the effect of sodium bicarbonate therapy vs. placebo on vascular function in 20 adult KTRs at least one year from transplant with an eGFR ≥ 45 ml/min per 1.73m² and a serum bicarbonate level of 20-26 mEq/L. Each treatment period was 8 weeks in duration with a 2-week washout period between treatments. The primary outcome was change in brachial artery flow-mediated dilation (FMD) between sodium bicarbonate treatment and placebo. Secondary endpoints were used to identify potential mechanisms by which bicarbonate may affect FMD and included serum interleukin-6 (IL-6) and C-reactive protein (hs-CRP).

Results: Twenty patients completed the study and were included in the primary efficacy analysis. The mean (SD) baseline eGFR of participants was 75 ± 22 ml/min/1.73m², respectively. Serum bicarbonate levels did not increase significantly with treatment (0.3 ± 1.5 mEq/L, $p=0.37$). Sodium bicarbonate therapy was not associated with worsening blood pressure, weight gain, or hypokalemia. There was a trend towards a significant increase in FMD after 8 weeks of sodium bicarbonate therapy compared to placebo (mean change in FMD 2.2%, 95% CI -0.1 to 4.6, $p=0.06$). There were no significant changes in hs-CRP, IL-6, eGFR or urinary albumin:creatinine ratio during treatment. Urinary ammonium decreased by 9 mmol/day ($p=0.003$), net acid excretion decreased by 12.5 mmol/day ($p=0.008$) and urine pH increased by 0.38 ($p=0.03$) with sodium bicarbonate.

Conclusions: Sodium bicarbonate therapy is safe and feasible in KTRs and there is a trend towards improvement in FMD, strengthening the need for a larger randomized controlled trial.

Primary Presenter: Katherine Branche

Project Title: Radius of Curvature in Patient-Specific Short Rod Constructs Versus Standard Pre-Bent Rods

Primary Mentor: Christopher J. Kleck

Secondary Mentor(s):

Thematic Area: Basic Biomedical Science

Abstract:

Background: Recent studies support the need for sagittal alignment restoration when performing lumbar degenerative spinal fusions. The development of patient-specific spine rods (PSSR) may help maintain or improve sagittal alignment in these surgeries.

Methods: A retrospective review was conducted for patients who underwent posterior spinal surgeries involving 4 or less levels. The pre-planned PSSR radii of curvature (ROC) was compared to standard pre-bent rods with a ROC of 125 mm. All surgeries were performed at a single institution by 3 surgeons from September 2016 through October 2018. Data was then compared using a 2-tailed paired t-test. PSSR had either 1 or 2 definitive ROCs.

Results: For rods with 2 ROCs, the "œcranial "• curve was measured between the upper instrumented level and L4 or L5. The "œcaudal "• curve was measured between L4 or L5 and the lower instrumented level. The PSSR with 1 ROC and the caudal portion of the rods with 2 ROCs were significantly smaller than the industry standard ROC.

Conclusion: PSSR demonstrate more acute ROC than industry standard rods. In PSRs, the most lordosis occurs between L4-S1 and flattens out at the thoracolumbar junction, mimicking the normal distribution of lumbar lordosis (LL). PSSRs could help achieve or maintain sagittal alignment and prevent the sequela of flat back syndrome.

Primary Presenter: Megan Brown

Project Title: Comparison of Healthcare Service Utilization By Language and Refugee Status

Primary Mentor: Kristine Rodrigues

Secondary Mentor(s):

Thematic Area: Global Health

Abstract:

Introduction: Non-English Non-Spanish (NENS)-speaking immigrant and refugee populations, unique in their cultures, languages, backgrounds, and health concerns, experience specific healthcare needs and disparities that place unique demands on the current Colorado healthcare systems.^{3-6,11-14,16-23,28,34,36,41,44,47,52,54} Previous studies have explored the health disparities of refugees in comparison to immigrant or United States (US)-born populations.²⁷ A few have also compared English-speaking, Spanish-speaking, and NENS-speaking populations^{20-21,23,32,50-51}; however, less is known about healthcare utilization for specific NENS[1]-speaking, refugee and immigrant populations.

Methods: To explore emergency department and urgent care utilization as well as inpatient hospitalizations by language and refugee status, we performed a retrospective observational cohort study of patients, ages 0-99 years, seen in the Denver Health Emergency Department, one of Denver Health's urgent cares, or hospitalized at Denver Health in 2019. Using administrative data, we collected demographic and clinical characteristics, including gender, age, insurance and employment status, years followed in the Denver Health system, medical complexity, preferred language, refugee status, and race/ethnicity, and also determined how many emergency department or urgent care visits (calculated together as acute care visits)^[2] and hospitalizations each patient had in 2019. We then performed univariate and multivariate logistic regression analysis comparing acute care utilization and hospitalization by preferred language, language group, and refugee status.^[3]

Results: 81,462 patients seen in the emergency department, urgent care, and hospitalized at Denver Health were included in the study sample. Patients' preferred languages were 80.5% English (n = 65,577), 16.4% Spanish (n = 13,337), and 3.1% NENS (n = 2,548). Of the patients in the sample, 0.2% (n = 133) were classified as refugees, which was fewer than expected. Compared to English speakers, Nepali-(adjusted OR 0.4, 95% CI [0.2-0.9]), Somali- (adjusted OR 0.5, 95% CI [0.3-0.98]), and Vietnamese-speaking patients (adjusted OR 0.6, 95% CI [0.4-0.8]), had lower odds of recurrent acute care visits. Spanish- and Vietnamese-speaking patients had higher odds of hospitalization compared to English speakers (adjusted ORs 1.6, 95% CI [1.5-1.7] and 2.0, 95% CI [1.4-2.8] respectively). No difference was found the other preferred languages compared to English for recurrent acute care visits or hospitalizations. When grouped together, the NENS language group had lower odds of having recurrent acute care visits ([adjusted OR 0.8, 95% CI [0.7-0.9]) compared to English speakers. There was no difference between NENS speakers and English speakers for hospitalizations. Refugees had lower odds of hospitalization compared to non-refugees (adjusted OR 0.4, 95% CI [0.2-0.8]) but no difference was found for recurrent acute care visits.

Conclusions: Emergency department/urgent care utilization and hospitalization vary by language and refugee status. Grouping languages together (e.g. all NENS or all limited English proficiency) can lead to missing disparities and needs of specific immigrant and refugee groups. More research is needed to explore these missing disparities to determine the specific needs of these populations in order to provide equitable healthcare.

Primary Presenter: Timothy Browne

Project Title: A Virtual Case-Based Learning Module on Acute Ischemic Stroke for Pre-Clinical Medical Students

Primary Mentor: Maureen Stabio

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Acute ischemic stroke represents the fifth leading cause of death in the United States and affects nearly 800,000 patients annually. Recognizing this massive impact on healthcare, The University of Colorado School of Medicine lists the ability to identify stroke symptoms and anatomically localize associated brain lesions as core competencies for all graduates. As the curriculum shifts away from the traditional lecture to small group learning, a need for cases and small group facilitators has been recognized in the pre-clinical core. Furthermore, the COVID-19 pandemic has created a novel problem for medical education as virtual learning has replace in-person learning for all pre-clinical courses. A survey of MedEd Portal shows a paucity of case-based learning modules on acute ischemic stroke, so an interactive case-based learning module was created to address this gap in resources for second-year medical students. This learning module was designed for students in medical programs to integrate knowledge from current and previous classes with a real-world example.

The learning module was created using anatomic donor medical records and brain images for reference which were approved by the Colorado State Anatomic Board and the donor family prior to creation. User interface utilizes Powerpoint, which allows learners to follow the clinical case in slides and provides a platform which is compatible with on Macintosh and Windows machines. This module contains 74 slides and takes approximately 60 minutes to complete. Students should use this module in small groups (3-4 people) to facilitate discussion. It is an interactive learning experience where students must choose which tests are appropriate for an acute ischemic stroke patient based on clinical presentation. The clinical recommendations are based on the American Heart Association and American Stroke Association 2018 Guidelines for the care of acute ischemic stroke. Students view the results taken from the patient 's medical records and use those results to determine a care plan. Students are also presented with questions based on the test results with opportunity to discuss whether the patient should receive particular medical interventions. At the end of the module, students observe images and a 3D model of the donor 's brain to show the morphological changes that the brain aneurysm caused. Students use the models and their knowledge of the underlying neuroanatomy and gross anatomy to answer questions about the structures that were injured as a result of the stroke. 22 multiple choice and 13 discussion questions are distributed throughout the module.

Meta-analysis studies of case-based learning and closely related problem-based learning show significant increase in measures of students ' program evaluations and students ' clinical performance. This case-based learning module, developed using a real patient 's medical records as well as donor post-mortem brain images and interactive 3D models, provides a novel and

authentic clinical learning experience to supplement basic science training. A pilot test in the Phase II Nervous System course was conducted which allowed for evaluation of the overall efficacy of the module and focused on improvements to immediate recall as well as the students' attitudes toward the experience. 38 students completed the learning module during the pilot and 27 surveys were completed. 100% of respondents indicated that the learning module was a valuable experience (48% agree, 52% strongly agree), 100% of respondents indicated that they would utilize other modules like this (41% agree and 59% strongly agree).

Primary Presenter: Kaitlyn Brunworth

Project Title: Selection of trainees for global health electives: a literature review

Primary Mentor: David Richards

Secondary Mentor(s):

Thematic Area: Global Health

Abstract:

Background: As medical trainee participation in global health experiences (GHE) increases, ethical and logistical challenges must be addressed to ensure that GHEs are beneficial both to trainees and hosting institutions. Selection of suitable trainees for GHEs is an important aspect of a mutually beneficial global health partnership. To our knowledge, a literature review on best practices for selection of trainees for GHEs does not yet exist.

Objectives: To systematically review literature regarding current practices in selection of trainees for GHEs, and to investigate whether existing programs involve host institutions in the selection of trainees.

Methods: The authors performed a systematic review of literature indexed on PubMed, CABI, and EMBASE in July of 2020. Abstracts were limited to studies in English related to selection guidelines for trainees in global health experiences published in the last 5 years.

Results: A total of nine articles met inclusion criteria. Two major themes emerged: criteria for trainee selection and selection methods. Selection criteria included self-selection, ability to pay, academic standing, clinical qualifications, and non-academic attributes. Selection methods included written application, letter of recommendation, personal interview, and multiple mini interview.

Discussion: Standardized guidelines for the selection of trainees for GHEs do not yet exist. When selecting trainees for a GHE, in addition to academic standing and clinical skills, it is important to select for favorable attitudes and behaviors known as non-academic attributes. While several sources emphasized the importance of building a lasting partnership between host and sending institution, only one source described the methods by which the host institution was involved in selection of trainees. These findings are important because they identify a gap in practice and an opportunity to develop and evaluate a system for trainee selection for GHEs.

Primary Presenter: Abigail Bryant

Project Title: Medicaid Acceptance in Specialty Care

Primary Mentor: Rita Lee

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Medicaid is the number one health insurer in the United States, insuring more than 1 in 5 Americans. With the expansion of Medicaid under the Affordable Care Act (ACA), enrollment in Medicaid and the Children's Health Insurance Program (CHIP) increased 29%. Despite Medicaid insuring an immense number of people, many medical practices do not accept Medicaid patients creating a gap in access to health care. One of the largest gaps is access to specialty care, with only a limited number of specialty physicians accepting established adult Medicaid patients, and even fewer accepting new adult Medicaid patients.

Using a literature review and meetings with community stakeholders, the causes for, and solutions to, the lack in access to specialty care for people on Medicaid were examined. It was discovered that the largest barriers to Medicaid acceptance were related to the billing process, and impressions that Medicaid patients are socially complex, medically complex, and non-compliant with treatment plans. The solutions proposed include increasing care coordination, systemically changing how Medicaid is billed, and providing further education during training in Medicaid and social determinants of health.

Currently healthcare reform is a huge point of contention in our state and country. We are at a pivotal point, and it is important as we reform our system to ensure that the changes made will increase access and decrease stigma associated with being a patient of a lower socioeconomic class. This three-pronged approach of how to proceed will not be an overnight solution to the issue of specialty acceptance for Medicaid patients, but will open a dialogue between patients and providers and will get us one step closer to health equity.

Primary Presenter: Khyla Burrows

Project Title: Preconception Counseling; Identifying Ways to Improve Services

Primary Mentor: Dr. Teresa Harper

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: Preconception counseling encompasses patient education and inclusive decision making intended to increase maternal and fetal health and wellbeing throughout pregnancy and during the postpartum phase. This study evaluates maternal conditions for which current preconception services are provided and the type of counseling patients received for their condition through the University of Colorado Maternal-Fetal Medicine Division.

Methods: We identified patients who received preconception counseling during 2018 through patient 's electronic medical records. Patient charts were reviewed to determine reason for preconception referral, counseling received and ultimate patient outcomes in regard to following counseling advice and pregnancy outcomes. Patients were organized into five categories based on the reason for preconception counseling and were then grouped by the recommendation to either proceed with immediate conception, defer immediate conception pending completion of further recommendations, or to not conceive.

Results: From January 2018 through December 2018, fifty-nine patients were identified who were referred to preconception counseling. Fifty-two percent (n=31) of the women referred were referred for maternal disease, 40% (n=24) were referred for infertility, 32% (n=19) were referred for previous poor obstetric outcomes, 30% (n=18) were referred for advanced maternal age and finally, 15% (n=9) were referred for gynecologic anatomic abnormalities. Patients were often referred to counseling for more than one reason. During the initial evaluation, 58% (n=34) of patients were determined to have no concern for immediate conception while 7% (n=4) were ultimately advised to not conceive. The majority (73%, n=43) of the referred patients were Caucasian and married (76%, n=45).

Conclusion: The majority of patients referred to preconception counseling were ultimately counseled it was appropriate for them to proceed with immediate conception, 73% (n=43). The demographics of patients who accessed preconception counseling did not represent the diverse makeup of the surrounding community and therefore access to counseling needs to be expanded for greater accessibility. Using categories of patient referral, we identified areas of preconception counseling that would benefit from standardization to ensure patients receive comparable services and advice.

Primary Presenter: Maximilliam Cabrera

Project Title: DEFINING LGBTQIA+ INCLUSIVITY IN THE COLORADO HEALTHCARE SETTING.

Primary Mentor: Rita Lee

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Despite national improvements in LGBTQIA+ inclusivity, local governmental policy and public attitudes continue to influence the health of this community. This study emphasizes perspectives among rural and non-urban LGBTQIA+ patients to further define attributes of inclusive healthcare provision through a thematic, qualitative approach. Participants (n=28) joined semi-structured focus groups in Denver, Ft. Collins, Colorado Springs, and Grand Junction. They were more likely to identify as white (78.6%) and transgender or gender diverse (71.4%), and a majority of patients (85.7%) lived in rural or non-urban regions outside of the Denver metropolitan area. Focus group themes were identified, such as inclusive language use, comfort with sexual history taking and exams, advanced communication skills, cohesion among all team members, LGBT training credentials, provider connection to community, ability to provide specialized and preventive care, importance of LGBTQIA+ symbolism, and value for the individual. Specific examples of each were provided in detail, including notable direct quotations. This study describes a more inclusive healthcare environment for those traditionally under-represented in LGBTQIA+ medical literature; results were used to create a variety of publicly available resources for patients and healthcare providers in Colorado. Patients discussed tangible solutions to meet these identified needs, which should be a call to action for providers to continue to strive for more patient-centered care.

Primary Presenter: Brenna Cameron

Project Title: The Impact of Critical Illness on Siblings as Expressed through Personal Narrative

Primary Mentor: Tess Jones

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

The bond of a sibling is unmatched and when a brother or sister is diagnosed with a critical illness, the sibling is impacted equally, although, in different ways. Some studies have attempted to capture the similar feelings and psychological adjustment siblings must make following a diagnosis. However, by quantifying and measuring these experiences they strip away the core of the story. Rather than transforming stories into data we should do as Arthur Frank suggests and *œlearn with stories • rather than from them.* While illness memoir is a growing subgenre, there are hardly any works written from the perspective of a sibling. Through writing my own memoir about my sister's cancer diagnosis to reading other illness memoirs written from the perspective of a sibling I have found three similar themes: a change in our relationships with our siblings as a result of illness, isolation, and the pain that comes with watching the repercussions of illness on the growth of our siblings.

Primary Presenter: Scott Cao

Project Title: Prescribing Buprenorphine for Opioid Use Disorders in the ED: A Review of Best Practices, Barriers, and Future Directions

Primary Mentor: Scott Simpson

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Abstract: ED-initiated addiction treatment holds promise for enhancing access to treatment for those with opioid use disorder (OUD). We present a literature review summarizing the evidence for buprenorphine induction in the ED including best practices for dosing, follow-up care, and reducing implementation barriers. A literature search of Pubmed, PsychInfo, and Embase identified articles studying OUD treatment in the ED published after 1980. Twenty-five studies were identified including eleven scientific abstracts. Multiple studies suggest that buprenorphine induction improves engagement in substance treatment up to 30 days after ED treatment. Many different induction protocols were presented, but no particular approach was best supported as criteria for induction and initial dosing vary widely. Similarly, transition of care models focused on either a "hub and spoke" model or "warm hand-offs" model, but no studies compared these approaches. Common barriers to implementing induction programs were provider inexperience, discomfort with addiction treatment, and limited time during the ED visit. No studies described the number of EDs offering induction. While ED buprenorphine induction is safe and enhances adherence to addiction treatment, uncertainty persists in how to best identify patients needing treatment, how to initiate buprenorphine, and how to enhance follow-up after ED-initiated treatment.

Primary Presenter: Jesus Cardenas

Project Title: Is the effect of Early vs. Late tracheostomy on patient mortality and ICU length of stay overrated? A qualitative Narrative review of Randomized Controlled Trials

Primary Mentor: Meghan Prin

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: Tracheostomy creates a trans-laryngeal airway most commonly indicated in patients who are difficult to wean from the ventilator or in those requiring prolonged mechanical ventilation. The procedure provides long-term access to a protected airway. There is interest in identifying causal benefits that the timing of tracheostomy, early vs. late, could provide on patient outcomes such as mortality, time on mechanical ventilation (MV), and hospital and intensive care unit (ICU) length of stay (LOS).

Objectives: The aim of this review is to evaluate randomized controlled trials for effects of early vs late tracheostomy on outcomes of ICU mortality and ICU LOS. Our aim is to evaluate the comparability of available randomized controlled trials on early vs late tracheostomy on patient outcomes.

Methods: We searched PubMed and Embase through November 25, 2020. Studies eligible for inclusion were randomized controlled trials (RCT) involving adult populations in which the primary intervention was early vs. late tracheostomy, those reporting mortality, time on MV, and Hospital or ICU LOS. All ICU populations meeting these criteria were eligible for inclusion. We collected published information on the timing of tracheostomy, mortality, time on mechanical ventilation, Geographic location of study, and Hospital and ICU LOS which are summarized in a narrative format using tables.

Results: Searching PubMed and Embase databases resulted in 1,566 articles and yielded a total of 86 articles to undergo title and abstract review. Of these, 16 studies met the criteria for inclusion in this review.

Limitations: No statistical analyses were attempted.

Conclusions: There is significant heterogeneity in defining the timing of early vs late tracheostomy and the ICU population of study that makes comparison difficult. There is significant confounding due to selection bias and physician preference. With one exception, the RCTs reviewed here unanimously reported no significant effect on mortality. There was no consensus on effects on other measures of time on mechanical ventilation, Hospital LOS and ICU LOS.

Primary Presenter: Lauren Carpenter

Project Title: Stevens Johnson Syndrome in Children: Consider Monitoring for Bronchiolitis Obliterans

Primary Mentor: Deborah Liptzin

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

We reviewed patients with Stevens Johnson Syndrome (SJS) evaluated at Children's Hospital Colorado and investigated the occurrence of bronchiolitis obliterans (BO). Approximately 9% of SJS patients developed BO. Pediatric hospitalists should consider monitoring SJS patients for BO, especially patients with recurrent SJS and patients treated with mechanical ventilation.

Primary Presenter: Scott Christenson

Project Title: Falling Short: How to Effectively Reduce Wilderness Search and Rescue Events by Changing Introductory Level Outdoor Education.

Primary Mentor: David Young

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Ease of access to the wilderness, particularly by people with novice skills, is placing an ever-increasing burden on search and rescue teams. Wilderness education often begins with promotional type classes that teach hard skills such as how to improvise a splint, or all too often, how to make a litter to carry a person out. Skills of this type may negatively influence novice adventurers to overestimate their outdoor competencies and underestimate the danger they are walking themselves further into. Many sources have demonstrated that around half of search and rescue is for uninjured day-hikers who are often lost, dehydrated/hypovolemic, or without the minimum necessary gear such as windproof/waterproof clothing and head lamp. Additionally, people often wait till darkness falls before committing to the idea of reaching out for help which places additional burdens on SAR crews. Considering this; the way to precisely target reducing SAR events is to focus introductory level wilderness education classes on decision making and effectively evaluating one's own skills and supplies against one's environment. Decision making in medical education is well studied, and lessons learned here can apply to introductory wilderness classes. Effective decision-making centers on recognizing biases, risk assessment, evaluation of alternative strategies and how to utilize the most appropriate information. Education such as this should be the mainstay of introductory wilderness education and hard skills which serve little use and have a minimal chance of being employed should be eliminated as they give people a false sense of confidence.

Primary Presenter: Nathan Clark

Project Title: Urological Consultation in Patients with Renal Trauma can Decrease Rates of Nephrectomies.

Primary Mentor: Fernando Rodrigo

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Introduction/Background: Renal traumas are initially managed by the trauma team in the emergency department (ED). The objective of this study was to evaluate if urological consultation can improve outcomes in renal trauma patients. Furthermore, we will evaluate for disparities in the incidence and care for individuals of varied ethnic backgrounds who suffer renal trauma.

Methods/Materials: Data was collected from a level 1 trauma center (Denver Health Medical Center, CO) from January 2008 to July 2020. Patients diagnosed with renal trauma were included in the study and divided into two groups: urological consultation or no urological consultation. Patient characteristics and outcomes were compared between the groups.

Results: A total of 463 patients were treated for renal trauma and 41% received urological consultation. The urological consultation group had more males ($p=0.009$) and high grade renal trauma (abbreviated injury score (AIS) 3-5, $p<0.001$). Patients with signs of hypovolemic shock (systolic blood pressure (SBP) ≤ 90 mm Hg, $p=0.019$); pulse ≥ 100 beats per minute (bpm), $p<0.001$) were less likely to receive urological consultation. Overall survival rate was higher in patients who received a urological consultation (98%) compared to those who did not (86%, $p<0.001$). (Figure 1a)

Moreover, patients who had high grade renal trauma ($p=0.008$) or high injury severity score (ISS ≥ 27 , $p<0.001$) were more likely to survive. (Figure 1b)

Nephrectomy occurred more often in patients with SBP ≤ 90 mm Hg ($p<0.001$), had high grade renal trauma ($p<0.001$), or underwent trauma operation on the day of admission. (Figure 4)

Patients with AIS grade 4 or 5 renal trauma were less likely to undergo nephrectomy when urology was consulted ($p<0.001$). (Figure 2)

Individuals belonging to ethnic minorities significantly more likely to have sustained penetrating trauma compared to their white counterparts. Urology was consulted less often for penetrating trauma than blunt ($p=0.043$). Overall, there was no difference in consultation rate between white and minority patients ($p=0.501$)

Conclusions: Patients with high grade renal trauma that received urological consultation were less likely to have nephrectomy despite severe ISS and AIS compared to patients without urologic consultation. Moreover, this group also had higher survival rates than those managed without urology consultation, even after controlling for shock, AIS, and ISS. Nephrectomy was

avoided more often with urology input and partial nephrectomy was able to be achieved only with the involvement of urology. Therefore, we believe that urology consultation should be strongly considered in the event of renal trauma, irrespective of the severity of overall condition.

Primary Presenter: Melissa Conklin

Project Title: Effect of Unilateral Cordotomy on Perception of Dysphagia

Primary Mentor: Matthew Clary

Secondary Mentor(s): Marie Jette

Thematic Area: Clinical Science

Abstract:

Objectives: CO2 laser medial transverse cordotomy is a permanent static procedure performed to achieve adequate functional airway in cases of posterior glottic stenosis and bilateral vocal fold paralysis. Although it is the preferred method to manage long-term bilateral vocal fold immobility, it is widely believed that cordotomy has the potential to cause aspiration. The minimal existing data on the effect surgical enlargement of the glottic airway on swallowing function is heterogeneous. Through investigation of dysphagia after cordotomy, we hope to better understand the influence of glottic function and its role in dysphagia. The Eating Assessment Tool (EAT-10), is a validated dysphagia symptom-specific outcome measure. We hypothesized that EAT-10 scores would not change after CO2 laser cordotomy despite causing glottic insufficiency.

Methods: Retrospective review was performed on sequential patients having undergone unilateral CO2 laser cordotomy with complete pre- and postoperative EAT-10 questionnaire data available for evaluation.

Results: Fifteen patients were available for analysis; 10 patients underwent primary unilateral medial transverse cordotomy, 5 patients underwent revision cordotomy, and 20 unique procedures were included in the dataset. The median EAT-10 score during the visit prior to surgery was 3.5, whereas the post-surgery median score was 2. Furthermore, the median difference of 0 was statistically non-significant ($P = .91$).

Conclusion: CO2 laser cordotomy does not contribute to patient-reported dysphagia despite creating glottic incompetence. This suggests vocal fold apposition may play a less significant role in normal swallowing function than widely believed.

Primary Presenter: Bailey Corson

Project Title: "Doctor, What Happens After My Arthroscopic Rotator Cuff Repair?"

Primary Mentor: Rachel Frank

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

CONTEXT: Rotator cuff repair (RCR) surgery is one of the most common ambulatory surgeries in orthopedics. Limited knowledge of the injury and surgical management can result in decreased patient satisfaction. The purpose of this current concepts review is to highlight the current literature on important pre and postoperative considerations for both patients and orthopedic surgeons performing arthroscopic RCR.

EVIDENCE ACQUISITION: A comprehensive literature review of PubMed identified 128 articles published between January 1987 and April 2020 that met inclusion and exclusion criteria and screening for relevant topics performed by the authors. Relevant topics include comparisons between operative and non-operative treatment for rotator cuff repair, functional and symptomatic outcomes, factors affecting outcomes, failure of primary treatment, comorbidities and adverse events, and patient expectations.

STUDY DESIGN: Clinical Review

LEVEL OF EVIDENCE: Level IV

RESULTS: There are many preoperative risk factors that can influence a patient's postoperative course following RCR including age, sex, preinjury tendon health, tear anatomy, smoking status, preinjury opioid use, and presence of diabetes. Intraoperative technique considerations and postoperative pain control and physiotherapy approaches may also influence the postoperative period. Several of these factors may influence both operative and recovery times as well as a patient's time of returning to work, sports and daily activities. The relationship between RCR and the development of glenohumeral arthritis and the utilization of reverse total shoulder arthroplasty is still being explored.

CONCLUSIONS: To aide patients with postoperative expectations, surgeons should discuss risk factors which could lead to prolonged recovery or failed treatments. Furthermore, surgeons need to discuss how rotator cuff surgery will affect their ability to return to work, return to activities, risk of development of glenohumeral arthritis, and need for possible further operative intervention.

Primary Presenter: Ian Coulter

Project Title: Different roles of T-type calcium channel isoforms in hypnosis induced by an endogenous neurosteroid epipregnanolone

Primary Mentor: Slobodan Todorovic

Secondary Mentor(s):

Thematic Area: Basic Biomedical Science

Abstract:

Background: Many neuroactive steroids induce sedation/hypnosis by potentiating gamma-aminobutyric acid (GABAA) currents. However, we previously demonstrated that an endogenous neuroactive steroid epipregnanolone [(3 β ,5 β)-3-hydroxypregnan-20-one] exerts potent peripheral analgesia and blocks T-type calcium channels (T-channels) while sparing GABAA currents in rat sensory neurons.

Methods: Here, we utilized electroencephalographic (EEG) recordings to characterize thalamocortical oscillations, as well as mouse genetics with wild-type (WT) and different knockout (KO) models of T-channel isoforms to investigate potential sedative/hypnotic and immobilizing properties of epipregnanolone.

Results: Consistent with increased oscillations in slower EEG frequencies, epipregnanolone induced an hypnotic state in WT mice when injected alone intra-peritoneally (i.p.) and effectively facilitated the hypnotic and immobilizing effects of a common volatile anesthetic isoflurane. The CaV3.1 (CACNA1G) KO mice demonstrated decreased sensitivity to epipregnanolone-induced hypnosis when compared to WT mice, whereas no significant difference was noted between CaV3.2 (CACNA1H) and WT mice. In contrast, epipregnanolone-induced hypnosis in CaV3.3 (CACNA1I) mice was substantially longer than in WT mice. Finally, when compared to WT mice, onset of epipregnanolone-induced hypnosis was delayed in CaV3.2 KO mice but not in CaV3.1 and CaV3.3 KO mice.

Conclusion: To our knowledge, this work is the first to report on the hypnotic properties of epipregnanolone in rodents. We speculate that distinct hypnotic effects of epipregnanolone across all three T-channel isoforms is due to their differential expression in thalamocortical circuitry. We posit that endogenous neuroactive steroids that target neuronal T-channels may have an important role as novel hypnotics and/or adjuvants to anesthetic agents.

Primary Presenter: Sofiya Diurba

Project Title: Emergency Department Provider Attitudes and Behaviors Regarding Lethal Means Assessment and Counseling

Primary Mentor: Marian Betz

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Objective: This study examined emergency department (ED) and behavioral health (BH) provider attitudes and behaviors related to lethal means screening and counseling of patients with suicide risk, specifically examining differences by provider type and whether providers had firearms in their own home.

Methods: Emergency department providers (physicians and mid-level practitioners) and behavioral health (BH) providers at four Colorado EDs completed an anonymous, web-based survey.

Results: Fewer ED providers (35%) than BH providers (81%) felt confident in their ability to counsel patients about lethal means ($p < .001$). In multivariable analysis, the only clinical or provider factor associated with often or almost always asking patients about firearm access was provider type, with BH providers more likely than ED providers to ask in all scenarios (OR: 5.58, 95% CI 1.68-18.6). Behaviors and attitudes about lethal means counseling did not vary by whether the provider had firearms at home. Almost all providers said that additional training and protocols about how to help patients make firearm storage decisions would be helpful.

Conclusions: Gaps in ED-delivered lethal means counseling persist, highlighting directions for future provider education and protocol development.

Primary Presenter: Casey Dolen

Project Title: Simulating Teamwork for Better Decision Making in Emergency Medical Services

Primary Mentor: Kathleen Adelgais

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Emergency Medical Services (EMS) are an essential component of health systems and are critical to the provision of pediatric emergency care. Challenges in this setting include fast pace, need for advanced teamwork, situational awareness and limited resources. The purpose of this study was to identify human factors-related obstacles during care delivery by EMS teams that could lead to inefficiencies and patient safety issues. We examined video recordings of 24 simulations of EMS teams (paramedics and EMTs) who were providing care to pediatric patients. Two reviewers documented a total of 262 efficiency and patient safety issues in 4.25 hours of videos. These issues were grouped into 28 categories. Reviewers also documented 19 decision support opportunities. These issues and decision support opportunities can inform the design of clinical decision support systems that can improve EMS related patient outcomes.

Primary Presenter: Yeshai Dollin

Project Title: Pediatric Clinical Perspectives on Adolescent Physician Assisted Suicide

Primary Mentor: Joel Friedlander

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Objective: Physician assisted suicide (PAS) for adults has been gaining support in the United States (US). Recent studies suggest that up to 13% of families consider ending their terminally ill child's life prematurely. The goal of this study was to assess the impact of pediatric clinician background on the perspective and understanding of the practice Adolescent Physician Assisted Suicide (APAS). This study hypothesized there was significant clinician interest in APAS and their background influenced their position.

Study Design: Pediatric clinicians in 13 divisions at a quaternary medical center prospectively responded to a survey and evaluated a case study about APAS. Responses were statistically evaluated.

Results: Seventy-nine pediatric clinicians aged 29-65 years responded from approximately 500 that were queried. Forty-six, including 11 general pediatricians and 31 subspecialists completed the case-study and 34 finished the survey. 52.4% felt APAS should be legal and 42.9% said APAS was needed. Of the cohort, 7.1% noted they previously had been requested to discuss APAS 1-5 times. There was no statistical difference of responses based on specialty, years of practice, experience, or religion on perspectives of legalization or use of APAS. 84.8% felt religious background was important regarding APAS, however only 19% would discuss it with patients.

Conclusions: A slight majority of pediatric clinicians support APAS though it is rarely being requested in clinical practice. Although there was no significant difference amongst variables, approaches likely vary and data suggests clinicians require additional training. Clinicians feel religion is important during end-of-life decision making, but infrequently discuss it.

Primary Presenter: Kunal Doshi

Project Title: Drought and Its Effect on Infectious Disease

Primary Mentor: Sara Paull

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

The purpose of the study is to examine the effects of drought on different infectious disease processes. The aim is to provide a much-needed synthesis of drought-driven changes to disease risk. A tremendous amount has been written about potential effects of climate change on disease, but the vast majority of the work focuses on effects of temperature and/or short-term precipitation events. Very little synthesis has been done looking at longer-term effects of drought. By identifying themes of how drought can influence disease transmission, the hope is to increase interest and research on this important but often overlooked topic. Initially, a search through three databases was conducted using key terms like "climate change," "drought," "infectious disease," "malaria," "cholera," and a combination of similar terms. About 800 articles were identified and downloaded. From those 800 articles, 350 were chosen based whether or not there was a comparison between weather variables and disease processes. Criteria was based on disease process being compared to moisture index, dryness index, ENSO, or precipitation. A literature review was conducted based off those results. Findings suggest that the increase in vector borne diseases during periods of drought are driven by human behavior change and mosquito's behavior change. Mosquitoes increase blood feeding during dry periods and the development of drought resistant eggs. Finally, humans increase their storage in water sources increasing the proximity between mosquitoes and human.

Primary Presenter: Samuel Dunham

Project Title: Prescribing buprenorphine for opioid use disorders in the ED: a review of best practices, barriers, and future directions

Primary Mentor: Scott Simpson

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

ED-initiated addiction treatment holds promise for enhancing access to treatment for those with opioid use disorder (OUD). We present a literature review summarizing the evidence for buprenorphine induction in the ED including best practices for dosing, follow-up care, and reducing implementation barriers. A literature search of Pubmed, PsychInfo, and Embase identified articles studying OUD treatment in the ED published after 1980. Twenty-five studies were identified including eleven scientific abstracts. Multiple studies suggest that buprenorphine induction improves engagement in substance treatment up to 30 days after ED treatment. Many different induction protocols were presented, but no particular approach was best supported as criteria for induction and initial dosing vary widely. Similarly, transition of care models focused on either a "hub and spoke" model or "warm hand-offs" model, but no studies compared these approaches. Common barriers to implementing induction programs were provider inexperience, discomfort with addiction treatment, and limited time during the ED visit. No studies described the number of EDs offering induction. While ED buprenorphine induction is safe and enhances adherence to addiction treatment, uncertainty persists in how to best identify patients needing treatment, how to initiate buprenorphine, and how to enhance follow-up after ED-initiated treatment.

Primary Presenter: Bryant Elrick

Project Title: Seymour Fractures: A Retrospective Review of Infection Rates, Treatment and Timing of Antibiotic Administration

Primary Mentor: Frank Scott

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: Seymour fractures are important to recognize and treat promptly because injuries may result in growth disturbance, nail deformity, or infection. We hypothesize that the administration of antibiotics within 24 hours of injury will be associated with a decreased rate of infection.

Methods: Patients younger than 18 years were included if clinical examination and radiographs demonstrated a Seymour fracture. The timing of antibiotic administration and treatment details were reviewed. The presence of superficial infections or radiographic evidence of osteomyelitis was recorded.

Results: A total of 52 patients with 54 fracture that had greater than 30 days of follow-up and were included in data analysis. The average age at the time of injury was 10.2 years. Thirty-four (63%) of 54 patients were most commonly injured secondary to a crush type mechanism. The overall infection rate was 27.3% (15/54 fractures). Among the 29 fractures that received antibiotics within 24 hours of injury, 2 infections (6.9%) were noted at final follow-up. Delayed administration of antibiotics beyond 24 hours postinjury was observed in 17 fractures and was associated with an increased infection rate of 76.5% (13/17, $P = 0.000$).

Conclusions: Early administration of antibiotics within 24 hours of injury is associated with a reduction in the development of infections. Patients with delayed antibiotic administration may be at high risk for early superficial infection or osteomyelitis. This study highlights the importance of early identification and appropriate treatment of Seymour fractures including the prompt administration of antibiotics following injury.

Primary Presenter: Daniela Escobar

Project Title: Translabial Ultrasound for Assessment of Synthetic Midurethral Sling Complications

Primary Mentor: Alison Sheridan

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Translabial ultrasound (TLUS) is an inexpensive, non-invasive imaging modality traditionally used for assessment of pelvic organ prolapse. The utility of TLUS has recently been expanded to the evaluation of synthetic midurethral slings (MUS) surgically implanted for management of stress urinary incontinence (SUI). The purpose of this manuscript is to familiarize radiologists with translabial ultrasound technique and provide a technical protocol for TLUS execution as it can be optimized for imaging and assessment of MUS, including identification of MUS configuration and recognition of common complications. This manuscript provides example images of transobturator and retropubic slings and their associated complications, as visualized on TLUS. Accurate imaging and assessment of MUS is helpful in the evaluation of the patient presenting with symptoms suspicious for sling-related complications and in the planning of surgical revision.

Primary Presenter: Mark Farchione

Project Title: Overview and History of Medical Education in Germany, France, United Kingdom, and the United States

Primary Mentor: Jennifer Bellows

Secondary Mentor(s):

Thematic Area: Global Health

Abstract:

The modern Western undergraduate medical education system involves the incorporation of three main teaching methods: didactic classroom learning, clinical skills practice, and laboratory training. The extent to which each method has been formally emphasized has varied between countries and time periods. From the early 1700s until the early 1900s, three main changes in medical education were identified that define the transition from the pre-Age of Enlightenment methods of teaching to the modern day medical education systems in the United States and Western Europe. These are: 1. The abandonment of apprenticeships in favor of more formal training in universities and teaching hospitals. 2. The combination of didactic learning, laboratory training, and clinical skills practice. 3. The standardization of medical school curricula and the granting of medical licenses to reduce variation in the competencies of different physicians. These three changes occurred in different countries at different times, but the general trend seen indicates that most educational innovation occurred first in the German states before being adopted by its neighbor France. The United Kingdom and the United States were the last major Western countries to adopt the three changes and enter the modern era of medical education.

Primary Presenter: Simon Feseha

Project Title: Global genetic deletion of CaV3.3 channels facilitates anaesthetic induction and enhances isoflurane-sparing effects of T-type calcium channel blockers

Primary Mentor: Slobodan Todorovic

Secondary Mentor(s):

Thematic Area: Basic Biomedical Science

Abstract:

We previously documented that the CaV3.3 isoform of T-type calcium channels (T-channels) is inhibited by clinically relevant concentrations of volatile anaesthetics, including isoflurane. However, little is understood about the functional role of CaV3.3 channels in anaesthetic-induced hypnosis and underlying neuronal oscillations. To address this issue, we used CaV3.3 knock-out (KO) mice and a panselective T-channel blocker 3,5-dichloro-N-[1-(2,2-dimethyltetrahydro-pyran-4-ylmethyl)-4-fluoropiperidin-4-ylmethyl]-benzamide (TTA-P2). We found that mutant mice injected with the vehicle showed faster induction of hypnosis than wild-type (WT) mice, while the percent isoflurane at which hypnosis and immobility occurred was not different between two genotypes. Furthermore, we found that TTA-P2 facilitated isoflurane induction of hypnosis in the CaV3.3 KO mice more robustly than in the WT mice. Isoflurane-induced hypnosis following injections of TTA-P2 was accompanied with more prominent delta and theta EEG oscillations in the mutant mice, and reached burst-suppression pattern earlier when compared to the WT mice. Our findings point to a relatively specific value of CaV3.3 channels in anaesthetic induced hypnosis. Furthermore, we propose that T-channel blockers may be further explored as a valuable adjunct to reducing the usage of potent volatile anaesthetics, thereby improving their safety.

Primary Presenter: Amber Fleck

Project Title: A Literature Review of Community Health Volunteers (CHVs): Characteristics, Experiences, and Motivations

Primary Mentor: Madiha Abdel-Maksoud

Secondary Mentor(s):

Thematic Area: Global Health

Abstract:

Countries around the world are suffering from severe healthcare personnel shortages.¹⁹ In an attempt to alleviate some strain on the healthcare infrastructure and increase access to care, implementation of community health volunteer (CHV) programs has increased substantially.^{19,20} CHVs work within their communities and provide health education, sanitation training, specialty counseling, or referrals when necessary.^{8,9} This literature review explores the characteristics, experiences, and motivations of community health volunteers in order to better understand opportunities for improved sustainability and functionality of these programs. Motivations for fulfilling these positions include: personal recognition, personal development, community service, and monetary/non-monetary incentives.^{10,12,13,20} However, the significant volunteer turn-over and high attrition rates have raised doubt on the sustainability of CHV programs.^{9,24} The reasons for attrition have been explored and narrowed down to the following: insufficient remuneration, lack of quality support, excessive demands of the position, and unmet expectations for development. ^{5,7,10,20,25} Taking into consideration CHV desires and reasons for dissatisfaction may enhance the creation of efficient and sustainable programs, which fill sizable vacancies in the healthcare system.

Primary Presenter: Connor Fling

Project Title: Pneumocystis jirovecii Pneumonia During Treatment of Autoimmune Hepatitis with Oral Budesonide

Primary Mentor: James Maloney

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Oral budesonide is an effective therapy for autoimmune hepatitis with fewer side effects compared to oral prednisone. Clinical trials and observational studies of its use in autoimmune hepatitis and Crohn 's disease have reported no increase in the incidence of infection, consistent with its first-pass inactivation in the liver. In particular, the opportunistic infection Pneumocystis jirovecii pneumonia (PJP) has not been reported with budesonide, a status unique among oral steroids. We herein report two cases of PJP that occurred during budesonide treatment of autoimmune hepatitis. Both patients were started on budesonide despite the presence of cirrhosis and portosystemic shunting, conditions where budesonide use is contraindicated. We hypothesize that PJP infection occurred due to minimal first-pass metabolism of budesonide due to cirrhosis and portosystemic shunting, allowing sufficient systemic drug levels to increase PJP risk. These cases illustrate the importance of identifying signs of developing cirrhosis and/or portosystemic shunting in patients with autoimmune hepatitis while on therapy and substituting other steroids or steroid-sparing agents with the provision of PJP prophylaxis when indicated.

Primary Presenter: Ryan Friedman

Project Title: Impact of Race and Primary Language Spoken on Quality of Life After ED Diagnosis of Concussion in Children

Primary Mentor: Joe Grubenhoff

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Background: Pediatric concussions have become an increasingly relevant public health concern, with over pediatric 329,000 concussions diagnosed in 2012¹. The number of diagnosed concussions increased by 30% from 2006 to 2013^{1,2}. In spite of this, there are few studies that have investigated correlation between demographic factors and concussion outcomes for pediatric patients. As such, the primary purpose of this study was to determine if race and primary language spoken have an impact on a child's quality of life one month following an ED evaluation of a concussion. Secondary outcomes measured include the relationship between race and primary language spoken with school support, school days missed, and sub-score on PedsQL.

Methods: We conducted a retrospective observational cohort study that analyzed information collected from a parent study that was conducted at a regional pediatric trauma center ED: using the PedsQL measurement device, we measured the quality of life at thirty days post-concussion for 223 patients. The primary outcome was PedsQL score at thirty days post-hospitalization: a decreased quality of life was defined as a PedsQL < 69.7. Physical, Emotional, Social, and School PedsQL sub-scores < 72.9, 59.6, 66.6, and 62.9 respectively were defined as a clinically meaningful difference. Days of school missed and school support were compared using Chi-square, Fisher's exact, t-tests, ANOVA, Wilcoxon Rank Sum, and Kruskal Wallis tests.

Results: We found that race and language spoken were not correlated with a decreased quality of life at 30 days post-concussion. Primarily Spanish-speaking individuals were less likely to have an abnormal school functioning score than primarily English-speaking individuals ($p < 0.01$). Non-Hispanic white patients were more likely to report receiving support from school ($p < 0.001$). There was no correlation between race/ethnicity and/or language with days of school missed.

Discussion: While overall quality of life following pediatric concussion was not related to race or language as hypothesized, Hispanic white children and Black children compared to non-Hispanic white children received significantly less school support. Similarly, primarily Spanish-speaking individuals received less school support than primarily English-speaking individuals (although not statistically significant). These findings, coupled with the existing literature, which highlights disparities in follow-up care, indicate a need for interventions aimed at minimizing healthcare disparities in pediatric patients with mild traumatic brain injury.

Primary Presenter: Joseph Fuchs

Project Title: A Novel Intervention in Cultural Competency Training Focused on Cross-cultural Communication for Undergraduate Dental Students

Primary Mentor: Paritosh Kaul

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Racial and ethnic minorities remain underrepresented within the healthcare workforce generally and within the dental profession specifically. Consequentially, professional organizations including the Commission on Dental Accreditation have identified the importance of cultural competency training in dental education. One essential component of providing care for patients of diverse backgrounds is culturally sensitive, patient-centered communication. To address this need, we implemented an interactive, two-hour Cross-Cultural Communication (CCC) educational session for Dental Students (DS). This study describes the intervention and provides data on its effectiveness. Our session employed dyad training, role playing, education about Kleinman 's Explanatory Model, and introduced the new "œModel for Negotiating Across Cultures "• that can be broadly applied to various aspects of patients ' culture. Learners included 51 first-year (24) and third-year (27) DS. Evaluation compared students ' pre-/post-intervention responses to a modified Health Belief Attitudes Survey (HBAS), which measured four domains: Opinion, Belief, Context, and Quality. For the first-year students, the mean difference improvement between the pre- and post-intervention surveys for each domain was statistically significant ($p < 0.05$). For the third-year students, there was a similar result as compared to the first-year students with the exception for the domain of Quality ($p = 0.083$). The educational paradigm used in this study fills a curricular gap in effectively teaching CCC among DS. Moreover, the intervention can be applied across health professions education. Limitations include that the study did not explore the long-term retention of knowledge or performance of CCC in the clinical settings.

Primary Presenter: Benjamin Fuller

Project Title: A Community Based Participatory Research Initiative Addressing Alcohol Use in the Refugee Population from Burma

Primary Mentor: Janet Meredith

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

BACKGROUND: Since 1948, there has been ongoing civil war and strife within Burma, causing thousands of civilian deaths and millions to be displaced from their homes. Many have sought safety in unofficial refugee camps along the Thai-Burma border. These camps are rudimentary and lack basic necessities. From 2006-2016, it is estimated that 159,692 refugees from Burma left these camps and ultimately resettled in the United States, making refugees from Burma the largest group of refugees during that decade¹. Many of those seeking a new life found themselves resettling in Colorado. The refugee population in the Denver Metro area is the largest in all of Colorado. Refugees exposed to violence, either directly or indirectly, as many from Burma have been, are at increased risk of anxiety, depression, and substance use disorders^{2,3}. Refugees often struggle to navigate the complexities of the American healthcare system^{4,5}. The development of novel programs and partnerships to assist refugees in access and acquisition of healthcare is essential to build stronger communities.

OBJECTIVES: Establish a partnership with stakeholders in the refugee community, work in direct partnership with the community to identify health-related areas of concern, and develop a culturally appropriate intervention to address these areas of concern.

METHODS: The project was divided into three phases that utilized community-based participatory research (CBPR) principles. The first phase of the project was undertaken in 2014 and sought to establish a partnership with stakeholders in the refugee community. This included working with community organizations and leaders including refugee housing managers, members of the Aurora Police Department, The Spring Institute, healthcare navigators, healthcare providers, and youth from the refugee community themselves. Phase one also consisted of working in direct partnership with refugee youth and other stakeholders in the community to form a Youth Advisory Board (YAB), with the aim of identifying a health related area of concern within their community that they would like to address. This was achieved through informal focus groups and discussions with the Youth Advisory Board. The members of the YAB identified alcohol use as their paramount concern. With an identified concern and community partnerships established, phase 2 began. Phase 2 consisted of IRB approved structured qualitative interviews to better understand the effects of alcohol use on the community and to identify any possible interventions that may already exist. The qualitative interviews were transcribed and analyzed using immersion crystallization methodology. Multiple medical student coders individually analyzed each interview transcript and multiple themes emerged. Phase 3 is currently underway, with the aim of presenting the findings to the community, and

generating a culturally appropriate intervention to address problematic alcohol use from the themes that were identified.

RESULTS: After Immersion Crystallization of the 10 interviews, several themes were generated. These themes include: problematic alcohol consumption spanning across all ages and ethnic groups, problematic alcohol use originating in the refugee camps, positive and negative influential roles of family and religion on consumptive practice, impact of problematic alcohol use on unemployment and violence, knowledge deficit on the negative impact of alcohol on physical health and wellness, and the lack of access to a culturally appropriate intervention.

CONCLUSIONS: This project expands upon current literature regarding the impact of alcohol use within the community of refugees from Burma. The themes generated will be leveraged to create a culturally competent intervention to effectively address alcohol use in this community.

Primary Presenter: David Gamble

Project Title: Use of Cost Cards in Problem-Based Learning for Medical School Resource Stewardship Education

Primary Mentor: Christopher King

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Introduction: Healthcare costs are a substantial burden on patients and our economy. The Choosing Wisely® Students and Trainees Advocating for Resource Stewardship (STARS) campaign aims to integrate healthcare value curricula into medical education programs to combat this problem. At the University of Colorado Anschutz Medical Campus, students involved in this campaign created charts with a list of common medical tests and procedures, along with their associated costs to the patient ("cost card") for students to use while working through pre-clinical problem-based learning (PBL) cases.

Methods: Cost cards were created for each PBL case. Each card contained relevant tests and their associated costs. Cost cards were incorporated into the case materials for the 18-month pre-clinical PBL curriculum. Student attitudes regarding cost and educational impact were measured using end-of-year survey instruments.

Results: 131 students in the first-year class and 179 students in the second-year class completed the evaluation. Over one-fifth (21.0%) of students reported using the cards during every case or most cases. Most (91.9%) students found the cards improved their understanding of cost, and 86.1% of students reported that they at least occasionally consider cost when deciding which studies to order.

Discussion: Although a minority of students consistently used the cost card, the majority found that it augmented their understanding of cost. Cost cards are useful for introducing healthcare value concepts to medical students within a PBL curriculum during the preclinical years.

Primary Presenter: Mackenzie Garcia

Project Title: Assessing Identity-Based Bias in Problem-Based Learning Curriculum Through a Community Lens

Primary Mentor: Rita Lee

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Background: Identity-based bias in medical education contributes to discrimination in healthcare and health inequities. Community-Students Together Against Healthcare Racism (C-STAHR) was developed in 2010 to combat healthcare racism using community-based participatory research. The aim of this analysis was to evaluate the problem-based learning (PBL) curriculum at a US medical school for identity-based bias through a community lens.

Methods: An evaluation tool was developed from prior C-STAHR focus group data and Sadker Foundation's Seven Forms of Bias¹. Community participants were recruited via snowball sampling. Participants evaluated PBL cases using this survey and qualitative discussions in focus groups. Survey responses were assigned value based on ideal answer. Questions were summed and divided by total possible points to create a percentage referred to as the Bias Score. Bias Scores corresponding to a particular case were averaged. We used a multivariate mixed effects linear regression model to associate patient-character identity with Bias Score. Three evaluators (two per transcript) coded transcripts through iterative code generation and emergent themes were identified.

Results: Six focus groups (43 participants total) were recruited. Each focus group evaluated five of 15 unique cases ""each case was reviewed by two groups. The average case Bias Score was 40% (SD: 20.3%). In multivariate mixed effects models, Latinx and Transgender-Man identities resulted in the largest increase in Bias Score [9.1% (p-value=0.047) and 11.4% (p-value=0.069), respectively]. Emergent themes from community participants include discriminatory care, assumptions based on identity, and missed opportunities to address important patient needs.

Conclusions: Community members are valuable assets to identify identity-based bias in medical school curriculum. PBL cases included incidences of identity-based bias that may perpetuate harmful stereotypes and implicit bias of future physicians. These findings represent a larger need to evaluate and address issues around bias and representation in medical education curricula.

Primary Presenter: Sanju Garimella

Project Title: WHO Package of Essential Noncommunicable (PEN) Disease Interventions for Primary Health Care

Primary Mentor: Leana May Moser

Secondary Mentor(s): Madiha Abdel-Maksoud, Cherian Varghese, Geneva, Switzerland

Thematic Area: Global Health

Abstract:

"The adoption of the Global Strategy for the Prevention and Control of Noncommunicable Diseases (NCDs) at the World Health Assembly in 2000 was an act of solidarity with the many low- and middle-income countries facing the catastrophic consequences of NCDs. It was also an acknowledgement that the long-term needs of people living with NCDs were being neglected, and was a turning point that has inspired action over the past two decades.

The risk of a 30-year-old person dying from any of the four major NCDs (cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes) before the age of 70 years declined by 15% globally between 2000 and 2012. This rapid improvement was largely due to policy, legislative and regulatory measures put in place to provide more people with access to screening; early diagnosis and treatment for hypertension (such as aspirin, beta blockers, diuretics and statins); and to protect people against tobacco use (such as through tobacco- control legislation).

Despite the important progress made in the first decade of the 21st century, momentum has since dwindled, with annual reductions in age-standardized premature mortality rates slowing for the main NCDs. Between 2000 and 2016 overall NCD risk declined only 18% globally “ with the risk of diabetes showing a 5% increase. In the past two decades NCDs have killed 200 million women and men aged between 30 and 70 years, the majority living in low- and middle-income countries. Most of these premature deaths could have been avoided. Unless immediate action is taken, Sustainable Development Goal (SDG) target 3.4 (reduce premature mortality from NCDs by one third) by 2030 will not be met. It is therefore more important than ever for the global community to mobilize for accelerated action to progressively cover

1 billion additional people with essential health services and medicines for the prevention and control of NCDs.

WHO has been providing guidance to advance this work. The Package of essential noncommunicable (PEN) disease interventions for primary health care in low-resource settings was first introduced in 2010 as a prioritized set of cost-effective interventions able to deliver an acceptable quality of care, even in resource-limited settings. Information on the cost-effectiveness of the interventions helped to make limited resources go further. From 2010, many additional elements were added and in 2013 a comprehensive set of tools was developed. The total cardiovascular risk assessment charts and management of type 2 diabetes were further updated in 2019.

The result today is this user-friendly WHO package of essential noncommunicable (PEN) disease interventions for primary health care resource, which brings together all these updates as protocols that are adaptable to local settings and able to empower primary care physicians, as well as allied health workers, to contribute to NCD management. WHO PEN is not meant to be exhaustive or prescriptive, but rather to be an important first step for integration of NCD management into primary health care. WHO PEN is also suitable for emergency and humanitarian settings. When implemented, it will bring more people living with or affected by NCDs into contact with the health system and promote universal health coverage"

Primary Presenter: Lillian Goodman

Project Title: Female Teens and Sexual Consent: How Conversations on Consent Affect Teens Sexual Activity

Primary Mentor: Jeanelle Sheeder

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Background: Awareness has grown of the frequency and regularity that sexual violence occurs in the United States. Research on this topic has focused on college-aged females, not adolescents though they experience a high prevalence of sexual violence. Prevention strategies have focused on "œconsent education"• which has been directed to this same population and ignored teens. This study gathered information on adolescent females' exposure to sexual consent education and sexual activity to better inform recommendations and clinical practices for education on consent counseling for this population.

Methods: A convenience sample of patients attending a Title X funded health clinic in Denver, Colorado. Data was gathered from an anonymous online survey asking approximately 28 questions on the topic. We compared responses using median tests and Fisher-exact tests.

Results: 101 females, ages 13-24 participated in the survey. No significant difference between exposure to consent and no exposure to consent was found for age, sexual activity, age of first sexual activity, or number of partners. Parents and providers were the most common source of information with providers being the preferred source. Some differences were found between the groups in how they interpreted behaviors or indicators of consent.

Conclusion: The majority of adolescents are receiving information on consent, however, what that information contains is unclear and often incomplete. Adolescents are asking for consent information and the need for comprehensive and accurate consent education is necessary. Updating provider guidelines and disseminating consistent information throughout adolescents' social networks would best meet the needs of this population.

Primary Presenter: Sara Graves

Project Title: The Haxtun to Holyoke Model: A Chronic Care Guide in a Rural Critical Access Hospital

Primary Mentor: Craig McCarty

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Introduction: Diabetes mellitus is a common affliction, with 9.3% of Coloradoans carrying the diagnosis in 2018.² These cases cost an estimated \$3.8 billion annually in Colorado (American Diabetes Association, 2018). Socioeconomic status influences many modalities of treatment for Type II Diabetes Mellitus, from diet modification to increased exercise, to pharmacologic management. The latter is a significant barrier in the States as "three in ten (29%) of all adults report not taking their medicines as prescribed at some point in the past year because of the cost" (Kaiser Family Foundation, 2019). We describe the ongoing process of creating a care coordination model for a rural family medicine diabetes clinic, including the establishment of a pharmaceutical sample closet. The sample closet is an important part of this clinic's care for patients with diabetes, many of whom are low income. Cost is an important aspect of medical care, especially to patients. Samples are important and common: a retrospective analysis of a safety net clinic in Kansas City, MO showing that "the presence of samples in the clinic reduced patient out-of-pocket expenditures per visit by approximately \$19" • 17.

Methods and Results: The Family Practice of Holyoke began to establish a Type II Diabetes Mellitus clinic based on a model created at the Haxtun Hospital District Family Medicine Clinic. The clinic needed to address difficulties with care coordination and affordability, as patients at both sites were often seen by specialists in more than 5 different health systems across two states, and had fixed incomes. Care coordination was managed by a handbook which centralized patient information in a way that is accessible to patient and provider. Both hospital systems were unable to afford EPIC, so Care Everywhere was unavailable for coordination. Patients were referred to and from many different health systems, making digital standardization of patient records near impossible. As previously mentioned, the patients in our clinic also tended to have poor technology literacy, and a limited willingness to use digital formats including virtual visits and electronic charts. This resulted in the creation of the handbook. A sample closet was re-vamped in Holyoke, with expired stock removed, the closet organized, and new samples ordered. This was done to help glucose lowering medications become more affordable to patients, as sometimes a "covered drug" • was still \$800/month out of pocket. To date, over 25 pharmaceutical sample orders have been successfully placed, with several recurring orders established.

Discussion: This work was a quality and process improvement project for the diabetes clinic in Haxtun. Phillips county is medically underserved, and T2DM is widespread, while providers are limited. There is a large variety of conflicting evidence about the effects of drug samples in primary care offices, with literature demonstrating results ranging from inappropriate

administration of samples to decreased out of pocket cost for patients, to the possibility of increased adherence. The ethics of providing drug samples are still currently being debated, and further research into the benefits to patients is needed. This project also attempted to find a solution to care coordination. This is a national issue with no clear solution that desperately needs improvement.

Primary Presenter: Hunter Greer

Project Title: Intra Arterial Chemotherapy for Rhabdomyosarcoma

Primary Mentor: Adam Green

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

We report a case of a boy with parameningeal rhabdomyosarcoma that recurred despite chemotherapy and proton radiation and was subsequently treated with targeted intra-arterial (IA) chemotherapy. IA chemotherapy showed encouraging results, with partial response by imaging and symptom relief. However, ablation of the internal maxillary artery supplying the tumor resulted in terminating IA chemotherapy. There are clear potential advantages of IA chemotherapy in terms of increasing intratumoral chemotherapy concentration while minimizing systemic toxicity. While current clinical trial evidence is limited, further research could prove IA chemotherapy to be a promising treatment modality for some localized solid tumors.

Primary Presenter: Daniel Grine

Project Title: The Role of the University of Colorado Human Cardiac Tissue Bank (UC-HCTB) in the Transomics for Precision Medicine (TOPMed) Program

Primary Mentor: Matthew Taylor

Secondary Mentor(s):

Thematic Area: Basic Biomedical Science

Abstract:

Purpose of Study: Tissue specific biorepositories are expensive yet valuable entities that enable critical biological studies of human diseased tissue. The University of Colorado Human Cardiac Tissue Bank (UC-HCTB) was established over 30 years ago to collect human cardiac samples. The extensive UC-HCTB has joined the Transomics for Precision Medicine (TOPMed) study sponsored by the NIH-NHLBI. TOPMed aims to sequence the entire genome, transcriptome, and proteome of human samples to establish a robust, publicly- available dataset for biological discovery and hypothesis testing of NHLBI focused diseases, akin to the established Cancer Genome Atlas (<https://cancergenome.nih.gov/>). Here, we present the study design of the UC-HCTB TOPMed collaboration and present early 'omic' data related to human heart failure genomics.

Methods Used: 1078 human heart samples from the IRB-approved UC-HCTB are approved for submission. Tissue selection is from left ventricle samples harvested at the time of orthotopic heart transplantation or implantation of a left ventricular assist device (LVAD). Whole genome and transcriptome sequencing will be done in phase one of the project.

Summary of Results: The UC-HCTB contains tissue from 1,343 unique patients. Of these patients, 860 have complete clinical and demographic data on age, sex, race, year of transplant, and diagnosis. The 860 samples include 591 (69.7%) failing and 269 (31.3%) non-failing hearts. Common diagnoses include: ischemic cardiomyopathy (26.7%), idiopathic dilated cardiomyopathy (22.7%), familial cardiomyopathy (4.3%), and retransplant (3.8%). The failing and non-failing samples are 21.7% and 52.8% female respectively. The racial distribution among the failing hearts is 77.5% White, 9.6% Black, 9.1% Hispanic, and 2.4% Asian.

Conclusions: Initial studies include DNA and RNA sequencing; subsequent, planned studies include metabolomic and proteomic analysis. We present data on the analyses of disease versus control states and within-disease, subgroup analyses. Additional, planned analyses will include studying gender and racial differences in gene expression.

Primary Presenter: Kira Grush

Project Title: The Association between Immediate Postpartum Etonogestrel Implants and Positive Postpartum Depression Screens in Adolescents and Young Adults

Primary Mentor: Kristina Tocce

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Objective: We aimed to compare rates of positive postpartum depression screens at 6 weeks postpartum among adolescents and young adults (AYA) initiating immediate postpartum contraceptive implants and those initiating other methods.

Design: Through a retrospective observational design, we collected data on demographics, reproductive history, prenatal and postnatal depression, and postpartum contraception.

Setting: Patients participating in an AYA prenatal-postnatal program were eligible for inclusion.

Participants: A total of 497 patients were enrolled between January 2013 and December 2016. The median age was 19 years (range 13- 22 years); 86% were primiparous, 50% were Latina, 24% were black, and 16% were white; 34% initiated immediate postpartum implants (n = 169).

Intervention: Those initiating a contraceptive implant within the first 14 days postpartum were included in the intervention group. **Main Outcome Measure:** We compared rates of positive Edinburgh Postpartum Depression Scales (EDPS) (scores ≥ 10) in AYA initiating immediate postpartum implants and those initiating other contraceptive methods.

Results: The AYA initiating immediate postpartum implants were similar to the rest of the cohort in baseline characteristics, aside from an increased rate of preterm births among the intervention group (19.4% vs 12.1%; $P = .03$). Prenatally, 14% had an elevated Center for Epidemiologic Studies Depression Scale (CES-D) scores (11.5% immediate postpartum implants vs 15.4% comparison, $P = .25$). At 6 weeks postpartum, 7.6% had a positive postpartum depression screen; this rate was significantly lower for those initiating immediate postpartum implants compared to those choosing other methods (4.1% vs 9.5%, $P = .04$).

Conclusions: Providers should continue to encourage AYA to choose whichever highly effective contraceptive method they prefer for postpartum use.

Primary Presenter: Karima Hamamsy

Project Title: Development of a Novel Curriculum in Motivational Interviewing for Medical Students in an Elective and Longitudinal Integrated Clerkship (LIC)

Primary Mentor: Anne Frank

Secondary Mentor(s): Jennifer Adams, Deb Seymour, Cindy Morris, Chad Morris

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Motivational Interviewing (MI) is a method proven to be effective in helping patients find their intrinsic motivation towards behavioral change (1). We believe that introducing medical students to MI early in their careers will allow them to develop a more patient-centered approach to medical care. Our project started with a MI elective that took place in the Fall of 2018 for first- and second-year medical students. The elective included a combination of didactics, exercises, MI practice, and discussion. The second part of our project was a MI curriculum for the 2020-2021 Denver Health Longitudinal Integrated Clerkship (DH-LIC). The curriculum consists of a lecture on MI principles, MI-specific exercises, 1:1 coaching with experienced facilitators, and two team-based learning (TBL) cases focused on chronic disease management and application of MI skills. Our evaluation methods are quantitative and qualitative pre- and post-elective and curriculum surveys. Students who completed the elective showed an increase in confidence and comfort with MI. Our pre-curriculum survey for the DH-LIC showed that most students reported that MI is "very important" or "extremely important" for their medical education, and 42.9% (n=21) of students reported lower comfort using MI in patient encounters. Post-curricular DH-LIC surveys will measure efficacy of and student satisfaction with the curriculum. An interactive, longitudinal, and multimodal curriculum has met a need in the CUSOM curriculum. We anticipate further dissemination of this curriculum to future CUSOM clerkship students and believe the structure and content is exportable.

Primary Presenter: Katie Havranek

Project Title: Governmental Aid and Housing Insecurity Among Hospitalized Patients

Primary Mentor: Julie Knoeckel

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Homelessness has deleterious effects on patients' health. Housing insecurity has been associated with higher hospital resource use, more frequent readmission, and worse health outcomes. Social Security Disability Insurance was created to assist those living with permanent mental or physical disabilities. Supplemental Security Income (SSI) was intended to help elderly individuals unable to escape poverty. Economic, political, and environmental changes have occurred since these programs were initially created and with a growing population of those experiencing homelessness and housing insecurity, it is unclear if these programs are functioning to address the social determinants of health.

Resources from the government were found to be helpful in aiding individuals get access to prescriptions and medical appointments, but government assistance is not adequately addressing the needs of those experiencing housing insecurity. Hospitalized patients experiencing homelessness or housing insecurity should be offered individualized assistance in finding and applying for community and governmental aid programs.

Primary Presenter: Caitlan Hinton

Project Title: Appropriateness of a Brief Bleeding Control Curriculum Taught by Medical Students to Laypersons in Heavily Trafficked Locations: A Systematized Review of the Literature

Primary Mentor: Rita Lee

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Introduction: Trauma is a leading cause of death in the US and the recent increase in mass shootings has emphasized the need for laypersons to provide hemorrhage control until EMS arrives. The Hartford Consensus translates lessons learned from the military to reduce deaths from uncontrolled hemorrhage. Stop the Bleed was created to train laypersons in bleeding control techniques and make bleeding control kits accessible in public spaces. I created a brief bleeding control curriculum that uses hands-on training taught by medical students deployed to laypersons in highly trafficked public places.

Methods: Conducted a systematized literature review through PubMed.

Results: Laypersons have a willingness to help in an emergency but lack the knowledge and skills to respond effectively. Bleeding control training successfully improves skills, knowledge, confidence, and willingness to act in many different populations. This outcome appears to be maintained when taught in a brief format or by health professional students.

Discussion: Training is necessary for laypersons to effectively recognize and treat hemorrhage and successfully improves feelings of confidence and self-efficacy that could lead improve rates of layperson assistance in emergencies. Brief formats may allow participants to focus on the fundamentals of bleeding control, while teaching by medical students may allow for more wide dissemination of training. Training in high traffic areas in the community may be an effective way to address barriers to obtaining training and bring training into the communities that need it most.

Primary Presenter: Sami Hourieh

Project Title: Four for the Price of One: Achieving Competencies of Multiple Clerkships with Rural Family Physicians

Primary Mentor: Roberto Silva

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Introduction: Longitudinal Integrated Clerkships (LICs) allow medical students to participate in comprehensive care of patients over time and meet core clinical competencies over several disciplines concurrently. Most urban LICs have large pools of preceptors that include many subspecialists. In rural communities, family physicians often provide primary care as well as emergency, inpatient, and obstetric care. We will examine how requirements of multiple core clerkships can be met with a small group of rural preceptors led by family physicians. Methods: We will examine a pilot program that combined five traditional clerkships (primary care, ob-gyn, surgery, inpatient medicine, and emergency care) into LICs in rural communities. Students logged all patient experiences including patient age, complaints and diagnoses, level of student involvement, clinical setting, and preceptor. Students also logged involvement in procedures and surgeries. We examine how learning objectives of clerkships traditionally led by sub-specialists can be met with rural preceptors. Results: Medical students were able to meet the majority of required core competencies while working with family physician preceptors. On average, students met greater than 97% of competencies on average across all 5 traditional clerkship blocks included in the LIC. Discussion: Our findings support the case that a large number of sub-specialist preceptors is not required to teach the core competencies of the clerkship year. This research lays an important foundation for further research to explore the possibility of rural LICs as a method to increase rural practice and address rural health shortages in Colorado.

Primary Presenter: Madeline Huey

Project Title: Community Partners' Experiences Collaborating with Medical Students via Longitudinal Service-Learning: A Qualitative Exploratory Study.

Primary Mentor: Heather Cassidy

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Purpose: When service-learning is aligned with community goals, it can cultivate deep engagement between learners and their communities. Medical students engaging in longitudinal service-learning develop a more nuanced view of physician leadership, sustain high levels of civism, and reinforce intrinsic motivations core to their professional identity. Community partners' experiences of collaborating with medical students via service-learning has not been well-characterized. The University of Colorado School of Medicine (CUSOM) integrated a year-long service-learning curriculum into a longitudinal integrated clerkship for third-year medical students. In the third year of this program, we undertook a qualitative study of community partners' motivations for and experiences with this collaboration.

Method: This is a qualitative exploratory study utilizing seven semi-structured interviews with the primary liaisons at seven community-based organizations that had partnered with CUSOM medical students via service-learning for at least two academic years. Interviews were conducted by a faculty-student dyad from CUSOM. Interviews were audio recorded, transcribed verbatim, and analyzed by five investigators using a grounded theory framework.

Results: Interviews explored community partner motivations for partaking in longitudinal service-learning, their experiences collaborating with medical students, outcomes achieved, and their aspirations for future collaborations. Community partners reported engaging in service-learning with the hope of influencing professional identity development of medical students. Partners aspired to impact medical students' attitudes and professional goals by increasing students' knowledge of the challenges faced by individuals served by their organizations. Partners identified meaningful outcomes for their organizations, clients and communities. Challenges related to curricular structure, student variability, communication, and scheduling; many partners were eager for expanded roles in student assessment.

Conclusions: Findings demonstrate that longitudinal service-learning can be understood via a dynamic socio-ecological model involving academic institutions, medical students, community-based organizations, clients, and communities. The actions, experiences, and outcomes of stakeholders in service-learning partnerships are interconnected, each impacting the others.

Primary Presenter: Darean Hunt

Project Title: A Community Based Participatory Research Initiative Addressing Alcohol Use in the Refugee Population from Burma

Primary Mentor: Leana May

Secondary Mentor(s): Janet Meredith

Thematic Area: Global Health

Abstract:

BACKGROUND: Since 1948, there has been ongoing civil war and strife within Burma, causing thousands of civilian deaths and millions to be displaced from their homes. Many have sought safety in unofficial refugee camps along the Thai-Burma border. These camps are rudimentary and lack basic necessities. From 2006-2016, it is estimated that 159,692 refugees from Burma left these camps and ultimately resettled in the United States, making refugees from Burma the largest group of refugees during that decade¹. Many of those seeking a new life found themselves resettling in Colorado. The refugee population in the Denver Metro area is the largest in all of Colorado. Refugees exposed to violence, either directly or indirectly, as many from Burma have been, are at increased risk of anxiety, depression, and substance use disorders^{2,3}. Refugees often struggle to navigate the complexities of the American healthcare system^{4,5}. The development of novel programs and partnerships to assist refugees in access and acquisition of healthcare is essential to build stronger communities.

OBJECTIVES: Establish a partnership with stakeholders in the refugee community, work in direct partnership with the community to identify health-related areas of concern, and develop a culturally appropriate intervention to address these areas of concern.

METHODS: The project was divided into three phases that utilized community-based participatory research (CBPR) principles. The first phase of the project was undertaken in 2014 and sought to establish a partnership with stakeholders in the refugee community. This included working with community organizations and leaders including refugee housing managers, members of the Aurora Police Department, The Spring Institute, healthcare navigators, healthcare providers, and youth from the refugee community themselves. Phase one also consisted of working in direct partnership with refugee youth and other stakeholders in the community to form a Youth Advisory Board (YAB), with the aim of identifying a health related area of concern within their community that they would like to address. This was achieved through informal focus groups and discussions with the Youth Advisory Board. The members of the YAB identified alcohol use as their paramount concern. With an identified concern and community partnerships established, phase 2 began. Phase 2 consisted of IRB approved structured qualitative interviews to better understand the effects of alcohol use on the community and to identify any possible interventions that may already exist. The qualitative interviews were transcribed and analyzed using immersion crystallization methodology. Multiple medical student coders individually analyzed each interview transcript and multiple themes emerged. Phase 3 is currently underway, with the aim of presenting the findings to the community, and

generating a culturally appropriate intervention to address problematic alcohol use from the themes that were identified.

RESULTS: After Immersion Crystallization of the 10 interviews, several themes were generated. These themes include: problematic alcohol consumption spanning across all ages and ethnic groups, problematic alcohol use originating in the refugee camps, positive and negative influential roles of family and religion on consumptive practice, impact of problematic alcohol use on unemployment and violence, knowledge deficit on the negative impact of alcohol on physical health and wellness, and the lack of access to a culturally appropriate intervention.

CONCLUSIONS: This project expands upon current literature regarding the impact of alcohol use within the community of refugees from Burma. The themes generated will be leveraged to create a culturally competent intervention to effectively address alcohol use in this community.

Primary Presenter: Edward Husarcik

Project Title: Analyzing Provider Interactions with the Problem List

Primary Mentor: Lisa Schilling

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

The problem list is an integral part of patient management in both primary and consulting services. It allows for the quick reference of active problems by consultants and provides a way to track conditions over time using problem-based charting longitudinally. There is a growing demand for the efficient curation of these lists as problem list bloat can impact patient care. Here we explore patterns of problem list interaction. The highest item removal rates by practice type are seen in internal medicine practices, most likely due to a higher level of problem list ownership. There was not a large difference between clinician educational degree and removal of problem list items. Notably, medical assistants removed problems as much as physicians. As far as removal of problems, the items with the highest frequency of removal were either symptoms, nondescript, or had a surgical resolution. Items that remained on the list for the longest duration had low frequencies of removal, and it was difficult to determine why they were removed without further study.

Primary Presenter: Olivia Hutton

Project Title: Improving Wikipedia Skin Disease Content

Primary Mentor: Robert Dellavalle

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Medical articles on Wikipedia receive 10 million daily views, and Wikipedia's top 500 skin-related articles received more than 16 million views during August 2018 alone. An editing partnership between the evidence-based medicine organization Cochrane ([www.cochrane.org] (<http://www.cochrane.org/>)) and Wikipedia was initiated in 2014. Cochrane Review Groups, Centers, and Fields engage with Wikipedia to recruit and train editors and share high-quality Cochrane Review evidence in Wikipedia articles. This research letter evaluates the most-viewed dermatologic articles on Wikipedia and describes the impact that trainees and dermatologists volunteering for the Cochrane Skin Wikipedia Initiative can have by enhancing the content of Wikipedia articles.

Primary Presenter: Hannah Imlay

Project Title: Acute Stress Disorder and Post-Traumatic Stress Disorder in the Outpatient Burn Population

Primary Mentor: Arek Wiktor

Secondary Mentor(s): Kiran Dyamenahalli

Thematic Area: Clinical Science

Abstract:

Introduction: Early screening and intervention for acute stress disorder (ASD), diagnosed within 30 days of the inciting trauma, and post-traumatic stress disorder (PTSD), diagnosed after 30 days, are quality metrics in burn care. However, a considerable knowledge gap remains surrounding these psychological conditions in the outpatient burn setting. In this study, we assessed the effectiveness of ASD and PTSD screening at an academic burn center and identified risk factors for their development.

Methods: A retrospective cohort study of all patients treated at an ABA-verified burn center's outpatient clinic, between July 2016 and August 2019, was undertaken. Adult patients with flame, flash, contact, or scald burns who were initially evaluated in the outpatient setting were included; primary inpatient admissions were excluded. ASD and PTSD were assessed using validated screening tools (ASDS and PCL-5, respectively). ASD/PTSD screening rate, screening tool appropriateness, and subsequent interventions were recorded, along with age, gender, % total body surface area (TBSA) burned, burn mechanism, operative intervention, psychiatric history, substance abuse history, and co-morbidities. Chi-square and Mann-Whitney U tests were used for univariate analysis of categorical and continuous variables, respectively.

Results: 2494 clinic encounters and 1147 unique patients were included in the analysis. Patients were screened for ASD or PTSD at 94.8% of encounters. Median age was 36 years (range of 18 to 94 years), 57.6% of patients were male (n=661), and median TBSA burned was 1% (range of 0.1 to 12%). Among all screens, the appropriate screening tool was applied 88.5% of the time. For all encounters, positive screening rates for ASD and PTSD were 13.2% (n=286) and 14.6% (n=48), respectively. Risk factors for positive ASD screens included a history of substance abuse (OR 1.9, p=0.03) and history of psychiatric illness (OR 2.6, p=0.002). Similarly, risk factors for positive PTSD screens included a prior positive ASD screen (OR 9.5, p=0.001), a history of substance abuse (OR 2.1, p=0.04), and a history of psychiatric illness (OR 3.3, p=0.002). Age, gender, burn mechanism, TBSA burned, and need for operative intervention did not predict positive screens. The intervention rate for positive PTSD screens by referral, counseling, or medication, was only 7.9%.

Conclusions: Demographics and burn severity do not appear to predict development of ASD or PTSD in the outpatient burn population. In contrast, a history of substance abuse or psychiatric illness warrant further attention. Despite consistent use of validated ASD and PTSD screening tools, these conditions remain under-treated in the outpatient setting, indicating a need for resource-expansion.

Primary Presenter: Andrew Isaac

Project Title: Substance Use Treatment Protocol Development and Organization: Creating Flowcharts to Standardize Care at The University of Colorado School of Medicine's Addiction Research and Treatment Services Adult Outpatient Program

Primary Mentor: Tyler Coyle

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

With the ever-growing opioid epidemic affecting millions of Americans, it is not surprising that the demand for substance use treatment programs is outpacing the supply. Such facilities frequently treat a number of addiction medicine complaints, including alcohol, stimulant, benzodiazepine and cannabis use disorders, among others. Such facilities often have staff turnover that requires highly specialized and time-consuming onboarding processes. The aims of this project were to update existing and create new protocols for the University of Colorado School of Medicine's Addiction Research and Treatment Services and to organize all protocols into digital, printable, easy-to-use flowcharts for onboarding staff members. Prior studies have shown that standardization of evidence-based care improves patient outcomes, and the process of creating these flowcharts was standardized and catalogued. This project has many potential future directions, namely studying the implementation of the flowcharts at the clinic to determine the effect on clinic metrics and patient outcomes. Additionally, these flowcharts were made to be universal and can be disseminated to other treatment programs across institutions in the future.

Primary Presenter: Carlos Jaquez

Project Title: Gender Differences in Academic Publications

Primary Mentor: Jody Vogel

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Introduction: Participation of women in medicine has increased over time. However, there are disparities in the gender of authors of original research and editorials in the medical literature. This is unsurprising given the overall gender inequality in academic medicine including differences in salary, availability of mentorship and sponsorship, research funding, and career flexibility affecting both recruitment and retention efforts of females. Gender equality in science, medicine, and global health is significant as it contributes to substantial health, social, and economic improvements within society. Previous investigations have demonstrated that women authors compose a minority of editorials and original research articles in major medical journal. However, limited data are available on more recent trends in academic publications by gender.

Methods: The following article types were included in the study: original research articles, review articles, and editorials. These article types from six discrete years (1993, 1998, 2003, 2008, 2013, and 2018) which were written in English with either the first or last author from the United States, in the following journals were included in the study: New England Journal of Medicine (NEJM), Journal of the American Medical Association (JAMA), Annals of Internal Medicine, Annals of Surgery, Obstetrics and Gynecology, and Pediatrics.

Results: In this investigation, 22,049 articles were identified within the time frame in question and of those, [***] articles were included while [***] were excluded. The observed proportion of female first authors was [***]% in 1993 and [***]% in 2018 demonstrating an increasing trend ($p < [***]$). The observed proportion of female last authors over the study time period was [***]% in 1993 and [***]% in 2018, demonstrating an increasing trend ($p = [***]$).

Discussion: Our investigation demonstrated an increase in the proportion of female first and last authors in the academic publications in the articles evaluated for this investigation. However, across the 25-year study time period, female authors comprised the minority of authors in academic publications.

Primary Presenter: Andrew Kamel

Project Title: THE EVALUATION OF MEDICAL STUDENT INTERNATIONAL MISSION TRIPS: A RAPID REVIEW

Primary Mentor: Rosemary Frasso

Secondary Mentor(s):

Thematic Area: Global Health

Abstract:

BACKGROUND: Previous reviews of the literature on medical mission trips have noted that there is a dearth of rigorous data collection and evaluation of the efficacy of medical missions to low- and middle-income countries (LMICs). Medical students are increasingly participating in these trips as global health curriculums become more popular and prevalent, and the literature about these international experiences has not been well-described. This rapid review aims to characterize the evaluation of medical mission trips for medical students to LMICs.

METHODS: This article is a rapid review of the literature using PRIMSA guidelines to search PubMed for studies about the evaluation of medical mission trips involving medical students. Results were sorted using inclusion and exclusion criteria to select studies for qualitative synthesis.

RESULTS: 19 articles were selected for inclusion in the qualitative synthesis. 47.4% evaluated only medical students, 31.6% evaluated a mix of medical trainees and clinicians, and 21% evaluated host clinicians and coordinators rather than students. 41.2% of included studies used pre- and post-experience surveys, 15.8% used only post-experience surveys, and 36.8% used semi-structured interviews. One study tested knowledge. Outcomes measured varied considerably, but often evaluated student and host perceptions and opinions of medical missions, ethical concerns, and international health care.

CONCLUSIONS: Studies evaluating medical missions for medical students reflect issues in the broader medical mission trip literature. Qualitative analysis and evaluation of student perceptions and opinions are disproportionately represented, and there is a deficiency of quantitative data collection. This review also demonstrates a lack of rigorous evaluation of outcomes for host countries and clinical outcomes for the patients MMTs treat.

Primary Presenter: Lakshmi Karamsetty

Project Title: The Rise of Mental Health Illnesses due to Economic Recessions. The Need for Collaboration between professionals within Mental Health & Economics

Primary Mentor: Steven Lowenstein

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Since 1979 the United States has faced six economic recessions, including the ongoing recession due to the COVID-19 pandemic. It is important to note that economic recessions are predicted to occur every 4-5 years based on market trends. Aside from the financial losses that occur during these times, mental health symptoms have been noted to increase throughout previous recessions. This paper explores various correlations that have been observed during previous recessions, especially focusing on the Great Recession in 2008, through a comprehensive literature review, using PubMed as well as economics journals. These trends are then compared to the ongoing economic recession the United States is facing today due to the COVID-19 pandemic and the increase in mental health symptoms, including anxiety, depression, panic, post-traumatic stress, substance use disorders and suicidality. Although causal connections were difficult to identify from the published literature, it was evident that specific vulnerable populations were more likely to suffer from these symptoms. Various solutions were noted, including the use of telemedicine and increasing access to mental health providers through employers. There is also a critical need for strong collaboration between economists and mental health providers, in order to mitigate such severe mental health consequences for the larger society.

Primary Presenter: Timothy Kelly

Project Title: Firearm Storage Maps: A Pragmatic Approach to Reduce Firearm Suicide During Times of Risk

Primary Mentor: Marian Betz

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Background: Suicide is one of the leading causes of death in Colorado, and temporary out-of-home firearm storage is an evidence-based suicide prevention strategy meant to reduce access to lethal means. However, there are significant barriers to out-of-home firearm storage, including a lack of knowledge about locations that offer such services. We sought to develop a first-of-its-kind virtual map that lists locations that consider requests for temporary, voluntary firearm storage.

Methods: We systematically contacted every Colorado law enforcement agency and gun shop via phone and/or email to identify locations that consider requests for temporary, voluntary firearm storage and that were willing to be listed on a publicly available online resource. The map was built on the Google Map platform.

Results: Of 471 gun retailers and 215 law enforcement agencies contacted, 61 Colorado locations (46 retailers and 15 law enforcement agencies) considered requests for temporary firearm storage and were willing to be publicly listed. Overall, temporary gun storage locations were located in 50% (32/64) of Colorado counties. The firearm storage map is available at <https://coloradofirearmsafetycoalition.org/gun-storage-map/> and has received 37,034 site visits to date.

Conclusion: Our experience demonstrates that firearm storage maps can support harm reduction approaches to prevent firearm-related injury and death, although significant practical and legal challenges remain. Future investigations should help clarify if firearm storage maps change patterns of firearm storage and/or help physicians and behavioral health evaluators provide more effective lethal means counseling to patients at risk of suicide.

Primary Presenter: Alec Kerins

Project Title: Facilitators and Barriers to Implementing a Screening Program for Social Determinants of Health with Practices Enrolled in the Innovation Support Project

Primary Mentor: Heather Bleacher

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Social prescribing programs have become increasingly more common in the primary care setting in order to connect patients with community resources to fill an unmet social need found when screening for social determinants of health. Though social prescribing has gained popularity, little research has been done to better understand the facilitators and barriers to successful implementation of a social needs screening and referral program. Between April and December 2020, 81 ambulatory care practices in Colorado enrolled in the Innovation Support Project, a program through the University of Colorado aimed at supporting practices to care for an increased number of patients with Medicaid. During this timeframe, 43 practices within the ISP chose to focus on social needs screening and had taken at least preliminary steps to implement a social needs screening and referral program. To better understand the components of a successful social needs screening program within these practices, field notes submitted from ISP were coded a priori using both PRISM and the PRAPARE toolkit as coding frameworks. Practices were also invited to participate in focus groups to better characterize the themes that emerged from the initial analysis of the field notes. Staff and leadership engagement, staff training, relationships and communication, technology, workflow, and robust community resources were identified as key facilitators of a social needs screening and referral program. Absence of the above facilitators, as well as screener burden, patient complexity and engagement, and COVID-19 were identified as barriers to successful implementation. Insights from this evaluation will inform the creation of resources and support for future practices enrolled in the ISP that choose to develop or refine their SDOH screening program. Further study is required to confirm these findings, however future work may also include characterization of facilitators and barriers based upon practice type (Ex: Family Medicine vs Pediatrics), comparing implementation with and without soliciting patient perspective as part of the planning process, and interviewing patients directly to understand their perspective on the social needs screening process.

Primary Presenter: Daewoong Kim

Project Title: Implementation of the WHO's Community-Based First Aid Response (CFAR) Program in Southwestern Guatemala

Primary Mentor: Emilie Calvellido-Hynes

Secondary Mentor(s):

Thematic Area: Global Health

Abstract:

Initial stabilization and expedient transfer of acutely ill-patients is a critical first step in delivering emergency care, which is often an issue in lower-middle income class countries. The WHO's Community First Aid Response (CFAR) program is a recently developed 3-day course designed to equip community members, who are often first to witness a medical emergency, with the skills and knowledge to mitigate commonly encountered emergent situations. This course was piloted in the rural Southwestern region of Guatemala, where a qualitative assessment was performed to evaluate for necessary context-appropriate changes, course content material, overall generalizability across language and cultural barriers, and major barriers to implementation. The most important finding revealed by surveys, post-implementation interviews, and focus groups emphasize the inherent complexity of augmenting pre-hospital systems in austere environments. To be considered as a widely-distributable and open access community-based education program, CFAR must address and continually suggest best-practice guidelines in its implementation, including but not limited to: a thorough assessment of local technologies and resources, pre-existing capabilities of the community, burden and location of disease, and the perspective, willingness, and capacity of the individuals involved in the course.

Primary Presenter: Michael Klausner

Project Title: Warfighter Personal Protective Equipment and Combat Wounds

Primary Mentor: Madiha Abdel-Maksoud

Secondary Mentor(s):

Thematic Area: Global Health

Abstract:

Background: Personal protective equipment (PPE) is crucial to force protection and preservation. Innovation in PPE has shifted injury patterns, with protected body regions accounting for decreased proportions of battlefield trauma relative to unprotected regions. Little is known regarding the PPE in use by warfighters at the time of injury.

Methods: We queried the PHTR for all encounters from 2003-2019. This is a sub-analysis of casualties with documented personal protective equipment at the time of medical encounter. When possible, encounters were linked to the Department of Defense Trauma Registry (DODTR) for outcome data. Serious injuries are defined as an abbreviated injury scale of 3 or greater.

Results: Of 1357 total casualty encounters in the PHTR, 83 were U.S. military with documented PPE. We link 62 of this cohort to DODTR. The median composite Injury Severity Score (ISS) was 6 (IQR 4-21), and 11 casualties (18%) had an ISS >25. The most seriously injured body regions were the extremities (21%), head/neck (16%), thorax (16%), and abdomen (10%). PPE worn at time of injury included helmet (91%), eye protection (73%), front (75%) and rear plates (77%), left/right plates (65%), tactical vest (46%), groin protection (12%), neck protection (6%), pelvic shield (3%), and deltoid protection (3%).

Conclusions: Our data set demonstrates that the extremities were the most commonly injured body region, followed by head/neck, and thorax. PPE designed for the extremities and neck are also among the least commonly worn protective equipment.

Primary Presenter: Glendalyn Klein

Project Title: White Collar/Professional Mentorship of Underserved and Minority Populations

Primary Mentor: Steven Zeichner

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Minority and underserved populations are often, or stereotypically, seen as being unable to find achievement in white collar/professional occupations (medical doctor, engineering, business, law, et cetera) due to a lack of representation in or access to those professions. Mentorship that reaches these communities at an early age gives children of these communities the ability to relate to professionals and the ability to visualize themselves in those professions. Using the University of Colorado School of Medicine (CUSOM) and the Community Choirs of the Colorado Children 's Chorale, outreach can be developed from a young age and give these children an insight that becoming a doctor is within their capabilities. CUSOM has a well-developed diversity outreach program for acceptance to their program (~50% minority acceptance, ~50% female acceptance), which allows for underserved and underrepresented populations to see that the goal of medical doctor is an achievable one.

Primary Presenter: Claire Koljack

Project Title: Anti-Stigma Mental Health Panel: An initiative to reduce mental health stigma experienced by health professional students

Primary Mentor: Rachel Davis

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Objective: Health professional students are at higher risk of mental health problems than the general population. Despite this, only a small percentage of students report they would seek professional help for a serious emotional problem. We implemented a small-scale, cost effective, peer-led panel for health professional students to share their stories of mental health problems and issues of stigma. The present study aimed to evaluate the short and long-term effects of the Anti-Stigma Mental Health Panel on health professional student panel attendees.

Methods: Thirty participants provided postcard consent to participate in the study. The outcome measure included eight questions that assessed participants' knowledge, attitudes and intended behaviors immediately preceding and following the panel, in addition to a six-month survey. The investigators performed three Wilcoxon signed rank tests between pre and post-intervention, post-intervention and 6-month follow-up, and pre-intervention and 6-month follow-up.

Results: There was a significant difference between pre and post-survey responses for one knowledge, one attitude, and two intended behavior measures. There were no significant differences between post-test and 6-month follow-up measure responses.

Conclusion: Investigators developed a brief, peer-led, inter-professional, and cost-effective method that reduced self-stigma among health professional students on a health professional student campus. A toolkit to replicate the panel and study can be found on the Department of Psychiatry's webpage.

Primary Presenter: Akshay Kumar

Project Title: A Review of Best Practices to Prepare Medical Students for Responsible Global Health Experiences

Primary Mentor: David Richards

Secondary Mentor(s):

Thematic Area: Global Health

Abstract:

There is an increasing interest in medical students participating in short-term global health experiences, and such programs are gradually becoming more established at many medical schools. With this comes a striking need to establish best practices for students to have responsible global health experiences. We set out to conduct a review of the existing published literature on best preparation practices for medical students with the goal of consolidating this info for global health programs to use in creating their own short-term experiences. Eleven articles from 2007-2018 were selected for final review after a thorough literature search of several databases that resulted in 759 articles. Of these articles, concepts of bidirectional participation, site-specific resource training, implementation of ethics training, and situational judgement tests and case discussions emerged as the most common themes. These themes were incorporated in both the selection and training process for medical students embarking on global health experiences. The findings in these articles provide an adequate starting point for novel or existing global health programs seeking to establish their own experiences, and employment of these preparatory practices that are tailored to specifics of a particular international elective can provide enriching experiences for both students and countries of destination.

Primary Presenter: Megan Kunkel

Project Title: Open Surgical Ablation of Ventricular Tachycardia: Utility and Feasibility of Contemporary Mapping and Ablation Tools

Primary Mentor: Wendy Tzou

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background Ventricular tachycardia (VT) catheter ablation success may be limited when transcatheter epicardial access is contraindicated. Surgical ablation (SurgAbl) is an option, but ablation guidance is limited without simultaneously acquired electrophysiological data.

Objective We aim to describe our SurgAbl experience utilizing contemporary electroanatomic mapping (EAM) among patients with refractory VT storm.

Methods Consecutive patients with recurrent VT despite antiarrhythmic drugs (AADs) and prior ablation, for whom percutaneous epicardial access was contraindicated, underwent open SurgAbl using intra-operative EAM-guidance.

Results Eight patients were included, among whom mean age was 63 ± 5 years, all were male, mean left ventricular ejection fraction was $39 \pm 12\%$, and 2(25%) had ischemic cardiomyopathy. Reasons for surgical Epi access included dense adhesions due to prior cardiac surgery, hemopericardium, or pericarditis (n=6), or planned left ventricular assist device (LVAD) implantation at time of SurgAbl (n=2). Cryoablation guided by real-time EAM was performed in all. Goals of clinical VT non-inducibility or core isolation were achieved in 100%. VT burden was significantly reduced, from median 15 to 0 events in the month pre- and post-SurgAbl ($p=0.01$). One patient underwent orthotopic heart transplantation for recurrent VT storm 2 weeks post-SurgAbl. Over mean follow-up of 3.4 ± 1.7 years, VT-storm-free survival was achieved in 6(75%); all continued AADs, although at lower dose.

Conclusion Surgical mapping and ablation of refractory VT with use of contemporary electroanatomic mapping is feasible and effective, particularly among patients with contraindication to percutaneous epicardial access or with another indication for cardiac surgery.

Primary Presenter: Dustin Lamb

Project Title: Rethinking the 48-Hour Rule-Out: Time to Positivity in Blood Cultures at a Pediatric Hospital

Primary Mentor: Sarah Parker

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: Initiation and continuation of empiric antimicrobial agents for a 48-72 hour rule out until blood

cultures are deemed negative are essential in the diagnosis and treatment of infants and children with suspected sepsis and serious bacterial infections (SBI). We aimed to determine the time to positivity (TTP) of blood cultures at a free-standing pediatric hospital over a 6-year period.

Methods: Data were extracted from our data warehouse for all patients who were hospitalized and had blood cultures drawn from January 2013 to December 2018. After exclusion positive blood were chart reviewed for both microbiologic and clinical data. TTP was calculated based on date and time culture was collected compared to date and time growth was first reported.

Results: Over a six-year period, a total of 6,184 positive blood cultures were identified out of 89,663 total cultures. After exclusions, a total of 2,130 positive blood cultures were included in this study. Overall TTP (mean hours, 95% confidence interval) for all included blood cultures was 21.26 hours (20.77;21.77). The mean (95%CI) TPP for gram-positive absolute pathogens and gram-negative absolute pathogens were 16.73 (16.18;17.3), and 15.99 (15.06;16.97), respectively. There was no difference seen in TPP between subspecialties within the hospital or type of line the blood culture was obtained from.

Discussion: This study shows that 36 hours or less may be a sufficient period of observation for infants and children started on empiric antimicrobials for sepsis or SBI. These findings highlight opportunities for antimicrobial stewardship to limit antimicrobial exposure.

Primary Presenter: Melissa Laughter

Project Title: Multifunctional fluorocarbon-conjugated nanoparticles of varied morphologies to enhance diagnostic effects in breast cancer

Primary Mentor: Daewon Park

Secondary Mentor(s):

Thematic Area: Basic Biomedical Science

Abstract:

Objective: A multifunctional trastuzumab-nanoparticle-fluorocarbon system was developed to maximize the diagnostic effects in human epidermal growth factor receptor 2 (HER2)-positive breast cancer. The mesoporous silica nanoparticle shape (e.g. amorphous, spherical, and tubular) was altered to optimize the ultrasound contrast potential. Fluorocarbon conjugated mesoporous silica nanoparticles produced higher mean pixel intensities.

Results: At lower non-toxic concentrations, tubular shaped nanoparticles produced a higher mean pixel intensity compared to amorphous and spherical particles. All systems displayed a clear binding preference towards HER2-positive breast cancer cells. Increased incubation times and conjugation of fluorocarbon to mesoporous nanoparticles increased binding preference to HER2-positive breast cancer cells. The highest binding affinity was seen with tubular shaped nanoparticles as compared to amorphous and spherical particles.

Conclusions: The trastuzumab-nanoparticle-fluorocarbon system of each morphology displayed functionality of enhancing contrast in ultrasound.

Primary Presenter: Bryn Launer

Project Title: The rising worldwide impact of benign prostatic hyperplasia

Primary Mentor: Grangille Lloyd

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Objectives: To describe the trend in the impact of lower urinary tract symptoms attributed to benign prostatic hyperplasia (LUTS/BPH) on a global scale using the Global Burden of Disease (GBD) database.

Materials and Methods: Using the GBD database, worldwide data aggregated from registries and health systems from 1990 to 2017 were filtered for LUTS/BPH diagnoses. Calculation of years lived with disability (YLD) were compared with other urological diseases. YLD were calculated by a standardized method using assigned disability weights. The GBD-defined sociodemographic index (SDI) was used to assess impact of LUTS/BPH by global SDI quintile.

Results: Global Burden of Disease data over the 1990 "–2017 study period were summarized and global numbers and trends noted with other urological diseases for comparison. A total of 2 427 334 YLD were attributed to BPH in 2017 alone, almost three times more than those attributed to the next highest urological disease, prostate cancer (843 227 YLD). When stratified by SDI quintile, a much lower impact of BPH was found in the bottom three quintiles, despite this subset representing 66.9% of the 2017 world population.

Conclusions: Lower urinary tract symptoms attributed to benign prostatic hyperplasia exert a rapidly rising human burden far exceeding other urological diseases. As the population ages and men in a lower SDI enjoy increased life expectancy and decreased competing mortalities, a continually accelerating wave of LUTS/BPH can be forecast. These epidemiological trends have serious implications for the future allocation of resources and the global urological workforce.

Primary Presenter: Alexandra Lauren

Project Title: Development of a Novel Curriculum in Motivational Interviewing for Medical Students in an Elective and Longitudinal Integrated Clerkship (LIC)

Primary Mentor: Anne Frank

Secondary Mentor(s): Jennifer Adams, Deb Seymour, Cindy Morris, Chad Morris

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Motivational Interviewing (MI) is a method proven to be effective in helping patients find their intrinsic motivation towards behavioral change.¹ We believe that introducing medical students to MI early in their careers will allow them to develop a more patient-centered approach to medical care. Our project started with a MI elective that took place in the Fall of 2018 for first- and second-year medical students. The elective included a combination of didactics, exercises, MI practice, and discussion. The second part of our project was a MI curriculum for the 2020-2021 Denver Health Longitudinal Integrated Clerkship (DH-LIC). The curriculum consists of a lecture on MI principles, MI-specific exercises, 1:1 coaching with experienced facilitators, and two team-based learning (TBL) cases focused on chronic disease management and application of MI skills. Our evaluation methods are quantitative and qualitative pre-and post-elective and curriculum surveys. Students who completed the elective showed an increase in confidence and comfort with MI. Our pre-curriculum survey for the DH-LIC showed that most students reported that MI is "very important" or "extremely important" for their medical education, and 42.9% (n=21) of students reported lower comfort using MI in patient encounters. Post curricular DH-LIC surveys will measure efficacy of and student satisfaction with the curriculum. An interactive, longitudinal, and multimodal curriculum has met a need in the CUSOM curriculum. We anticipate further dissemination of this curriculum to future CUSOM clerkship students and believe the structure and content is exportable.

Primary Presenter: Ian Lawrence

Project Title: Impact of an Educational Workshop on Laboratory Evaluation of Preeclampsia in La Paz, Bolivia

Primary Mentor: Lorna Moore

Secondary Mentor(s): Colleen Julian

Thematic Area: Global Health

Abstract:

Preeclampsia is a significant public health issue in Bolivia: Two-thirds of Bolivia's population lives above 2,500 meters of elevation, where the risk of preeclampsia is threefold higher than it is at lower altitudes. Preeclampsia carries risks during pregnancy, but also predisposes children to congenital heart and pulmonary circulation issues, along with elevated lifelong cardiovascular risks for both mothers and children who experience a preeclamptic pregnancy. Currently, there is an absence of the usage of standardized diagnostic criteria for preeclampsia in the major obstetric hospitals of La Paz and El Alto, Bolivia, hindering accurate diagnosis and preventive measures to help ameliorate risks associated with preeclampsia. In this study, we aim to evaluate risk factors and adverse outcomes associated with preeclampsia in this context, and to evaluate the implementation of standardized diagnostic criteria written by the American College of Obstetricians and Gynecologists (ACOG) for preeclampsia in hospitals in La Paz/El Alto. To evaluate this, a medical records review was conducted at three hospitals in Bolivia: Hospital Materno-Infantil (HMI), Hospital Boliviano-Holandés (HBH), and Hospital de la Mujer (HdIM). At these hospitals, records of all pregnancies complicated by hypertension over the course of two years were reviewed, along with two control "uncomplicated" pregnancies for each pregnancy complicated by hypertensive disorders. Notably, pregnancies complicated by hypertensive disorders were associated with an increased risk of babies Small for Gestational Age (SGA) (24.2% vs 13.5%, $p=0.0001$), and an increased percentage of neonates receiving supplemental oxygen (14.1% vs 7.8%, $p=0.0001$) and being transferred to the NICU (15.5% vs 1.8%, $p=0.0001$). Additionally, there was significant incongruence between diagnoses found in the medical charts and that which ACOG would recommend, with almost 40% of diagnoses of Gestational Hypertension and 70% of diagnoses of Preeclampsia meeting the ACOG criteria for Preeclampsia with Severe Features. This diagnostic incongruence and the associated adverse outcomes for mothers and children suggest further work on implementation of new diagnostic criteria is warranted, which may help in reducing adverse outcomes and guide strategic planning to address these issues.

Primary Presenter: Dung Le

Project Title: A Community Based Participatory Research Initiative Addressing Alcohol Use in the Refugee Population from Burma

Primary Mentor: Janet Meredith

Secondary Mentor(s): Jamaluddin Moloo

Thematic Area: Public Health and Epidemiology

Abstract:

BACKGROUND: For well over 50 years, there has been ongoing civil war and strife within Burma causing thousands of deaths and millions being displaced from their homes. Many have sought safety in unofficial refugee camps along the Thai-Burma border. These camps are rudimentary and lack basic necessities. From 2006-2016, it is estimated that 159,692 refugees from Burma left these camps and ultimately resettled in the United States, making refugees from Burma the largest group of refugees during that decade¹. Many of those seeking a new life found themselves resettling in Colorado. The refugee population in the Denver Metro area is the largest in all of Colorado. Refugees exposed to violence, either directly or indirectly, as many from Burma have been, are at increased risk of anxiety, depression, and substance use disorders^{2,3}. Refugees often struggle to navigate the complexities of the American healthcare system^{4,5}. The development of novel programs and partnerships to assist refugees in access and acquisition of healthcare is essential to build stronger communities.

OBJECTIVES: Establish a partnership with stakeholders in the community, work in direct partnership with the community to identify health-related areas of concern, and develop a culturally appropriate intervention to address these areas of concern.

METHODS: The project was divided into three phases that utilized community-based participatory research (CBPR) principles. The first phase of the project was undertaken in 2014 and sought to establish a partnership with stakeholders in the refugee community. This included working with community organizations and leaders including refugee housing managers, members of the Aurora Police Department, The Spring Institute, healthcare navigators, healthcare providers, and youth from the refugee community themselves. Phase one also consisted of working in direct partnership with refugee youth and other stakeholders in the community to form a Youth Advisory Board (YAB), with the aim of identifying a health related area of concern within their community that they would like to address. This was achieved through informal focus groups and discussions with the Youth Advisory Board. The members of the YAB identified alcohol use as their paramount concern. With an identified concern and community partnerships established, phase 2 began. Phase 2 consisted of IRB approved structured qualitative interviews to better understand the effects of alcohol use on the community and to identify any possible interventions that may already exist. The qualitative interviews were transcribed and analyzed using immersion crystallization methodology. Multiple medical student coders individually analyzed each interview transcript and multiple themes emerged. Phase 3 is currently underway, with the aim of presenting the findings to the community, and

generating a culturally appropriate intervention to address problematic alcohol use from the themes that were identified.

RESULTS: After Immersion Crystallization of the 10 interviews, several themes were generated. These themes include: problematic alcohol consumption spanning across all ages and ethnic groups, problematic alcohol use originating in the refugee camps, positive and negative influential roles of family and religion on consumptive practice, impact of problematic alcohol use on unemployment and violence, knowledge deficit on the negative impact of alcohol on physical health and wellness, and the lack of access to a culturally appropriate intervention.

CONCLUSIONS: This project expands upon current literature regarding the impact of alcohol use within the community of refugees from Burma. The themes generated will be leveraged to create a culturally competent intervention to effectively address alcohol use in this community.

Primary Presenter: Colton Leavitt

Project Title: Interferon Gamma-Induced Protein 10 (IP-10) and Cardiovascular Disease in African Americans

Primary Mentor: Leslie Lange

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Biomarkers of chronic inflammation (such as C-reactive protein) have long been associated with cardiovascular disease and mortality; however, biomarkers involved in antiviral cytokine induction and adaptive immune system activation remain largely unexamined. Objective: We hypothesized the cytokine interferon gamma inducible protein 10 (IP-10) would be associated with clinical and subclinical cardiovascular disease and all-cause mortality in African Americans. Approach: We assessed these associations in the Jackson Heart Study (JHS) cohort and the REasons for Geographic and Racial Differences in Stroke (REGARDS) study. Results: There was a modest association of IP-10 with higher odds of left ventricular hypertrophy (OR=1.14 (95% confidence interval (CI) 1.00, 1.29) per standard deviation (SD) higher IP-10 (105 pg/mL) in JHS). We did not observe associations with ankle brachial index, intima-media thickness, or arterial calcification. Each SD higher increment of IP-10 concentration was associated with incident heart failure (hazard ratio (HR) 1.12; 95% CI 1.02, 1.24, $p=0.02$) in JHS, and with overall mortality in both JHS (HR 1.07 per SD, 95% CI 1.01, 1.14, $p=0.02$) and REGARDS (HR 1.25 per SD, 95% CI 1.09, 1.43, $p=0.001$, SD=133 pg/mL), adjusting for cardiovascular risk factors and C-reactive protein. However, we found no association between IP-10 and stroke or coronary heart disease. Conclusion: These results suggest a role of IP-10 in heart failure and mortality risk independent of C-reactive protein. Further research is needed to investigate how the body's response to chronic viral infection may mediate heart failure and overall mortality risk in African Americans.

Primary Presenter: Mike Levy

Project Title: Resource Allocation: Training Cases from the SARS-CoV-2 Pandemic for Implementation of Crisis Standards of Care.

Primary Mentor: Barbara Statland

Secondary Mentor(s): Phil Fung

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Introduction: This collection of cases on resource allocation and reallocation was created with the intention of training teams of healthcare providers and community stakeholders in implementation of the Colorado Crisis Standards of Care. These cases were developed during the COVID-19 pandemic, at a time when the healthcare field was facing a potential for resource scarcity, and there was specifically a concern for ventilator shortage. While healthcare trainees receive training in ethical decision making, the ability to morally implement and apply hospital policies around issues such as resource allocation and reallocation is a critical yet absent component of training.

Methods: These cases were developed for training of resource allocation triage teams at two Colorado Hospitals. These cases were designed to assess team member knowledge and application of the resource allocation algorithm dictated by the Colorado Crisis Standards of Care (CSC) as they stood at the time of the case creation in April 2020. The cases utilize the tier system for determination of resource allocation, the re-allocation of a resource and the use of a score of the day for resource eligibility. At two Colorado hospitals, one county and one regional hospital designated triage teams were presented with cases prior to a group session and then were brought together to discuss decisions and address concerns and questions with a facilitator guiding the discussion.

Results: The training was completed by 43 total triage team members. A total of 8 participants completed the follow up survey for a total response of 18.6%. 5/8 found the cases were extremely (5/5) useful for identifying gaps or questions they had for implementation of the CSC for resource allocation, with the remaining survey responders ranking the cases 4/5 for usefulness. Only 3 of 8 responders had previous experience with resource allocation. Overall themes for beneficial impact of the cases were 1) understanding the tools and algorithms required for decision making, 2) identifying logistical hurdles and approaches to implementation, and 3) developing a team-based approach.

Discussion: While these cases were originally created for the training of triage teams during a potential impending shortage of resources for COVID-19 patients, this training can be adapted for use by healthcare trainees and/or hospital ethicists or in the event of another potential resource scarcity such as a disaster or pandemic. Experience not only in creating but also in implementing hospital ethical policy is a critical component in ethics training.

Primary Presenter: Andrew Levy

Project Title: Implementation of the WHO's Community-based First Aid Response (CFAR) in Southwestern Guatemala

Primary Mentor: Emilie Calvello Hynes

Secondary Mentor(s):

Thematic Area: Global Health

Abstract:

Initial stabilization and expedient transfer of acutely ill-patients is a critical first step in delivering emergency care, which is often an issue in lower-middle income class countries. The WHO 's Community First Aid Response (CFAR) program is a recently developed 3-day course designed to equip community members, who are often first to witness a medical emergency, with the skills and knowledge to mitigate commonly encountered emergent situations. This course was piloted in the rural Southwestern region of Guatemala, where a qualitative assessment was performed to evaluate for necessary context-appropriate changes, course content material, overall generalizability across language and cultural barriers, and major barriers to implementation. The most important finding revealed by surveys, post- implementation interviews, and focus groups emphasize the inherent complexity of augmenting pre-hospital systems in austere environments. To be considered as a widely- distributable and open access community-based education program, CFAR must address and continually suggest best-practice guidelines in its implementation, including but not limited to: a thorough assessment of local technologies and resources, pre-existing capabilities of the community, burden and location of disease, and the perspective, willingness, and capacity of the individuals involved in the course.

Primary Presenter: Daniel Levy

Project Title: Multimodal Swelling Management After Total Knee Arthroplasty: A Pilot Study with Cohort Comparison

Primary Mentor: Jennifer Stevens-Lapsley

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Purpose/Hypothesis: Swelling after total knee arthroplasty (TKA) is a major patient complaint and is associated with decreased muscle activation, strength, range of motion, and functional performance as well as increased pain and post-surgical complications such as deep venous thrombosis. However, to date, traditional physical therapy interventions such as cryotherapy have demonstrated minimal effectiveness in reducing swelling and its associated sequelae. The purpose of this pilot study was to determine the feasibility and initial efficacy of a multimodal swelling management (MSM) program for swelling after TKA.

Number of Subjects: 11

Materials/Methods: This was a prospective pilot study with historical cohort comparison. Eleven participants awaiting TKA for end-stage osteoarthritis (age 67 ± 6.4 years (mean \pm SD); 7 female) were consecutively enrolled and participated in MSM for 3 weeks after TKA. Patients were excluded if: 1) body mass index $> 40 \text{ kg/m}^2$ or 2) had a history of heart failure, lymphatic insufficiency, or any other condition associated with chronic lower extremity swelling. The MSM program consisted of use of a medical grade compression garment (Circaid® Juxtafit® Essentials) for 12 hours daily, self-administered manual lymph drainage massage once daily, and lower extremity active range of motion exercises performed 5 times daily to encourage venous and lymphatic return. Primary outcomes were patient satisfaction, adherence, and bioelectrical impedance, a valid and reliable measurement of swelling. All primary outcomes were assessed preoperatively and at 1, 2, 3, and 6 weeks postoperatively. Secondary outcomes included quadriceps strength and activation at 6 weeks. Data were compared to an historical control group ($n = 56$) with identical inclusion and exclusion criteria (CONTROL). Preliminary effect sizes were obtained by calculating Cohen's d statistic.

Results: 100% of MSM participants were satisfied with the intervention. Adherence for the compression garment, manual lymph drainage massage and exercises was 82%, 100%, and 100% respectively. MSM showed a large reduction in swelling compared to CONTROL at 1, 2, and 6 weeks with effect sizes of -1.41, -1.30 and -0.83 respectively. Using published CONTROL swelling estimates (50th percentile), MSM demonstrated 59.5% less swelling than CONTROL at 3 weeks. At 6 weeks MSM attenuated postoperative quadriceps strength loss to a greater degree compared to CONTROL (effect size of 0.49). MSM also led to an increase in quadriceps activation compared to CONTROL (effect size 0.46).

Conclusions: Use of the MSM program was feasible for treating swelling after TKA and led to large improvements in postoperative swelling and moderate improvements in quadriceps strength and activation. Larger randomized controlled trials are needed to determine efficacy of the MSM program.

Clinical Relevance: The MSM program is the first conservative intervention to demonstrate initial success in controlling postoperative swelling after TKA.

Primary Presenter: Carley Little

Project Title: DEFINING LGBTQIA+ INCLUSIVITY IN THE COLORADO HEALTHCARE SETTING

Primary Mentor: Rita Lee

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Despite national improvements in LGBTQIA+ inclusivity, local governmental policy and public attitudes continue to influence the health of this community. This study emphasizes perspectives among rural and non-urban LGBTQIA+ patients to further define attributes of inclusive healthcare provision through a thematic, qualitative approach. Participants (n=28) joined semi-structured focus groups in Denver, Ft. Collins, Colorado Springs, and Grand Junction. They were more likely to identify as white (78.6%) and transgender or gender diverse (71.4%), and a majority of patients (85.7%) lived in rural or non-urban regions outside of the Denver metropolitan area. Focus group themes were identified, such as inclusive language use, comfort with sexual history taking and exams, advanced communication skills, cohesion among all team members, LGBT training credentials, provider connection to community, ability to provide specialized and preventive care, importance of LGBTQIA+ symbolism, and value for the individual. Specific examples of each were provided in detail, including notable direct quotations. This study describes a more inclusive healthcare environment for those traditionally under-represented in LGBTQIA+ medical literature; results were used to create a variety of publicly available resources for patients and healthcare providers in Colorado. Patients discussed tangible solutions to meet these identified needs, which should be a call to action for providers to continue to strive for more patient-centered care.

Primary Presenter: Tristan Loesberg

Project Title: Efficacy of Wallet Cards and Letters in Sharing Difficult Airway Information to Patients and Providers

Primary Mentor: Steven Zeichner

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Unexpected airway difficulty continues to be a potential cause for significant morbidity and mortality for patients who receive procedures in the United States. Anesthetists and anesthesiologists are faced with this issue on a regular basis; the estimated prevalence of patients who have difficult airways varies from 0.1% to 10.1% depending on how difficult airway is defined (Rose DK, Cohen MM. 1996). Although many difficult airways can be identified using careful examination, unexpected difficulties still arise. Therefore, it is crucial for difficult airway knowledge to be shared among healthcare providers.

Our study will look at whether providing wallet cards containing the difficult airway information to patients improves the dissemination of difficult airway knowledge. A survey was administered to 172 patients whose University of Colorado Hospital (UCH) record indicates both presence of difficult airway and receipt of a wallet card and difficult airway letter. The survey asks patients several questions including 1) Their current understanding of their difficult airway 2) Their use of the wallet card and 3) whether they were enrolled in MedicAlert difficult airway registry. 60 patients responded, of which 45 (75%) recall receiving a wallet card in the mail. 41 patients who received a wallet card feel that they understand the information on it (91.1%) and 34 (75.5%) report carrying the wallet card with them. 27 (45%) of respondents had discussed their airway information with their primary care provider (PCP), of which 16 (59.3%) had shared their wallet card with their PCP. Only 2 (3.3%) of patients were registered for the MedicAlert difficult airway registry.

There is a large percentage of patients who remain unaware of their difficult airway status, and this poses a risk for similar complications arising during subsequent airway procedures. We should emphasize the importance of sharing this information with their providers and encourage patients to participate in the MedicAlert registry.

Primary Presenter: Amrita Mahajan

Project Title: Seasonal Trends in Operative Pediatric Supracondylar and Femur Fractures at a Pediatric Level 1 Trauma Center

Primary Mentor: Julia Sanders

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: Supracondylar humerus and femoral shaft fractures are two common injuries managed by pediatric trauma centers. While anecdotally we see an increase in many injuries with warmer weather, no studies in the United States have evaluated this subjective trend. The purpose of this study was to describe the seasonal variation in the incidence of operative pediatric supracondylar humerus and femur fractures, and the relative burden of these injuries on hospital census.

Methods: We performed an IRB-approved, retrospective review of 1626 supracondylar humerus and 607 femur fractures treated operatively between 2012 and 2018 at a single level 1 pediatric trauma center. Dates of injury were identified as weekday versus weekend, and temperature and precipitation data was obtained through the National Weather Service.

Results: Together, supracondylar humerus and femur fractures account for between 6% and 25% of orthopedic admissions. For every 10 degree (F) increase in temperature, there was a 10% increased likelihood of femur fracture and a 25% increased likelihood of supracondylar humerus fracture ($p=0.03$ and $p<0.0001$ respectively). Femur fractures were less likely to occur on weekdays compared to weekends (OR 0.65, $p=0.0001$) and less likely to occur on days with precipitation (OR 0.39, $p=0.03$), while supracondylar humerus fractures demonstrated no significant weekly or precipitation-related trends.

Conclusions: As often anecdotally reported, supracondylar humerus fracture volumes mirror temperature variations annually. Femur fractures appear to have more complex trends, with higher volumes on weekends regardless of season. Geographic variation in temperature, precipitation and proximity to seasonal activities such as snow skiing may contribute to injury volumes.

Level of Evidence: Retrospective case series, Level IV

Primary Presenter: Catherine Mann

Project Title: Patient Companion Program: A Curriculum to Promote Patient Advocacy and Education in the Geriatric Population

Primary Mentor: Janna Hardland

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Purpose/Aim: The Patient Companion Project was created to provide meaningful volunteer opportunities to undergraduate pre-health volunteers while benefiting patients living in a long-term care setting. This curriculum emphasizes education about pertinent geriatric topics, including elder abuse, health literacy, advanced care planning, palliative care, barriers to healthcare, patient advocacy, motivational interviewing, evidence-based medicine, isolation and its effects on the geriatric population, medical aid in dying, depression, PTSD, dementia, movement disorders, pain management, behavioral changes, Medicare/ Medicaid and HIPPA education, while providing companionship to long term care patients in the hopes of improving health outcomes.

Background: Volunteer and clinical experiences are important for admission of students to health professional programs yet combining these experiences can be difficult with busy class schedules and/or part-time employment. Additionally, geriatric patients often face challenges in health care with reduced access to resources, limited health care literacy, language barriers, and lack of social support. These patients are at increased risk of isolation, mood disorders and experience a large burden of illness and healthcare utilization. Pairing these groups offers an opportunity to benefit both the undergraduate volunteers as well as the paired geriatric patients.

Methods: We recruited the pre-health students from the University of Colorado at Denver and University of Colorado at Boulder by presenting at their institutions via their pre-med programs as utilizing pre-professional emails. We coordinated with the Colorado State Veteran 's Home Recreational Coordinator to pair our pre-health students with isolated veterans without severe cognitive disease for a period of 2 years. These undergraduate volunteers will meet with their assigned veteran twice every month. As a group, we meet every month for 1-2 hours for one of our educational lectures, journal club, book discussion, and to touch base with the undergraduate volunteers about their experience. The undergraduate volunteers document all their visits on an after-visit survey in order to monitor their experience, as well as fill out surveys monitoring their confidence about the curriculum 's learning objectives. We have also created quality of life surveys that can be implemented in the future of this project, in hopes to gather data before our volunteers are paired with their patient, at the one year mark and after 2 years of being paired with their patient. We will also provide surveys to the current and prior pre-health volunteers at the end of their dedicated 2 years regarding what significance the Patient Companion Project had on their life and their consideration of the medical field as a career field.

Summary of Progress: Our preliminary survey results show improvement in confidence in knowledge based, value based, and skill-based learning objectives after 6 months of the established educational curriculum.

Our future goal for this curriculum is to create a simple, straightforward guideline that can be easily replicated by others. Once the COVID-19 pandemic wanes and the nursing home community is safe again, we will ask our volunteers to return to their in-person visits with the option to continue letter writing as well. We will also try set up shadowing opportunities for them in specialties of interest once facilities allow the return of pre-med students. Our monthly lectures will continue in the zoom format for both the guest lecturers ' and our students ' convenience, unless we are implementing a hands-on workshop, since that has greatly reduced scheduling conflicts. Our hope is that other interested programs will be able to adopt our curriculum and implement it at their home programs.

Primary Presenter: Rachel Martin

Project Title: Perinatal Mental Health: Impact of the Mother-Infant Therapy Group (M-ITG) on Mental Health and Parenting Stress for Female Participants and their Partners

Primary Mentor: Celeste St. John-Larkin

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

As perinatal mental health is evolving as an increasingly recognized major public health issue, this study aims to address holistic ways to approach postpartum mood disorders and parenting stress for women and their partners. This is a retrospective analysis of self-reported data that was collected over the course of 5 years from 80 women enrolled in a 12-week program for mothers suffering from postpartum mood and anxiety symptoms. Self-reported data from study participants' male partners was also utilized to assess impact of M-ITG Program on partner mental health. The specific program from which data was collected is the Healthy Expectations Mother-Infant Therapy Group (M-ITG) run through Children's Hospital Colorado. Pre/post M-ITG Program symptoms of depression were assessed using the Center for Epidemiologic Studies Depression (CES-D) scale for mothers and Gotland Male Depression Scale (GMDS) for partners, and parent-child relationship stress was assessed using the Parenting Stress Index-Short Form scores (for both mothers and partners). Pre and post M-ITG Program scores were compared for mothers, partners, and between mothers and partners.

Results showed that women had a statistically significant improvement in both symptoms of depression as assessed by CES-D scores, as well as in total parenting stress as assessed by PSI-SF scores; however, when these scales were examined categorically as opposed to continuously, it was found that there was no significant change in clinical vs. non-clinical depression score range in women post-MITG (based on the CES-D cut-off score of clinical significance). Categorical analysis of parenting stress in women did show an improvement in PSI scores for women from the clinical range to the non-clinical range (also assessed based on a cut-off score for clinical significance for the PSI) post-MITG.

Male partners similarly did show a statistically significant improvement in symptoms of depression as assessed by a reduction in GMDS scores, though there was no significant change in clinical vs. non-clinical range depression scores (based on the GMDS cut-off score of clinical significance). Men showed no statistically significant improvement in total stress as assessed by PSI-SF scores, nor by categorical changes in clinical vs. non-clinical range scores in total parenting stress.

Future studies indicated involve utilizing greater sample size for better generalizability, as well as including a • control • group of men and women who are not participants in the M-ITG Program.

Primary Presenter: Desirae Martinez

Project Title: FirstUp: A Mentorship Program for First-Generation Students at the University of Colorado School of Medicine

Primary Mentor: Regina Richards

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Background: First-generation medical students experience difficulty transitioning to and succeeding in medical school. While mentorship is a key factor for achieving success in medicine, few mentorship programs target the specific needs of first-generation medical students.

Purpose: This study aimed to understand perceptions of first-generation medical students and identify how mentorship can best support their needs.

Methods: First-year first-generation medical students participating in a mentorship program at the University of Colorado School of Medicine provided quantitative feedback on perceptions related to their first-generation status, areas of need within mentoring, the quality of their mentor-mentee relationships, and the effectiveness of the mentorship program using a Likert-scale questionnaire (n = 17). Quantitative analysis was performed using descriptive statistics.

Results: Mentees' perceptions of personal well-being are most positive, while perceptions of professional identity and family are most negative. Mentees need most help with residency applications, career planning, professional networking, scholarships, and clinical rotations. Eighty-eight percent of mentees are satisfied with their mentor-mentee relationships. One hundred percent of mentees think the mentorship program is effective in supporting their needs.

Conclusion: Mentorship is an effective method for supporting first-generation medical students. A mentorship program that integrates mentees' family support systems into their medical student experience may help bridge their personal and professional identities.

Primary Presenter: Matthew Masur

Project Title: QUALITY IMPROVEMENT OF DATA COLLECTION AND UTILIZATION OF HEALTH INFORMATION FROM DHULIKHEL HOSPITAL OUTREACH CENTERS

Primary Mentor: Geoff Fauchet

Secondary Mentor(s):

Thematic Area: Global Health

Abstract:

The Dhulikhel Hospital in Nepal has established 16 outreach centers in nine districts to serve communities that do not have access to healthcare facilities. However, there was no method for tracking the changes in health status and therefore no efficient means of creating interventions that target specific needs of the community. The objective of this project was to develop a questionnaire with which the providers serving the outreach centers could collect data on the health status of their patients. Content of the questionnaire was informed by interviews with two pediatric outpatient providers, documented pediatric diagnoses between January-June 2018, and a literature review. Target population was 6-16 year-old students. Evaluation of pediatric diagnostic data revealed that a majority of concerns involved pulmonary and gastrointestinal systems. Pneumonia and other pulmonary conditions comprised 28.5% of diagnoses, and gastrointestinal concerns such as dysentery was 25.7%. Components of the questionnaire included personal and family health history, nutrition, and hygiene, and review of systems that emphasize commonly affected organ systems.

Primary Presenter: Kyle McDaniel

Project Title: "A tale of two substances": An observational study of opioid use among cannabis-related emergency room visits in Colorado

Primary Mentor: Andrew Monte

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Background: Despite legalization of medical and recreational cannabis in Colorado over the past decade, the exact effects on public health remain unknown, partially due to federal restrictions on research involving marijuana. This study aims to look at differences in emergency room visits between those that are also associated with opioid use and those that are not.

Methods: This study was an analysis of retrospective chart review done of all visits to the UCH ED between 2012 to 2016 that contained pre-determined cannabis-related ICD-9/10-CM codes. Demographic data, various visit metrics, and substance exposures, including opioid use per urine toxicology or patient narrative, were abstracted and analyzed using Exploratory.io.

Results: Of the study population, 9.6% of visits were also associated with opioid use (OU+). These patients were more likely to be white men than all-comers to the ED ($p < 0.0001$), and were significantly more likely to be admitted (71.4%) than all-comers (15.1%) or the study population (47.6%, $p < 0.0001$).

Conclusion: There are unique demographic characteristics and increased hospital admission risks for those who co-use cannabis and opioids. The exact mechanism or cause behind this association requires further research and exploration.

Primary Presenter: Laura McWhirter

Project Title: Rates of appropriate treatment and laboratory follow-up of gonorrhea and chlamydia infections in an urban safety-net system

Primary Mentor: Holly Frost

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: Partner transmission and reinfection are common with *Neisseria gonorrhea* (GC) or *Chlamydia trachomatis* (CT). Little is known about how often patients with GC/CT receive guideline-concordant treatment and follow-up labs or which factors influence rates of treatment and follow-up.

Objective: To assess rates of guideline-concordant care for GC and CT and evaluate patient and system-level factors related to these rates.

Methods: Retrospective electronic health record data from 2018-2019 for patients aged 14-24 with a positive GC/CT nucleic acid amplification test (NAAT) from at Denver Health (DH), Denver, CO were analyzed. Guideline-concordant care following a positive GC/CT NAAT was defined as receiving Centers for Disease Control and Prevention (CDC)-recommended antibiotic treatment within 14 days, HIV and syphilis testing within 6 months, and repeat GC/CT NAAT within 6 months of a positive test. Bivariate and multivariable regression modeling were used to assess the association of thirteen different factors with guideline-concordant care.

Results: There were 27,168 GC/CT NAATs performed during the study period, which identified 484 GC infections (1.8% positivity rate) and 2125 CT infections (7.8% positivity rate). In total, 37.6% (182/484) of patients with GC and 34.9% (741/2125) of patients with CT received all four elements of guideline-concordant care (Table 3). Patients with documented condom use (aOR 1.4 (1.1, 1.9), $p=0.01$) or those seen in pediatric clinics (aOR 1.5 (1.1, 2.2), $p=0.02$) were more likely to receive guideline-concordant treatment than other patients. Patients with a history of anxiety were less likely to receive guideline concordant treatment (aOR 0.64 (0.4, 1.0); $p=0.04$). Patients who had CT (aOR 0.8 (0.7, 1.0), $p=0.04$), were older, (aOR 0.9 (0.9, 1.0), $p<0.001$) and were male (aOR 0.3 (0.2, 0.4), $p<0.001$) were less likely to have GC/CT retesting; whereas, patients with documented condom use were more likely to have GC/CT retesting (aOR 1.5 (1.3, 1.8), $p<0.001$).

Conclusion: The findings of this study confirm suboptimal rates of guideline-concordant management after diagnosis with GC or CT infection. These results highlight a critical need for further improvements in the management of these infections in order to decrease complications, reduce transmission, and combat the growing STI epidemic.

Primary Presenter: Dallin Milner

Project Title: Pancreatic Tumor Microenvironment Modulation by EphB4-ephrinB2 inhibition and Radiation Combination

Primary Mentor: Sana Karam

Secondary Mentor(s):

Thematic Area: Basic Biomedical Science

Abstract:

Purpose: A driving factor in pancreatic ductal adenocarcinoma (PDAC) treatment resistance is the tumor microenvironment, which is highly immunosuppressive. One potent immunologic adjuvant is radiotherapy. Radiation, however, has also been shown to induce immunosuppressive factors, which can contribute to tumor progression and formation of fibrotic tumor stroma. To capitalize on the immunogenic effects of radiation and obtain a durable tumor response, radiation must be rationally combined with targeted therapies to mitigate the influx of immunosuppressive cells and fibrosis. One such target is ephrinB2, which is overexpressed in PDAC and correlates negatively with prognosis.

Experimental Design: On the basis of previous studies of ephrinB2 ligand-EphB4 receptor signaling, we hypothesized that inhibition of ephrinB2-EphB4 combined with radiation can regulate the microenvironment response postradiation, leading to increased tumor control in PDAC. This hypothesis was explored using both cell lines and in vivo human and mouse tumor models.

Results: Our data show this treatment regimen significantly reduces regulatory T-cell, macrophage, and neutrophil infiltration and stromal fibrosis, enhances effector T-cell activation, and decreases tumor growth. Furthermore, our data show that depletion of regulatory T cells in combination with radiation reduces tumor growth and fibrosis.

Conclusions: These are the first findings to suggest that in PDAC, ephrinB2-EphB4 interaction has a profibrotic, protumorigenic role, presenting a novel and promising therapeutic target.

Primary Presenter: Filiberto Morales

Project Title: Public Charge: Insulating the “Chilling Effect” •

Primary Mentor: Maria Gonzalez Albuxiech

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

As of February 2020, the Trump administration was allowed by the US Supreme Court to implement a new rule with regard to public charge regulations. Briefly, the new public charge regulations would establish participation in public programs, health status, and income as negative factors in determining if legal immigrants are able to successfully obtain legal permanent residency. The negative impact of changes to public charge were observed in both the literature and firsthand through health advocacy work. Immigration advocates, as well as critics of the changes to public charge, had long believed that the new regulation would cause immigrants and their families to be less likely to use vital resources they need. Furthermore, the regulation induced a “chilling effect” • defined as causing immigrant communities as a whole (even if not affected by the regulation) to not participate in public programs or obtain medical care. The specific aim of this project was to:

1) mitigate the “chilling effect” • (unaffected people disenrolling from programs, people disenrolling from unaffected programs, or not enrolling in the first place) by first identifying key themes contributing to the chilling effect and subsequent propagation of misinformation through qualitative interviews with key stakeholders.

2) provide accurate and easily accessible information on public charge (and various versions of the rule) to the largest health and immigration advocacy groups in Massachusetts through creation of a constantly updated multilingual electronic flyer. This two-pronged approach was created with the intent to identify local concerns with public charge and through a health advocacy approach provide a solution to identified problems by addressing misinformation.

Primary Presenter: Graciela Mujica

Project Title: Defusing COVID-19: Lessons Learned from a Century of Pandemics

Primary Mentor: Carlos Franco-Paredes

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Amidst the COVID-19 global pandemic of 2020, identifying and applying lessons learned from previous influenza and coronavirus pandemics may offer important insight into its interruption. Herein, we conducted a review of the literature of the influenza pandemics of the 20th century; and of the coronavirus and influenza pandemics of the 21st century. Influenza and coronavirus pandemics are zoonoses that spread rapidly in consistent seasonal patterns during an initial wave of infection and subsequent waves of spread. For all of their differences in the state of available medical technologies, global population changes, and social and geopolitical factors surrounding each pandemic, there are remarkable similarities among them. While vaccination of high-risk groups is advocated as an instrumental mode of interrupting pandemics, non-pharmacological interventions including avoidance of mass gatherings, school closings, case isolation, contact tracing, and the implementation of infection prevention strategies in healthcare settings represent the cornerstone to halting transmission. In conjunction with lessons learned from previous pandemics, the public health response to the COVID-19 pandemic constitutes the basis for delineating best practices to confront future pandemics.

Primary Presenter: Sara Muramoto

Project Title: A Research Journey with a Hospital-based violence intervention program (HVIP)

Primary Mentor: Katie Bakes

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Hospital-based violence intervention programs (HVIPs) have demonstrated reduced violence recidivism, but specific components for successful programs are not well defined[i],[ii]. At-risk Intervention and Mentoring (AIM), takes advantage of the teachable moment in the emergency department. This paper will follow AIM 's research journey which used a semi-structured interview, validated in the criminal justice system, to predict future violence for patients presenting to the emergency department and has now matured to focus on more client-centered outcomes. Over the past 4 years, the field has evolved to emphasize more qualitative outcome measures for patients, encompassing the unique experience of each patient.

Primary Presenter: Richard Nakano

Project Title: Four for the Price of One: Achieving Competencies of Multiple Clerkships with Rural Family Physicians

Primary Mentor: Roberto Silva

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Introduction: Longitudinal Integrated Clerkships (LICs) allow medical students to participate in comprehensive care of patients over time and meet core clinical competencies over several disciplines concurrently. Most urban LICs have large pools of preceptors that include many subspecialists. In rural communities, family physicians often provide primary care as well as emergency, inpatient, and obstetric care. We will examine how requirements of multiple core clerkships can be met with a small group of rural preceptors led by family physicians. Methods: We will examine a pilot program that combined five traditional clerkships (primary care, ob-gyn, surgery, inpatient medicine, and emergency care) into LICs in rural communities. Students logged all patient experiences including patient age, complaints and diagnoses, level of student involvement, clinical setting, and preceptor. Students also logged involvement in procedures and surgeries. We examine how learning objectives of clerkships traditionally led by sub-specialists can be met with rural preceptors. Results: Medical students were able to meet the majority of required core competencies while working with family physician preceptors. On average, students met greater than 97% of competencies on average across all 5 traditional clerkship blocks included in the LIC. Discussion: Our findings support the case that a large number of sub-specialist preceptors is not required to teach the core competencies of the clerkship year. This research lays an important foundation for further research to explore the possibility of rural LICs as a method to increase rural practice and address rural health shortages in Colorado.

Primary Presenter: Alexander Nguyen

Project Title: Metformin Improves Ventricle Size and Function in Adolescents with Type 1 Diabetes; Echocardiographic findings from the Effects of Metformin on Cardiovascular Function in Adolescents with Type 1 Diabetes (EMERALD) Study

Primary Mentor: Kristen Nadeau

Secondary Mentor(s): Uyen Truong

Thematic Area: Clinical Science

Abstract:

Background: People with type 1 diabetes (T1D) have higher rates of cardiovascular disease (CVD) despite modern advances in glucose control. Insulin resistance (IR) is known to relate to cardiovascular disease (CVD) in T1D though its relationship is inadequately understood. We previously demonstrated vascular and cardiac dysfunction in T1D adolescents, and that metformin improves BMI, body composition, insulin sensitivity, arterial stiffness, and carotid intimal media thickness. We hypothesized that metformin would improve cardiac function in T1D adolescents assessed by echocardiogram.

Methods: 48 T1D youths (mean age 16.8 ± 2.5 years, HbA1c $8.6 \pm 1.5\%$, BMI 25.1 ± 4.3 kg/m², diabetes duration 7.7 ± 4.2 years) were randomized to 3 months of 2000 mg of metformin daily or placebo. 43 participants had echocardiograms available at baseline and 3 months to evaluate traditional echocardiographic measures, cardiac strain, and intraventricular dyssynchrony. One-way ANOVA and paired t-tests analyzed within and between group differences.

Results: LV diameter at end-diastole (4.45 ± 0.47 vs. 4.26 ± 0.50 cm, $p = 0.019$) and end-systole (2.89 ± 0.39 vs. 2.69 ± 0.36 cm, $p = 0.022$) and LV dyssynchrony (98.0 ± 36.9 vs. 81.7 ± 27.5 milliseconds, $p = 0.014$) improved only within the metformin group. Aortic root diameter (2.51 ± 0.39 vs. 2.73 ± 0.28 cm, $p = 0.042$) was also significantly lower in the metformin vs. placebo group post-treatment.

Conclusions: Metformin may benefit with improving or reversing early cardiovascular changes in T1D. A better understanding of T1D-related CVD and the longer-term impacts of improving insulin action in T1D warrant further investigation as potential treatment targets.

Primary Presenter: Tiffany Nguyen

Project Title: Targeted therapy for pediatric low-grade gliomas and plexiform neurofibromas with trametinib

Primary Mentor: Kathleen Dorris

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Introduction: Activation of the mitogen activated protein kinase (MAPK) pathway through the BRAF oncogene and/or loss of the tumor suppressor neurofibromin 1 has been found to contribute to the pathogenesis and tumorigenesis of pediatric low-grade gliomas (LGG). Similarly, loss of neurofibromin is associated with the formation of neurofibromatosis type 1-associated plexiform neurofibromas (PN). Therefore, targeted therapy inhibiting the MAPK pathway with the mitogen-activated protein kinase kinase (MEK) inhibitor trametinib can augment traditional chemotherapy, radiotherapy, and surgical resection practices.

Methods: A retrospective chart review was conducted using the electronic medical records at Children's Hospital Colorado (CHCO) to identify pediatric patients (age 1-18 years old) with low grade gliomas (LGG) and/or plexiform neurofibromas (PN) who were treated with trametinib from 2015 to 2020. Data collected included patient demographics, location of the lesion, tumor molecular changes, NF1 status, best response to trametinib, duration of trametinib therapy, reason to discontinue trametinib therapy, and toxicities possibly attributed to trametinib therapy.

Results: Thirty patients (60% male) were identified. Thirteen (43%) had LGG only, fifteen (50%) had PN only, and two (7%) had both LGG and PN. The most common LGG location was the optic pathway/hypothalamus (67%), followed by the thalamus/brainstem (13%), spine (13%), or multifocal sites (7%). The most common PN location was the face (47.2%), followed by the neck (17.6%), trunk (17.6%), or multiple sites (17.6%). Of the fifteen patients with LGG, eight (53.3%) had mutations in BRAF or NF1. The median duration of trametinib therapy was 2 years (range 0.7 to 3.6 years). The most common toxicities included diarrhea, paronychia, and rash. No cardiac or ophthalmologic toxicity were reported in any of the patients. Of the patients with LGG, eight (53%) had stable disease (SD) and seven (47%) had partial responses (PR) to trametinib. Of the patients with PN, eleven (65%) had stable disease (SD) and six (35%) had partial responses to trametinib. Thirteen (43%) discontinued trametinib due to completion of planned treatment duration, eleven (37%) were still on therapy at the time of data censor, three (10%) discontinued due to toxicity, two (7%) discontinued due to progression of disease, and one (3%) was lost to follow-up.

Conclusions: Although this retrospective study cannot fully characterize clinical efficacy, the majority of patients with LGG or PN demonstrated at least stable disease, if not partial responses, with trametinib treatment. Additionally, very minimal short-term toxicities were reported, and, notably, no cardiac or retinal toxicities were found.

Primary Presenter: Christian Nicolosi

Project Title: Patients with Lung Transplantation in Acute Inpatient Rehabilitation - A Descriptive Study

Primary Mentor: William Niehaus

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Objective: Our objective was to describe functional outcomes, discharge trends, and common comorbidities in subjects who have had lung transplantation, and were subsequently admitted to an acute inpatient rehabilitation facility (IRF)

Methods: A retrospective chart review was performed on 21 subjects who received a lung transplantation from January 2003 - July 2018 and were admitted to IRF. Change in Functional Independence Measure (FIM), discharge dispositions, demographics, comorbidities, and acute hospitalization factors were assessed.

Results: Subjects had a median age of 56 years old. 52% received their transplant due to interstitial lung disease. Median acute hospitalization was 26 days with a median of 6 days of ventilator support post transplantation. In the IRF, median length of stay was 10 days and length of stay efficiency was 3.1. Median admission FIM scores were 72 with change in total of 34 ($p < 0.0001$). Motor FIM scores showed a median improvement of 45 ($p < 0.0001$), while cognitive FIM scores improved a median of 3 ($p < 0.0001$). 95% of subjects were discharged to a community setting ($n=20$).

Conclusions: Our study suggests that a subset of patients who have had lung transplants could be good candidates for acute IRF demonstrating good motor improvement in a reasonable amount of time with frequent discharge to the community setting.

Primary Presenter: Josten Overall

Project Title: Middle School to Medical School (M2M): An outreach program developed and implemented on the Anschutz Medical Campus encouraging underrepresented in medicine (URM) middle school students to pursue careers in medicine

Primary Mentor: Deb Seymour

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Background/Problem statement: Despite Affirmative Action Health Care Policy efforts, the diversity of the U.S. population is not reflected in the composition of the student body, medical school faculty, or physician workforce. Minority groups make up 30% of the U.S. population, but only 13% of medical students, 6% of physicians, and 3% of medical school faculty are members of an underrepresented minority groups.¹ Research studies demonstrate that increasing the number of URM medical students and practicing physicians, enhances learning outcomes, improves cultural competency, and helps eliminate healthcare disparities.^{2,3} Many of the existing medical school pipeline and mentoring programs are focused on high school and undergraduate students, while little research has been done on the impact of these programs on middle-school students.^{4,5}

Methods: In the summer of 2017, then-second year medical students Mario Hernandez and Josten Overall approached stakeholders at Skinner Middle School to propose a partnership in developing an outreach program at their school that would aim to increase URM student interest and self-efficacy in pursuing careers in medicine. Through shared-decision making, the students helped design a one-day curriculum for middle school students that incorporated the following elements: (1) hands-on activities, (2) teaching materials that were appropriate for the middle-school level, (3) storytelling, and (4) diverse representation amongst program leadership and student volunteers. The inaugural Middle School to Medical School (M2M) event took place in January 2018, during which pre- and post-evaluation surveys were used for program improvement. The second annual M2M occurred in February 2019 after which IRB exemption was obtained. Using quantitative (including 5-point Likert scales) evaluation methods, the program creators were able to assess the impact of the M2M program on participants' interest in medical careers and their sense of self-efficacy in achieving their medical career of interest. Participant feedback on various workshops, lessons learned, and overall takeaways from the program were also gathered through qualitative questions and analyzed using a manual coding and thematic analysis process. The results of the 2019 iteration of the program are summarized in this paper.

Results: There were a total of 18 students who participated in the February 2019 program, the majority (88%) of whom were from underrepresented minority backgrounds. After participating, the students expressed increased agreement with the statement that they are interested in becoming a medical doctor (3.3 pre vs. 3.6 post). The students also expressed significantly

greater interest in becoming health care providers other than doctors (3.1 pre vs. 3.4 post, $p<0.05$), and showed improved self-efficacy in possessing the knowledge needed to become a medical doctor (3.5 pre vs. 3.9 post, $p<0.05$). Overall, the majority of participants expressed enjoyment of the program with 77% stating that they would recommend the program to a friend.

Future Direction: The M2M outreach program was designed to spark interest in health professions for middle school students. The first two iterations of the program were held in 2018 and 2019 and were shown to be effective in increasing middle school students' interest and sense of self-efficacy in pursuing health care careers. In the midst of ongoing limitations created by the COVID-19 pandemic, the program leads are hoping to deliver a modified, virtual program in Spring 2021 and will gather pre- and post-evaluation data accounting for these curricular changes from prior iterations of the M2M Program. While data from the third iteration remains to be collected and evaluated, the efforts of this program and similar programs that engage URM youth within health professions are promising initiatives in increasing the number of URM individuals within health fields. Over time, programs that significantly increase diversity within medicine have the great potential to bridge the gap between racial and ethnic minorities and healthcare disparities.

Primary Presenter: Curtis Pacheco

Project Title: Adult Ambulatory Quality Improvement Project: Improving Compliance of American Diabetes Association Goals

Primary Mentor: John Beaman

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

The Adult Ambulatory Quality Improvement Project: Improving Compliance of American Diabetes Association Diabetic Goals aimed to assess the number of patients that were meeting American Diabetes Association Diabetic Goals to determine total number of goals met and apply methods to improve number of goals being met by patients at an ambulatory primary care clinic. Using the PDSA (Plan, Do, Study, Act) guidelines, we conducted a quality improvement project over 6 months in order to determine which diabetic goals were not being met and needed to be addressed. At follow-up visits, patients were encouraged to exercise regularly for 30 minutes per day, 3-5 days per week, as well as complete their yearly diabetic eye and foot exam. Handouts and posters outlining the importance of diabetes care to prevent ophthalmic, renal, and microvascular complications were provided to patients and posted to the walls of patient rooms. Of 21 diabetic patients, patients were meeting 5.7 out of the 9 diabetic goals measured. Over 50% of the patients were meeting each of the 9 measured goals. The goals that the highest number of patients were meeting were LDL goal <130 and non- smoking status at 95.2% and 85.7% respectively. The goal that the lowest number of patients were meeting was exercising, with only 52.3% of patients reporting exercising 3-5 times weekly. It is evident that physical activity is the ADA goal that needs the most attention at this clinic, as exercising 3-5 times weekly for at least 30 minutes would likely lead to weight loss, lower A1C values, improved blood pressure control, and improved lipid levels.

Primary Presenter: Madeline Paton

Project Title: An Evaluation of Safety and Patient Outcomes for Hand Surgery following Prior Breast Cancer Treatment: Establishing New Recommendations in Lymphedema

Primary Mentor: Matthew Iorio

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: Injuries to the upper extremity lymphatic system from cancer may require measures to prevent secondary lymphedema. Guidelines were established relating to the use of tourniquet and elective hand and upper extremity surgery. However, reports in the setting of hand surgery have indicated that prior guidelines may not be protective to the patient.

Methods: The study systematically reviewed the current literature evaluating elective hand surgery in breast cancer patients. We evaluated the risk of complications including new or worsening lymphedema and infection.

Results: 198 abstracts were identified, and a bibliographic review performed. Nine studies pertained to our subject, and four were included for final review. All studies included patients with prior breast cancer treatment involving breast surgery and axillary lymph node dissection. Pneumatic tourniquets were used during nearly all operations.

Patients without pre-surgery ipsilateral lymphedema have a 2.7% incidence of developing new lymphedema, and a 0.7% rate of post-operative infection. Patients with pre-surgery lymphedema have a 11.1% incidence of worsening lymphedema and 16.7% rate of infection. However, all cases of new or exacerbated lymphedema resolved within three months. Tourniquet use was not found to increase rates of lymphedema.

Conclusions: Based on the available evidence, there is no increased risk of complications for elective hand surgery in patients with prior breast cancer treatment. Breast cancer patients with pre-existing ipsilateral lymphedema carry slightly increased risk of post-operative infection and worsening lymphedema. It is our opinion and recommendation that elective hand surgery with a tourniquet is not a contradiction in patients with previous breast cancer treatments.

Primary Presenter: Regan Pelloquin

Project Title: Physical Function and Frailty Tools in Mortality Prediction of Middle-Aged Adults with HIV

Primary Mentor: Kristine Erlandson

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: Frailty and physical function impairments occur at an earlier than expected age in people with HIV (PWH). The goal of this study was to determine which tools or combination of tools assessing frailty/physical function were most predictive of mortality in a middle-aged population of PWH.

Methods: Using electronic health records, we determined survival, death, or loss to follow-up for 359 PWH, aged 45 "“65 years originally enrolled in a 2009 "“2010 cross-sectional cohort study. The predictive accuracy of various physical function measures [frailty score, Veterans Aging Cohort Study (VACS) index, 400-m walk, Short Physical Performance Battery (SPPB), grip strength, and falls] were compared using integrated time-dependent receiver operating characteristic area under the curve (AUC) in single variable models. Two-variable models were compared with the best single-variable model to determine if AUC improved with additional physical function variables.

Results: At 8-year follow-up, frailty, 400-m walk pace, SPPB, chair rise pace, VACS score, and falls were associated with increased hazard of mortality; grip strength was only predictive in sex-adjusted models. The VACS index and 400-m walk pace were the best individual predictors of mortality with time-dependent receiver operating characteristic AUC scores of 0.82, followed by SPPB (0.73), chair-rise pace (0.68), falls (0.65), frailty (0.63), and grip strength (0.55). Addition of the 400-m walk to VACS index yielded the only significant improvement in the prediction of survival compared with the VACS index alone ($P = 0.04$).

Primary Presenter: Katherine Pemberton

Project Title: The Med/Mid Writing Project: Medical students and middle school students document experiences of the COVID-19

Primary Mentor: Meghan Treitz

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Background: Globally, students have been affected by the COVID pandemic, and many have chosen to write about their experiences. At the University of Colorado, medical students joined with eighth grade students to document their experiences in The Med/Mid Writing Project. Over two weeks in May 2020, both groups of students wrote reflective pieces and shared in "open-mic" sessions via teleconferencing.

Objectives: To better understand the student perspective during a pandemic through reflective writing, and learn from interactions between two groups of students representing different generations.

Methods: Students were given a writing prompt each week. No formatting or content requirements were specified. All writers participated in virtual open-mic sessions, during which students volunteered to read pieces aloud and receive feedback. After the last session, students completed a survey and focus groups were conducted to elicit details of student experiences. A qualitative approach using iterative coding techniques was used to analyze student writings, focus groups, and survey comments. Survey data was analyzed using descriptive statistics.

Results: Seven medical students and five middle school students participated in the project. Themes common to the writings of both groups of students included: feeling enhanced external pressure to succeed and perform, friendship, family, hobbies, memories, and hope for the future. Representative comments from middle school students include: "I am self-conscious about my writing, but I improve my writing when sharing" and "Everyone was so supportive!". Representative comments from the medical students include: "They had just as much to bring to the table as the medical students" and "I was surprised at the emotional maturity the younger students showed." • The survey revealed that 80% of middle schoolers reported they agree or strongly agree that the project helped them gain confidence working with older students. 100% medical school students and 80% of the middle school students reported that they would participate in the project again.

Discussion: Despite differences in age and experience, both groups of students wrote about similar themes, feelings and archetypes. By working with one another to create, share and discuss reflective writing about the pandemic, students gained self-confidence, perspective and empathy. Both groups gained understanding of the other group, as well as themselves, through participation. Next steps include a writing group with medical school and middle school students

over a longer timeframe to evaluate changes in writing and development of near-peer relationships and mentoring.

Primary Presenter: Austin Peralta-Fogle

Project Title: Establishing the Limitations of Research regarding Obesity among Youth with Disabilities: a Narrative Literature Review

Primary Mentor: Jaime Moore

Secondary Mentor(s): Leana May

Thematic Area: Public Health and Epidemiology

Abstract:

Background: Over one-third of children and adolescents aged 2-19 are estimated to be overweight or obese. Increased rates of obesity are seen in the intellectual and/or developmental disability (I/DD) population, as well as in specific disorders such as Down Syndrome and Autism Spectrum Disorder. Within populations of syndromic obesity, such as Prader-Willi and Bardet-Biedl Syndrome, rates can range as high as 70% to 86%. Despite this, high quality data regarding weight reduction interventions in these groups is lacking.

Aim: Examine the literature to outline strengths and limitations of existing research

Method: Narrative review of published studies. The database PubMed was searched using terms related to "developmental disability, " "obesity management, " "pediatric," "obesity, " "Down syndrome, " "Autism Spectrum Disorder, " "Prader-Willi Syndrome, " "Bardet-Biedl Syndrome, " among youth and young adults (birth-24 years) between 2010-2020. Articles meeting inclusion criteria were summarized and evaluated.

Results: Five review articles and three individual clinical trials met inclusion criteria, and described weight management interventions ranging from multidisciplinary weight loss clinics, technology-delivered dietary sessions, to bariatric surgery outcomes. Studies varied by weight loss outcomes, and significant variance existed among the populations studied within each review.

Conclusions: This review reaffirms the scarcity of literature addressing the issue of obesity within the I/DD population. Additional, well powered, longitudinal and randomized studies are needed to better address obesity interventions in this underrepresented, heterogeneous population and to establish standardized clinical guidelines.

Primary Presenter: Adam Peszek

Project Title: Termination of persistent atrial fibrillation by ablating sites that control large atrial areas

Primary Mentor: William Sauer

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Aims: Persistent atrial fibrillation (AF) has been explained by multiple mechanisms which, while they conflict, all agree that more disorganized AF is more difficult to treat than organized AF. We hypothesized that persistent AF consists of interacting organized areas which may enlarge, shrink or coalesce, and that patients whose AF areas enlarge by ablation are more likely to respond to therapy.

Methods and results: We mapped vectorial propagation in persistent AF using wavefront fields (WFF), constructed from raw unipolar electrograms at 64-pole basket catheters, during ablation until termination (Group 1, N = 20 patients) or cardioversion (Group 2, N = 20 patients). Wavefront field mapping of patients (age 61.1 ± 13.2 years, left atrium 47.1 ± 6.9 mm) at baseline showed 4.6 ± 1.0 organized areas, each separated by disorganization. Ablation of sites that led to termination controlled larger organized area than competing sites ($44.1 \pm 11.1\%$ vs. $22.4 \pm 7.0\%$, $P < 0.001$). In Group 1, ablation progressively enlarged unablated areas (rising from $32.2 \pm 15.7\%$ to $44.1 \pm 11.1\%$ of mapped atrium, $P < 0.0001$). In Group 2, organized areas did not enlarge but contracted during ablation ($23.6 \pm 6.3\%$ to $15.2 \pm 5.6\%$, $P < 0.0001$).

Conclusion: Mapping wavefront vectors in persistent AF revealed competing organized areas. Ablation that progressively enlarged remaining areas was acutely successful, and sites where ablation terminated AF were surrounded by large organized areas. Patients in whom large organized areas did not emerge during ablation did not exhibit AF termination. Further studies should define how fibrillatory activity is organized within such areas and whether this approach can guide ablation.

Primary Presenter: Stefan Peterson

Project Title: 10 Clinically Relevant Herbals of Traditional Mexican Medicine

Primary Mentor: Monika Nuffer

Secondary Mentor(s):

Thematic Area: Global Health

Abstract:

Traditional Mexican Medicine is a historically significant piece of Mexican culture with herbal medicine and alternative practices very popular today. In 2012 in the United States, approximately \$12.8 billion was spent on integrative health and medicine with as much as 33% of the general adult population utilizing these remedies. Most concerning is that 72% of the Mexican American group is not reporting complementary and alternative therapy usage to their health care provider. In support of patient-centered care and as recommended by the National Center for Complementary and Integrative Health(NCCIH), this article seeks to understand the cultural significance of herbal medicines in this population and review 10 common herbals that are used especially within the Mexican and Mexican American population. The guide shares herbals that may be safe and effective as well as others that are unsafe or ineffective, such that these herbals may alter recommendations in patient care. To identify the herbals, multiple interviews were completed in Mexico City and Denver with a variety of health care providers. This included an evaluation of availability of the products. To further investigate the information, a literature review and review of multiple herbal databases both in English and Spanish was completed. The herbals presented are: Toloache (*Datura Stramonium*), Arnica (*Heterotheca Inuloides*), Hierbabuena (*Mentha piperita*), Manzanilla (*Matricaria recutita*), Sabila (*Aloe Vera*), Anis Estrella (*Illicium Verum*), Passiflora (*Passiflora Mexicana*), Valeriana (*Valeriana Edulsis*), Gordolobo (*Verbascum Densiflorum*), and Tila (*Tilia americana*). For additional historical context, visits to the Mexico City Museum of Medicine were completed which houses an Aztec herbal medicine manuscript from 1552. The primary beneficiary of this information is intended for improved future patient interactions among this population.

Primary Presenter: Haylie Petrick

Project Title: Comparison of maternity care outcomes among rural Colorado hospitals using birth certificate data

Primary Mentor: Mark Deutchman

Secondary Mentor(s): Bethany Kwan

Thematic Area: Public Health and Epidemiology

Abstract:

Purpose: The purpose of this study was to determine whether there was a difference among maternity care outcomes between urban, rural, and frontier facilities, if there were differences in maternity care outcomes among the rural/frontier facilities, and if there were population, facility, or differences in clinical care interventions that could account for these differences among the rural/frontier hospitals.

Methods: Colorado Birth Certificate Data from 2016-2018 was used to compare average percentage of adverse maternity care outcomes at urban, rural, and frontier facilities. A heat map of outcomes at rural and frontier facilities was used to identify high and low performing quartiles of facilities. Facility, population, and clinical care intervention differences were then compared between the high and low performing rural facilities.

Findings: Rural facilities in Colorado reported worse adverse maternity care outcomes compared to urban facilities. Variation in adverse maternity care outcomes among the rural facilities also existed. Providers at low performing rural hospitals on average augmented less labors, used vaginal forceps more, and had more clinical chorioamnionitis, unplanned hysterectomies, admissions of the mother to the intensive care unit, meconium aspiration, and hypoglycemia in the infant than the high performing rural hospitals. Mothers who delivered babies at the low performing rural hospitals tended to live at higher elevations, were more often to identify as non-white race, reported consuming more alcohol during the 2nd and 3rd trimesters, and were more often diagnosed with eclampsia and/or hemolysis, elevated liver enzymes, low platelet count (HELLP) Syndrome than mothers at the high performing rural hospitals.

Conclusions: This hypothesis generating study suggests there are worse maternity care outcomes at rural facilities compared to urban facilities in Colorado and some rural Colorado hospitals may perform better than others. However, due to numerous limitations this cannot be definitively concluded without additional research.

Primary Presenter: Andrew Pham

Project Title: JAK inhibition for treatment of psoriatic arthritis in Down syndrome

Primary Mentor: Joaquin Espinosa

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

People with Down syndrome (DS), the condition caused by trisomy 21 (T21), present with increased prevalence of several autoimmune conditions relative to the general population. This includes celiac disease, autoimmune skin conditions, and arthropathies. While it is now well established that T21 causes hyperactivation of interferon and downstream Janus kinase (JAK) signaling, the therapeutic value of this observation remains to be defined. Here, we describe the first reported case of an individual with DS who was treated with the JAK inhibitor tofacitinib as a first-line therapy for severely debilitating psoriatic arthritis (PsA). This resulted in near complete resolution of the patient 's clinical symptoms, psoriasis, and normalization of inflammatory markers.

Primary Presenter: Agnes Pham

Project Title: Activated Platelet Transfusions Decrease Count Increment and Time to Next Transfusion for Hematology-Oncology Patients

Primary Mentor: Rita Lee

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: A challenge faced by many hospitals is to match the need for blood with product availability. Because platelets have a short shelf life, they are often in short supply. Platelet shortages may lead to the postponement of treatments, the rescheduling of surgeries, and in extreme cases, to complications that may put patients' lives at risk. It would be in the transfusion service's best interest to direct the available platelets to the recipients who would receive the most benefit from them. Platelet activation status has recently been shown to be important for platelet efficacy in different patient populations. A method to screen platelets and assess the effect of activated platelet transfusions was evaluated. The goal was to reduce platelet consumption and the burden of platelet shortages by providing targeted platelet transfusions to hematology/oncology patients.

Study Design/Methods: A clinical study was conducted at a large academic hospital to evaluate the clinical response of hematology/oncology patients receiving activated platelets. Upon receipt of platelets from the regional blood center, each unit was tested for platelet activation status (ThromboLUX, LightIntegra Technology Inc.). Platelets were screened, and nonactivated platelets were allocated to hematology/oncology patients. The sporadic occurrence of these patients receiving activated platelets allowed for analysis of the effects of an activated platelet transfusion on the average count increment and transfusion interval of subsequent transfusions. Data were analyzed using a likelihood ratio test, 95% confidence interval, and Waldtype intervals.

Results/Findings: A total of 1296 tested platelet components were transfused to 122 patients. There was a statistically significant decrease of 5.4 Å— 109/L (21.5% reduction) in the count increment after receipt of an activated transfusion, with a mean posttransfusion count increment (1-4 hours) of 25.11 Å— 109/L (22.06-28.16) before and 19.71 Å— 109/L (15.87-23.55; $p = 0.003$) after an activated transfusion. The mean times between transfusions were 37.7 hours (30.2-47.1) before and 28.8 hours (22.0-37.6; $p = 0.04$) after receipt of an activated transfusion. There was a statistically significant decrease of 8.9 hours (30.9% reduction) in the time between transfusions after receipt of an activated transfusion.

Conclusions: A statistically significant reduction in count increments and time between transfusion was found after a patient received an activated transfusion. The limited shelf life for platelets necessitates careful inventory management. Being able to direct specific platelets to the patients who would benefit most from them could be helpful.

Primary Presenter: Ryan Phan

Project Title: Rapid Adoption of Telehealth at an Interprofessional Student-Run Free Clinic

Primary Mentor: Kari Mader, MD MPH

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Introduction: Student-run free clinics (SRFCs) have become important primary care homes during the COVID-19 pandemic. With students pulled from clinical sites, funding deficits, SRFCs' voluntary nature, and no best practices for telehealth SRFCs, many have been forced to close. This report shares a systematic approach for implementing a telehealth clinic along with initial outcomes from the Dedicated to Aurora's Wellness and Needs (DAWN) SRFC.

Methods: We utilized pilots with students, community volunteers, and patients to identify a telehealth platform. We implemented weekly plan-do-study-act (PDSA) cycles to develop a feasible interprofessional telehealth model. Key PDSA cycle goals included seamless utilization of platform, identification of necessary team members, appropriate scheduling of patients and volunteers, integration of interprofessional learners, positive patient and volunteer experience, and process for identifying and addressing patient social needs. Measured outcomes included total visits, no-show rates, and chief complaints addressed.

Results: Outcomes from PDSA cycles included a resultant telehealth clinic team and model, workflow for outreach for social needs screening and navigation, and team training guides. Visit data and no-show rates from January 2020 through July 2020 demonstrated total visits returned to 60% of pre-COVID numbers while no-show rates decreased significantly below pre-COVID rates. A range of acute and chronic concerns were successfully managed via telehealth.

Conclusion: SRFCs are poised to continue serving an important role in caring for the country's most vulnerable populations. The DAWN telehealth implementation process, outcomes, and resultant protocols may help inform other SRFCs seeking to establish telehealth services.

Primary Presenter: Kasey Pickard

Project Title: Addressing Infant Mortality: Healthcare Provider Understanding of Racial Disparities

Primary Mentor: Janet Meredith

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Background: Black infant mortality (IM) is at 2-3 times the rate of their White counterparts in the United States. Several studies consistently demonstrate that genetics, income levels, maternal education, and other socioeconomic factors do not fully account for these differences, leading to a growing consideration of racism and bias itself, particularly its role in patient/provider relationships, as a key contributing factor in racially disparate healthcare outcomes. Few studies have assessed healthcare provider awareness of the racial disparity in IM between Black and White infants, their perspectives on root causes, and their proposed solutions to this disparity as compared to current literature. We seek to understand where improvements can be made in healthcare workers' understanding and assuming a professional responsibility in addressing racial differences in IM as a healthcare crisis. Methods: We have created an anonymous survey to collect qualitative and quantitative data about physician perspectives, which includes rating scales, written responses, demographic information, and multiple-choice responses. Outcomes: 92 responses were recorded from providers. While a vast majority (85-92%) of respondents agreed that racial disparities in IM existed nationally and in Colorado, only around 60% agreed that it existed in their own practice. Only 65% of respondents agreed that the racial disparity in IM is growing in Colorado. While the majority (84%) of respondents agreed that socioeconomic factors did not account for the racial disparity in IM, when asked to select the contributing factors from a list, many selected unsubstantiated factors such as maternal education, income, and social habits. Most respondents were able to identify racism itself as a contributing factor. While most respondents were able to correctly identify low birthweight and prematurity, only 30% overall correctly identified SIDS and safe sleep practices as contributing factors. Themes of the proposed solutions included increasing the number of Black healthcare providers, increased access to healthcare and prenatal care, and education of providers on implicit bias. Conclusion: Healthcare providers appear hesitant in recognizing the existence of racial disparities in their own communities, as opposed to in the population at large. Additionally, we find that there is a substantial percentage of providers who still recognized unsubstantiated beliefs about contributing factors (such as abuse, income, education) in the racial disparity in IM, while not recognizing unsafe sleep practices, a known contributing factor. This study demonstrates a need for better provider education, which could serve to decrease potential provider bias when giving care to Black patients and families.

Primary Presenter: Anastasiya Ponomaryova

Project Title: Making the Medicine Health Services Unit the Best Unit Possible: The Ins and Outs of Patient Discharge

Primary Mentor: Emily Gottenborg

Secondary Mentor(s): Tyler Anstett, Manuel Diaz

Thematic Area: Clinical Science

Abstract:

Introduction: As a group of students enrolled in a five-week leadership development program, we were charged with making one of the medicine inpatient units at University of Colorado Health, an urban quaternary care academic medical center, the best unit. An area identified for improvement was length of stay reduction. Research shows that University of Colorado Health spends an estimated \$2721 for every inpatient day. Longer lengths of stay are associated with increased patient mortality and reduced hospital reimbursement, and hinder efficient patient flow through the hospital. In order to reduce length of stay, we focused on patient and provider barriers to discharge, and inefficiencies in the post-discharge room turnover time.

Methods: We surveyed over thirty patients and unit staff members, observed, documented, and timed the process of over twenty discharges, and identified three specific areas of improvement: 1) predicting time of discharge, 2) informing patients of their discharge time, and 3) enhancing the efficiency of the room turnover process. We implemented multiple interventions on the unit including: 1) Discharge Delay tracker, 2) Patient-centered Discharge Checklist, and 3) Room turnover closed-loop communication.

Results: Our team identified ways to standardize discharge delay tracking on the MHSU, improved on-time discharge by 24% using a Discharge Checklist, and reduced the average room turnover time by 30 minutes.

Lessons Learned: There is significant reducible waste in the discharge and room turnover processes. Tracking avoidable discharge delays can identify meaningful trends and patterns. A Discharge Checklist can better prepare patients for discharge. Finally, room turnover time can be reduced by addressing communication inefficiencies.

Primary Presenter: Hector Porragas-Paseiro

Project Title: An Evaluation of In-Person vs Videoconferencing Spanish Interpreters on Patient, Provider, and Hospital Based Outcomes in a Children's Hospital Emergency Department

Primary Mentor: Paritosh Kaul

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Limited English Proficiency (LEP) patients have decreased access to care, continuity of care, preventive screening, greater difficulty communicating with providers about informed consent, instruction, adherence, and follow up. The rising number of LEP patients, particularly Spanish speaking, and the critical role of the ER as the entry point into the US healthcare system, makes linguistic interpretation paramount. Linguistic interpretation ameliorates health disparities among LEP patients, including less use of emergency departments, better adherence to treatment plans, and fewer missed appointments. Linguistic interpretation also mitigates costs for providers and hospitals, including decreased unnecessary testing and lower admission rates. Evidence is lacking that compares in-person vs videoconferencing methods from the patient, provider, and hospital perspective. This study compared in-person and videoconferencing methods of Spanish interpretation using post-encounter surveys performed by patients/families and providers. In addition, a cost-use analysis was performed to compare these two methods on a hospital level. The surveys revealed that both patients and providers primarily prefer in-person interpreters in a clinical encounter. For patients/families, an in-person interpreter facilitated their capacity to understand clinical information, allowed patients/families to feel that their privacy was acknowledged and respected, and felt generally more satisfied with the entirety of the clinical encounter compared to a videoconferencing interpreter. For providers, an in-person interpreter allowed for a higher quality of communication (provider impression of information accuracy was reassuring; interpreter did not require information repeated) and allowed the provider to better engage with the patient/families' cultural values around healthcare compared to a videoconferencing interpreter. With regard to the cost-use analysis, videoconferencing encounters are typically much shorter than in-person encounters. However, videoconferencing encounters are more highly utilized and are more expensive. These findings demonstrate that while new tools for interpretation have made it easier and more convenient for use, an active effort should be done to obtain an in-person interpreter given that they are preferred by patients and providers. Videoconferencing methods should continue to be considered as the most reasonable and cost-effective alternative to the in-person gold standard of Spanish interpretation.

Primary Presenter: Kristin Porter

Project Title: Access to Initiation of Gender-Affirming Hormone Therapy for Transgender and Non-Binary Patient in a Primary Care Clinic

Primary Mentor: Rebecca Mullen

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

There is a critical need to improve access for transgender and non-binary individuals to inclusive, gender-affirming primary care. This includes, but is not limited to, safe, reliable, medically supervised access to gender-affirming hormone therapy (GAHT). At AF Williams Family Medicine Clinic, a primary care clinic within the University of Colorado/UCHealth system, 22.2% of the 36 providers who responded to a survey on attitudes towards transgender individuals and their care were not willing to initiate GAHT.

The objective of this quality improvement project was to improve access to safe, reliable, medically supervised GAHT in primary care clinics in the university system by implementing a multi PDSA cycle quality improvement approach with the first cycle designed to identify specific barriers to initiating GAHT among providers at AF Williams clinic, devise interventions based on specific barriers, pilot intervention(s) at AF Williams clinic, quantify and discuss the impact, and disseminate best practices to other primary care clinics within the university system.

As a first step, and in order to better understand the landscape of GAHT prescribing at AF Williams and specific barriers around which interventions could be developed, a REDCap survey was developed and deployed to capture specific barriers from the perspectives of individual providers. Results of this survey suggest that less than 20% of providers at AF Williams are currently initiating GAHT as part of their practice. The most frequently cited reason for not currently initiating GAHT was a perceived lack of patients presenting to the clinic in need of these services, despite prior studies suggesting that there is a great need for these services in the community at large. This suggests that future efforts of this work should focus on raising awareness among clinic patients and the community at large that these services are within the scope of primary care clinics and are available at AF Williams while also making providers more comfortable encouraging, eliciting, and instigating open conversations with their patients about gender-affirming hormone therapy.

Limitations of this work in applying successful interventions and strategies to other clinics the university system, or outside the system, are a relatively small sample size of providers, the unique provider demographics inherent to a resident continuity clinic site, and the payer makeup of the patient population.

Primary Presenter: Jamie Pospishil

Project Title: Stroke Alert Study: A Retrospective Evaluation of Stroke Alert Activations and Outcomes at the University of Colorado Hospital

Primary Mentor: Robert Kowalski

Secondary Mentor(s): William Jones, Robert Kowalski

Thematic Area: Clinical Science

Abstract:

Background: Stroke Alert (SA) protocols are being implemented across the country in order to establish an expedited means of evaluation for patients presenting with possible acute ischemic stroke (AIS). These protocols have been successful in improving time to diagnosis, and therefore have improved access to thrombolytic therapies within the necessary window of treatment (8). There are widely varying reports of stroke alert activation sensitivity and specificity for true ischemic stroke between different hospital systems and different activation settings (prehospital, emergency department (ED), inpatient). Given that SA protocols are a use of hospital resources and may lead to unnecessary diagnostic tests or treatments, we aim to evaluate trends among prehospital, ED, and inpatient SAs in order to identify predictors of stroke mimics and other characteristics that might further inform decisions to activate an alert.

Methods: This is a retrospective observational study of adult Stroke Alert activations at the University of Colorado Hospital. Data collected includes patient demographics, symptoms triggering a SA, stroke risk factors, initial neurologic evaluation data, final diagnosis and clinical outcome.

Results: Preliminary data analysis of 200 stroke alert patients over a 3-month period in 2019 revealed a true stroke diagnosis in 33% of alerts and mimics in 67%. The vast majority (79%) of the institution's stroke alerts were activated in the ED. The most common presenting symptoms, alone or in combination with other symptoms, were unilateral weakness (37%), aphasia (17%), altered mental status (17%) and facial droop (15%). Initially paged symptoms included two or more symptoms in 39% of cases. True stroke was significantly associated with older age ($p = 0.029$). Stroke mimics were significantly associated with female sex (57% female, 43% male, $p = 0.01$ OR 2.222 (95% CI 1.2 – 4.1)). Unilateral weakness was the only presenting symptom significantly associated with true stroke ($p = .005$, OR 2.410 (95% CI 1.3 – 4.5)). Additionally, presentation with two or more symptoms was significantly associated with true stroke, with 55% of true strokes presenting with two or more symptoms and only 32% of mimics presenting as such ($p = .002$, OR 2.615 (95% CI 1.4 – 4.8)).

Conclusions: The UCH institution has 67% of stroke alert patients ultimately diagnosed with a stroke mimic. This preliminary result reveals a higher-than-average stroke mimic rate within SA activations compared to rates reported by other institutions, which may be related to a relatively low-threshold system in place at this institution. Female patients were more likely to be presenting with a mimic rather than a true stroke, while older patients and those presenting with unilateral weakness and/or greater than one symptom were more likely to have true stroke.

Additional data collection and analysis is needed in this study in order to further qualify these findings and determine ways in which they can inform future stroke alert protocol and staff education.

Primary Presenter: Franklin Powlan

Project Title: Return to Duty as a Functional Outcome Measure Following Orthopaedic Surgery:
A Preliminary Investigation

Primary Mentor: Frank Scott

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background In the military, return to duty (RTD) status has commonly been used as a functional outcome measure following orthopaedic surgery. This is at times regarded similarly to æreturn to sport (RTS), or as an indicator of return to full function. The purpose of this study is to determine the efficacy of RTD status as a standalone surrogate for RTS and assess its overall usefulness as a functional outcome measure.

Questions/Purposes (1) For military patients, is return to duty status an effective surrogate for return to sport following orthopaedic surgery? (2) Is return to duty status an indicator of returning to full function after orthopaedic surgery?

Methods Pre and post-operative self-reported RTD status, profile status, RTS status, deployment status, MOS (military occupation specialty) changes, and MEB (medical evaluation board) status, were retrospectively reviewed for all active duty soldiers who underwent orthopaedic surgery at our institution from February 2017 to October 2018. Minimum follow up time for inclusion was 1 year.

Results Of the patients reporting full time duty status with no restrictions at final follow up, 12.2% reported being limited in their sports/fitness activities and 70.7% reported an overall lower level of sport activity. 29.3% of patients who reported full RTD with no restrictions also reported not returning to the same work level, 34.1% reported being non-deployable, 19.5% reported an active MEB, and 3.6% reported a change in MOS.

Conclusions RTD status is commonly reported in military orthopaedics as a way of describing post-operative functional outcome. 58.6% of patients reported full RTD with no restrictions/profile at final follow up. However, the majority of these patients reported lower level of sport activity. Numerous patients also reported not returning to the same work level, being non-deployable, or undergoing an active MEB. Therefore, our preliminary investigation suggests self-reported full RTD may not be an appropriate indicator of return to full function, nor an adequate surrogate for RTS.

Level of Evidence Level IV, Case Series

Primary Presenter: Alan Quach

Project Title: Hematuria after transrectal prostate biopsy: a warning of future infection?

Primary Mentor: Al Barqawi

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Purpose: To identify the incidence and predictive factors of infectious complications in a prophylactic-controlled cohort of men undergoing transrectal ultrasound-guided prostate needle biopsy (TRUS-Bx) at a single institution.

Materials and Methods: A retrospective review was performed on 539 patients who underwent TRUS-Bx between 2010-2015. All patients received prophylactic Sulfamethoxazole/Trimethoprim and Levofloxacin prior to the biopsy. Charlson Comorbidity Index (CCI) was calculated for each patient. The characteristics of patients with and without infectious complications were compared using Fisher exact tests and student's t-test.

Results: 539 biopsies were performed. Mean age was 64 years, PSA was 17, prostate volume was 41 mL, and CCI score was 3. A total of 7 (1.3%) infectious complications were reported 48-72 hours after biopsy, with 2 (0.4%) developing sepsis. Analysis indicated no significant differences in mean age ($p=0.544$), PSA ($p=0.881$), prostate volume ($p=0.532$), or CCI score ($p=0.499$) among patients who developed infection. Individual components of the CCI revealed no statistically significant differences. Additional complications following biopsy included: hematuria (8.3%), rectal bleeding (1.3%), urinary urgency (0.9%), and new onset erectile dysfunction (0.6%). Hematuria was associated with the development of infectious complications (OR=8.75, CI 1.895 - 40.400, $p=0.0055$).

Conclusions: Our cohort of patients undergoing TRUS-Bx had a lower infectious rate compared to that reported by the AUA (1.1% vs 5-7%). Although this study has limited power, CCI was poorly predictive of infectious complications following TRUS-Bx. Persistent hematuria following biopsy was associated with infectious complications. The clinical importance of hematuria following TRUS-Bx, if any, needs to be further clarified.

Primary Presenter: Laylaa Ramos Arriaza

Project Title: Sex Specific Quality of Life Differences in Chronic Rhinosinusitis

Primary Mentor: Vijay Ramakrishnan

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Objective: Sex discrepancies have been reported in total sino-nasal outcomes test (SNOT-22) but limited data exists on sex differences within SNOT-22 subdomains and tissue biomarkers.

Study Design: Prospective cohort

Setting: Academic medical center

Methods: Patient demographics, mucus swabs and clinical data including SNOT-22 were collected. Sex differences in SNOT-22 subdomains were assessed using linear regression. A random forest model was applied to assess importance of variables in predicting total SNOT-22 score. Enzyme-linked immunosorbent assays (ELISA) were used to measure Substance P and tryptase in a subset of mucus samples from men and women matched for age and disease type to explore biological sex differences and relationship to SNOT-22.

Results: A total 520 patients were studied (mean age 48.3 years, 50.9% female). A statistically significant difference amongst age existed between genders (50.1 years old vs 46.6 years old, $p=0.008$). Men had more CRS with nasal polyps (CRSwNP) than women (48.2% vs 35.5%, $p=0.004$) while women had more disease without nasal polyps (CRSw/oNP) (34.1% vs 43%, $p=0.046$). Men had a higher mean Computed tomography (CT) Lund-Mackay Score (11.3 vs 9.5, $p=0.004$) while women had a higher overall mean SNOT-22 score (40.9 vs 46.9, $p=0.001$). Regarding SNOT-22 subdomains, women had statistically significant higher scores in ear/facial, psychological and sleep domains ($p<0.0001$, 0.0034, 0.0065 respectively). The random forest model revealed age, objective disease measures, sex were top predictors for Total SNOT-22 above other variables such as smoking, presence of comorbid allergy or asthma and presence of polyps or Aspirin Exacerbated Respiratory Disease (AERD). Mucus substance P was not statistically associated with Total SNOT-22 score.

Conclusion: Applying SNOT-22 subdomains may be beneficial in sex focused therapy as clear differences exist in CRS disease manifestations amongst men and women.

Primary Presenter: Bradley Reeves

Project Title: Strap stabilization for proximal junctional kyphosis prevention in instrumented posterior spinal fusion

Primary Mentor: Vikas Patel

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Study Design: This is a retrospective, single-institution, cohort study.

Objectives: To evaluate the association of Mersilene tape use and risk of proximal junctional kyphosis (PJK), after surgical correction of adult spinal deformity (ASD) by posterior instrumented fusion (PIF).

Summary of Background Data: PJK, following long spinal PIF, is a complication which often requires reoperation. Mersilene tape, strap stabilization of the supra-adjacent level to upper instrumented vertebra (UIV) seems a preventive measure.

Methods: Patients who underwent PIF for ASD with Mersilene tape stabilization (case group) or without (control group) between 2006 and 2016 were analyzed preoperatively to 2-year follow-up. Matching of potential controls to each case was performed. Radiographic sagittal Cobb angle (SCA), lumbar lordosis, pelvic tilt, sacral slope, and pelvic incidence were measured pre- and postoperatively, using a deformity measuring software program. PJK was defined as progression of postoperative junctional SCA at UIV $\geq 10^\circ$.

Results: Eighty patients were included: 20 cases and 60 controls. The cumulative rate of PJK 10° at 2-year follow-up was 15% in cases versus 38% of controls (OR = 0.28; P = 0.04) with higher latent period in cases, (20 vs. 7.5 months), P = 0.018. Mersilene tape decreased risk of PJK linked with the impact of the following confounders: age, ≥ 55 years old (OR = 0.19; 0.02 P ≤ 0.03); number of spinal levels fused ≥ 7 (OR = 0.13; 0.02 P ≤ 0.06); thoracic UIV (T12 – T1) (OR = 0.13; 0.02 P ≤ 0.06); BMI ≥ 27 kg/m² (OR = 0.22; 0.03 P ≤ 0.08); and osteoporosis (OR = 0.13; 0.02 P ≤ 0.08).

Conclusions Mersilene tape at UIV + 1 level decreases the risk of PJK following PIF for ASD.

Primary Presenter: Grant Ridgway

Project Title: Step-Wise Board Game

Primary Mentor: Daniel Goldberg

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

The USMLE Step exams are significant milestones and statistics for medical learners. The Step 1 exam, in particular, represents a critical data point referenced by residency programs when considering medical student applications. Despite the importance of this examination most study aids (textbooks, lectures, online videos, etc.) follow a paradigm of passive, individualized learning rather than collaborative, active engagement. This occurs despite abundant research that demonstrates substantial benefit of active participation in learning. Gamification, which can be described as the application of game-design elements and principles to information systems aimed to afford specific experiences and motivations, can enable learners to actively participate in an exchange of information. Participants in games have additional motivation to engage in the game itself and can retain contextual information when trying to remember important knowledge at later points. The purpose of this project is to apply the concept of gamification to Step 1-related medical information to provide students with a supplemental means of active preparation aimed toward collaborative study.

Primary Presenter: Elia Rieder

Project Title: Patient Companion Program: A Curriculum to Promote Patient Advocacy and Education in the Geriatric Population

Primary Mentor: Janna Hardland

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Purpose/Aim: The Patient Companion Project was created to provide meaningful volunteer opportunities to undergraduate pre-health volunteers while benefiting patients living in a long-term care setting. This curriculum emphasizes education about pertinent geriatric topics, including elder abuse, health literacy, advanced care planning, palliative care, barriers to healthcare, patient advocacy, motivational interviewing, evidence-based medicine, isolation and its effects on the geriatric population, medical aid in dying, depression, PTSD, dementia, movement disorders, pain management, behavioral changes, Medicare/ Medicaid and HIPPA education, while providing companionship to long term care patients in the hopes of improving health outcomes.

Background: Volunteer and clinical experiences are important for admission of students to health professional programs yet combining these experiences can be difficult with busy class schedules and/or part-time employment. Additionally, geriatric patients often face challenges in health care with reduced access to resources, limited health care literacy, language barriers, and lack of social support. These patients are at increased risk of isolation, mood disorders and experience a large burden of illness and healthcare utilization. Pairing these groups offers an opportunity to benefit both the undergraduate volunteers as well as the paired geriatric patients.

Methods: We recruited the pre-health students from the University of Colorado at Denver and University of Colorado at Boulder by presenting at their institutions via their pre-med programs as utilizing pre-professional emails. We coordinated with the Colorado State Veteran's Home Recreational Coordinator to pair our pre-health students with isolated veterans without severe cognitive disease for a period of 2 years. These undergraduate volunteers will meet with their assigned veteran twice every month. As a group, we meet every month for 1-2 hours for one of our educational lectures, journal club, book discussion, and to touch base with the undergraduate volunteers about their experience. The undergraduate volunteers document all their visits on an after-visit survey in order to monitor their experience, as well as fill out surveys monitoring their confidence about the curriculum's learning objectives. We have also created quality of life surveys that can be implemented in the future of this project, in hopes to gather data before our volunteers are paired with their patient, at the one year mark and after 2 years of being paired with their patient. We will also provide surveys to the current and prior pre-health volunteers at the end of their dedicated 2 years regarding what significance the Patient Companion Project had on their life and their consideration of the medical field as a career field.

Summary of Progress: Our preliminary survey results show improvement in confidence in knowledge based, value based, and skill-based learning objectives after 6 months of the established educational curriculum.

Our future goal for this curriculum is to create a simple, straightforward guideline that can be easily replicated by others. Once the COVID-19 pandemic wanes and the nursing home community is safe again, we will ask our volunteers to return to their in-person visits with the option to continue letter writing as well. We will also try set up shadowing opportunities for them in specialties of interest once facilities allow the return of pre-med students. Our monthly lectures will continue in the zoom format for both the guest lecturers" and our students" convenience, unless we are implementing a hands-on workshop, since that has greatly reduced scheduling conflicts. Our hope is that other interested programs will be able to adopt our curriculum and implement it at their home programs.

Primary Presenter: Hope Rietcheck

Project Title: Quality Improvement for Community Nutrition Education Programs

Primary Mentor: Jeremy Long

Secondary Mentor(s): Rita Lee

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Background: In the past, food pantries have been shown to be unable to support healthy diets. Similarly, the overall dietary intake of most food pantry users does not meet recommendations. However, registered dietitian nutritionists (RDNs) working in food banks have been able to lead efforts to increase healthy food access and nutrition education. Metro Caring, an anti-hunger center in Denver, CO, is unique amongst the surrounding food pantries in that it implements nutritional requirements, such as sugar guidelines, for the resources it provides. Metro Caring's staff includes an RDN and dietetic technician registered (DTR) who oversee nutrition programs involving dozens of volunteer nutrition educators from various backgrounds, from dietitians to former or current program participants. The goal of these programs is to encourage and make accessible healthy lifestyles.

Objective: This study is the first phase of quality improvement measures to evaluate the effectiveness of two of the programs currently available at Metro Caring - the Healthy Tastings (HT) recipe demonstrations and Food For Thought (FFT) nutrition education activities.

Design: Over a three-week course, phone call surveys were attempted for every person who visited Metro Caring during that time. Anonymous surveys were conducted 0-2 days after appointments and consisted of 11 distinct questions with several sub-questions. Responses were recorded and later coded into categorical groups, subjective to the answers that were collected and based on common themes of the free-answer responses. Limitations included individuals who were at work during time of phone call, non-English speakers, and those with unlisted phone numbers.

Results: 181 surveys were ultimately collected, 94 of which participated in at least one of the programs. Notable results concluded that around 30% of individuals who did not participate in the programs were simply unaware of their existence. Additionally, participants of both programs experienced a significant increase in Stage of Change regarding healthy eating/nutritional education when compared before and after interaction with the programs. Finally, more than a third of participants did not create a goal for behavior change as a result of these programs.

Conclusion: Future efforts should increase active recruitment to involve participants with these programs, based on feedback. A major shortcoming was identified with failure to meet one of the program aims, goal creation for positive lifestyle changes • ; volunteers should be trained to provide more assistance in this area, discussing and encouraging goal formation during the interaction. Results from this study will be shared back to nutrition educators at Metro Caring to

improve and adjust the programs and volunteer training. This survey should be repeated as necessary to track implemented changes.

Primary Presenter: Jennifer Robinson

Project Title: Viral Load Predicts Virologic Failure on repeat testing in Children on Antiretroviral Therapy at a large clinic in Kisumu, Kenya: A Retrospective Cohort Study

Primary Mentor: Lisa Abuogi

Secondary Mentor(s):

Thematic Area: Global Health

Abstract:

Background: The association between recent viral load testing on subsequent virologic failure in children with HIV on antiretroviral treatment (ART) has not been extensively studied.

Methods: This retrospective cohort study included children with HIV at a large urban clinic in Kisumu, Kenya, ages 0-14 years on ART with at least 2 viral load (VL) results in January 2015-July 2018. First VL during the study period was compared with subsequent VL. Undetectable VL was defined as 0-39 copies/mL, LLV 40-999 copies/mL, and virologic failure > 1000 copies/mL. Chi square test was used to measure the association between first viral load and other risk factors. Multivariate logistic regression was performed controlling for sex and time on ART to evaluate association with virologic failure on repeat VL as main outcome.

Results: A total of 172 children were included: 49% female with a median age of 10 years, IQR: 8-12 (Table 1). Within this cohort, 110 (64%) children had undetectable virus, 22 (13%) had LLV, and 40 (23%) had virologic failure (VF). Among children with VF on first VL, 32.5% had VF on subsequent VL, compared to 7.3% with undetectable VL and 9.1% with LLV ($p=0.001$). Children with VF were on ART for shorter periods (median 19.8 months, IQR: 10.3-53.3) compared to undetectable children (median 62 months, IQR: 31.3-92.3) and those with LLV (median 65.6 months, IQR: 34.9-88.5) (adjusted Odds Ratio (aOR) 6.8, 95% confidence interval (CI) 2.2-20.5). In multivariate analysis, there was no significant difference in subsequent virological failure between LLV and children with undetectable virus at baseline (aOR 1.4, 95% CI 0.3-7.3).

Conclusion: Children with virologic failure are at highest risk of continued failure on subsequent viral load. Further studies should evaluate interventions to improve treatment optimization in children with virologic failure and further explore outcomes in children with LLV.

Primary Presenter: Gavriel Roda

Project Title: Optimizing Nicorandil for Spinal Cord Protection in a Murine Model of Complex Aortic Intervention

Primary Mentor: Brett Reece

Secondary Mentor(s):

Thematic Area: Basic Biomedical Science

Abstract:

Background: There are currently no clinically utilized pharmacological agents for the induction of metabolic tolerance to spinal cord ischemia-reperfusion injury in the setting of complex aortic intervention. Nicorandil, a nitric oxide donor and ATP-sensitive potassium (KATP) channel opener, has shown promise in neuroprotection. However, the optimized clinical application of the drug and its mechanism of neuroprotection remains unclear. We hypothesized that 3-days pretreatment would confer the most effective neuroprotection, mediated by mitochondrial KATP channel activation. Methods: Spinal cord injury was induced by 7 minutes of thoracic aortic cross-clamping in adult male C57BL/6 mice. Time course: mice received 0.1 mg/kg nicorandil for 10 min, 4 hours, and 3 consecutive days prior to ischemia compared with control. Dose challenge: mice received 3-days nicorandil pretreatment comparing 0.1 mg/kg, 1.0 mg/kg, 5.0 mg/kg, and saline administration. Mitochondrial KATP channel blocker 5-hydroxy-decanoate (5HD) was co-administered to elucidate mechanism. Limb motor function was evaluated, and viable anterior horn neurons quantified.

Results: Nicorandil pretreatment at 4 hours and 3 days before ischemia demonstrated significant motor function preservation; administration 10 min before ischemia showed no neuroprotection. All nicorandil doses showed significant motor function preservation. Three days administration of Nicorandil 1.0 mg/kg was most potent. Neuroprotection was completely abolished by 5HD co-administration. Histological analysis showed significant neuron preservation with nicorandil pretreatment, which was attenuated by 5HD co-administration.

Conclusion: Three days administration of Nicorandil 1.0 mg/kg showed near-total motor function preservation in a murine spinal cord ischemia-reperfusion model, mediated by the mitochondrial KATP channel.

Primary Presenter: Kyra Rodi

Project Title: The Philosophy of Pain

Primary Mentor: Joseph Frank

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Though there are many differences in cultures, traditions, philosophy, and religion, pain is present in some capacity for every human on earth. There are many different ways to think about what pain is, as well as the role it plays and the approaches to treating it. Though the historical understanding is varied, pain is understood today to be some combination of sensory perception and experiential processing through a biopsychosocial model. This paper examines the history of pain from primary sources and considers different perspectives on pain in order to provide insight to how to best approach it today. By diving into different religious and cultural understandings of pain, it seeks to offer a broader perspective on how healthcare professionals can understand pain and how individuals can conceptualize pain. Additionally, it is vital in the healthcare setting to acknowledge that the culture of patients and the culture of providers influence pain care. This study seeks to draw on previous work in done the pain realm, and provide a starting point for more extensive research into understanding pain in many different contexts, including gender, religion, culture, and philosophy. Ultimately, pain is an incredibly complex entity, and must be addressed through many different avenues and perspectives.

Primary Presenter: Rhianna Rubner

Project Title: Progress of Clinical Therapies for Dry Age-Related Macular Degeneration

Primary Mentor: Valeria Canto-Soler

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Dry Age-Related Macular Degeneration is a progressive and debilitating disease that currently affects millions of people worldwide with no successful treatment available. The millions of people suffering from this disease are simply awaiting the slow progression to blindness. Currently much research is being done in the hopes of slowing the progression of this disease or of curing it. This paper seeks to give a current review of therapies that have reached clinical trial for treatment of Dry AMD. A thorough search of Pubmed, Embase and Clinicaltrials.gov has led to a comprehensive collection of the most recent methods being tested as treatment for Dry AMD. This paper also endeavors to assess the current status and future direction of therapeutics for Dry AMD.

Primary Presenter: David Sabio

Project Title: Feasibility of Iron Ingot use in a Resource-Limited Caribbean community: findings from a survey to guide anemia prevention

Primary Mentor: Elizabeth Lowenthal

Secondary Mentor(s): Ryan Close

Thematic Area: Public Health and Epidemiology

Abstract:

Background: The WHO (World Health Organization) recommends universal iron supplementation for children and women of child bearing age in areas with a prevalence of iron deficiency anemia >40%. Implementation of this recommendation is made difficult by the cost and logistical barriers to continuous use of oral iron. Novel interventions that address iron deficiency in sustainable and cost-effective methods are in need.

Aims: To examine the current cooking practices and resources accessible to local families, to determine if the widespread use of a reusable iron ingot (ie. the Lucky Iron Fish) as a means of sustainable iron fortification would be a practical and feasible intervention in this area, and help guide assessments of this kind in other similar locales.

Methods: A total of 210 mothers with infants under 12 months of age were administered a questionnaire about their household cooking practices and resources. This data was recorded in REDCap and underwent descriptive and qualitative analysis.

Results: The vast majority of participants boil water at least 3 times per week (96.2%), and a substantial amount boil water daily (86.7%). While 207 (99.0%) of respondents have year round access to some form of an acidifying agent of those 200 (96.6%) use it to cook.

Conclusions: Current cooking practices and resources include a frequency of boiling water and access to acidifying agents that would make the broadscale iron fortification of foods with the Lucky Iron Fish a feasible intervention, while findings suggest implementation strategies would likely vary in different subpopulations.

Primary Presenter: Kristina Sandquist

Project Title: Elevating our Engagement: An Evaluation of Launching a Community Board at a Student-Run Free Clinic

Primary Mentor: Kari Mader

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Background: The DAWN Clinic is an interprofessional student-run free clinic (SRFC) that provides primary care to uninsured patients in Aurora, Colorado. There is no literature describing feasibility or models of community advisory board (CAB) formation from an SRFC. The Community Leaders of DAWN (CLD) was created in 2018 with a mission to promote healthy communities in Aurora. The purpose of this project is to share the process and outcomes evaluation of the inaugural year of DAWN's CLD community board.

Methods: Interventions included a kickoff day, monthly group meetings, and planning committee meetings. Mixed-method evaluation utilizing pre-post surveys, student-leader exit surveys, focus groups, and key informant interviews assessed the facilitation process and impact of the community board on the community, community members, and student leaders. Quantitative data analysis employed frequencies and means; qualitative data analysis included two coders using a constant comparison analysis.

Results: The CLD included eight actively involved community members. Some disconnect existed between qualitative and quantitative findings related to group cohesion, self-efficacy, and conceptualization of oneself as a leader. Regular attendance was a serious challenge, yet a strong sense of "œfamily "• still emerged, and all members organically identified themselves as community ambassadors. Skilled facilitation, translation, and flexibility via technology were key processes for success. The CLD was successful in challenging DAWN leadership to increase access to care. Student leaders gained confidence in their skills as leaders and ability to create a functioning community board.

Conclusions: "– This evaluation provides DAWN with an opportunity to improve community responsiveness through working towards continued sustainable engagement. Appropriately, additional CLD members will be recruited to engage with DAWN as ambassadors for their community.

Primary Presenter: Rosalyn Savoie

Project Title: Does Pregnancy Lead to the Development of Anti-Cyclic Citrullinated Peptide Antibodies?

Primary Mentor: Kristen Demoruelle

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Objective: There is an increased risk of developing rheumatoid arthritis (RA) during the postpartum period, but the etiology of this risk is unknown. The goal of this study was to determine whether pregnancy is associated with an increased prevalence of anti-cyclic citrullinated peptide (CCP) antibodies, which are RA-related antibodies that have been identified in the blood prior to the onset of joint disease in RA.

Methods: Stored serum samples were obtained from 340 RA-free women in their 3rd trimester of pregnancy and 142 non-pregnant controls. Samples were tested for anti-CCP3 (IgG Inova) and anti-CCP3.1 (IgG/IgA Inova). Questionnaires were used to assess women 's health and smoking histories. Chi-square/Fisher 's exact testing were used to compare groups. In addition, cervicovaginal fluid (CVF) and breast milk (BM) samples were obtained from 28 postpartum women and CVF in 52 non-postpartum controls. All samples were tested for anti-CCP-IgG (Inova) and anti-CCP IgA (in house assay). Questionnaires were used to assess women 's health and smoking histories. Pearson 's correlation and Mann-Whitney-U testing were used to compare groups.

Results: The prevalence of serum anti-CCP positivity did not differ between pregnant and non-pregnant women. [For CCP3, 2.1% vs. 1.2%, $p=0.43$ and for CCP3.1, 1.4% vs. 1.5%, $p=1.0$]. Within the pregnant women, there was no difference in anti-CCP positivity based on age, history of ever-smoking, or sexually transmitted infection during pregnancy. In postpartum women, total number of pregnancies significantly correlated with CVF anti-CCP-IgG and CVF anti-CCP-IgA levels [For CVF anti-CCP-IgG, $r=0.33$, $p=0.01$; for CVF anti-CCP-IgA, $r=0.40$, $p=0.01$]. In addition, age was significantly correlated with BM anti-CCP-IgA levels [$r=0.43$, $p=0.05$].

Conclusion: An association between pregnancy and systemic anti-CCP antibodies was not identified, suggesting that the increased risk of developing RA in the postpartum period is not due to increased systemic anti-CCP development during pregnancy. However, we did find a positive correlation between total number of pregnancies and local anti-CCP antibodies in the female genital tract and between age and anti-CCP antibodies in BM during the postpartum period. Additional studies are needed to understand how this mucosal generation of anti-CCP antibodies during the postpartum period influences the risk of RA development and the influence of genetics and other environmental factors on the development of anti-CCP during pregnancy and postpartum.

Primary Presenter: Sean Schooley

Project Title: Assessment of Critical Care Experience in Undergraduate Medical Education: A Systematic Review

Primary Mentor: Angela Czaja

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Critical care education is oft overlooked in undergraduate medical education as the curricula offered by medical schools is variable and there is no formal consensus on what courses should be included. This systematic review looks into the literature surrounding this topic, identifying what the requirements are, what schools are doing for critical care education, what is desired by experts in the field, and whether or not there is data to support performance differences at the intern or resident level as a result of the presence or absence of this coursework. There is found to be a large body of experts from a wide range of disciplines that recognize the importance of critical care education, including its ability to help learners manage unstable patients and critical conditions like STEMI, learn critical thinking skills, improve communication, and reduce the intensity of intern year and the burnout risk associated with it. In addition, there is found to be a relatively small (~40%) amount of schools that require critical care experience, and little consensus on how to implement this curriculum. There is also found to be difficulty in how to measure the impact of this and other curriculum changes, though EPAs are viewed as a promising candidate. Finally, further directions of this research are discussed including potential surveys for intern and/or resident classes from a variety of specialties and tracking of metrics like EPAs for more objective information.

Primary Presenter: Anthony Scott

Project Title: The Utility of iCare HOME Tonometry for Detection of Therapy-Related Intraocular Pressure Changes in Glaucoma and Ocular Hypertension

Primary Mentor: Leonard Seibold

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: Intraocular pressure (IOP) is the main modifiable risk factor in the management of patients with glaucomatous optic neuropathy,¹ one of leading causes of vision loss in developed countries.² Currently, patients with glaucoma receive IOP measurements 2-4 times per year during standard-of-care clinic appointments. These limited readings often fail to detect the peak IOP and may not reflect patients' true mean IOP, as emerging research has demonstrated IOP variation both within and across days.^{1,3} Our study assesses how the iCare HOME, an FDA-approved rebound tonometer⁴ which patients can use to self-measure IOP at home, may be used to more completely assess IOP and monitor therapy-related IOP changes.

Subjects, Participants, and/or Controls: 43 eyes (n=27 subjects) with open angle glaucoma or ocular hypertension were enrolled during standard-of-care clinic visits. Participants were grouped into control eyes managed on stable therapy (n=18 eyes), or therapy change eyes undergoing selective laser trabeculoplasty (SLT, n=8 eyes), initiating topical therapy (n=8 eyes), or adding a second medication to existing monotherapy (n=9 eyes).

Methods: Subjects recorded IOP four times daily (before breakfast, before lunch, before dinner, before bed) for one week using iCare HOME tonometry. Upon tonometer return, subjects underwent SLT or new medication start; an additional week of iCare HOME measurements was collected after 4-6 weeks. Control subjects recorded an additional week of measurements after six weeks. Measurements were grouped into four time periods (5-10am, 10am-3pm, 3-5pm, 8pm-1am). Goldmann applanation tonometry (GAT) was performed at each study visit for comparison. Detection of therapy response was defined as an IOP reduction of $\geq 20\%$.

Results: For eyes which demonstrated a therapy response by GAT (n=11), iCare HOME detected a therapy response in 90.9% of eyes in ≥ 1 time period and 45.5% of eyes in all four time periods. In eyes without a GAT-measured therapy response (n=14), iCare HOME detected a response for 71.4% (n=10) of eyes in ≥ 1 time period and for 7.1% of eyes (n=1) at all four time periods. In treatment eyes, intraday and interday average minimum and maximum IOP, as well as interday IOP range, were significantly reduced after therapy without a significant change in intraday IOP range. Control group eyes did not demonstrate a significant change in average IOP minimum, maximum, or range between study weeks.

Conclusions: Home tonometry with iCare HOME reliably detects therapy-related IOP changes in patients with glaucoma and ocular hypertension. Treatment responses correlated well with in-office GAT and may detect treatment responses missed by GAT. IOP measurements via home

tonometry provide additional clinical information regarding intraday and interday IOP fluctuation beyond standard of care, in office GAT measurements. The iCare HOME is a valuable tool to monitor therapeutic efficacy in patients with glaucoma.

Primary Presenter: Delia Shash

Project Title: "Should We Have Called A Code White?": A Quality Improvement Project
Evaluating the Code White Protocol and the Provider's Utilization

Primary Mentor: Diedre Wagers

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: Postpartum hemorrhage (PPH) is a leading cause of maternal morbidity and mortality in both the United States and in Colorado specifically. New implementation of a three-step Code White protocol in order to combat this devastating complication at a community-based hospital in Colorado Springs was the primary focus of this quality improvement project.

Objective: Our objective was to evaluate utilization of the new three-step Code White protocol and elicit the obstetrics and gynecology providers' attitudes towards its implementation.

Methods: A retrospective chart review using the ICD-10 code for PPH was performed in order to gather data on the number of PPH that were occurring and the subsequent Code White alerts or activations that were called. PPH was defined as estimated blood loss (EBL) of $\geq 500\text{mL}$ for vaginal deliveries and EBL $\geq 1000\text{mL}$ for cesarean deliveries. Furthermore, we distributed a survey to the obstetrics and gynecology staff members in order to elicit the providers' perspectives and attitudes towards the new protocol.

Results: Upon conclusion of the project, we discovered that 70% of PPH were not subsequently being called with either a Code White alert or activation, which was not in accordance with the new three-step protocol. We also discovered that a main contributor to this underutilization of the Code White protocol was nurses' fear of backlash from physicians. Furthermore, most providers perceived a delay in blood products when a Code White was not called which could potentially lead to further complications and harm to patients.

Conclusion: The new three-step Code White protocol was being severely underutilized at our community-based hospital. Ideas to improve utilization of the protocol would be to create a nursing protocol where a Code White must be called whenever the criteria for PPH is met and also to create a culture of safety so nurses feel comfortable speaking up and advocating for their patients.

Primary Presenter: Mitchell Shellman

Project Title: Epidemiology of Snakebites for a Large Poison Center from 2007 - 2017

Primary Mentor: Nicklaus Brandehoff

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

BACKGROUND: There are approximately 9,000 venomous snake bites in the United States every year resulting in approximately 5 deaths per year. The large majority of bites are by native pit vipers with a small percentage due to coral snakes and exotic pets. With a small percentage of hospitals having access to an inpatient toxicology service or dedicated snakebite services, the majority of venomous snakebites receive consultation from poison centers to help guide appropriate care. Here we report the epidemiology of snakebites to a large poison control center over an 11-year period with the aim of analyzing severity of snake bite by geographic region, patient demographics, and snake species. Given the current treatment protocols in Emergency Departments, this paper aims to refine treatment based on both snake bite and patient epidemiology.

METHODS: All calls to a large regional poison center for snakebite exposures from January 1st, 2007 through December 31st, 2017 were extracted and analyzed. During calls, specialists in poison information (SPI) recorded data based on the poison center's standardized snakebite protocols. There were no exclusion criteria. A standardized database was established using the REDCap data management system. These data were analyzed using descriptive statistics.

RESULTS: One-thousand seven-hundred ninety-two cases were categorized as snakebites during this time. The majority of calls were due to venomous snakes (N=1217, 67.9%) followed by non-venomous snakes (N=351, 19.6%) and unknown (N=224, 12.5%). The mean patient age was 33 years old (standard deviation = 20.1). Most bites occurred in the summer months. Males (N=1217, 67.9%) represented the majority of bites compared to women (N=536, 29.9%). More bites occurred in the upper extremities (N=837, 46.7%) than the lower extremities (N=725, 40.1%). Bites to the hand occurred in 747 cases (41.6%). Rattlesnakes accounted for the majority of the venomous snakebites (N=818, 67.2%). Other venomous snakes included copperheads (N=127, 10.4%), unknown pit vipers (N=71, 5.8%), water moccasins (N=15, 1.2%), exotic snakes (N=9, 0.7%) and coral snakes (N=2, 0.2%). Local symptoms (N=1385, 77.3%) were the most common documented symptoms followed by systemic (N=427, 23.8%) and hematologic (N=94, 5.3%) symptoms. Hypotension (N=98, 23.0%), nausea (N=142, 33.3%), and perioral paresthesias (N=125, 29.3%) were the most common systemic symptoms. Sixty four percent (N=782) of recorded venomous snakebites received antivenom. Twenty-six (3.0%) patients received antivenom for a non-venomous snakebite. Three (0.2%) deaths occurred. None of the reported deaths received antivenom.

CONCLUSIONS: Our data is consistent with previous data illustrating more bites occur in males. A smaller percentage of venomous snakebites received antivenom than other recently

published data. Many of the nonvenomous snakebites were managed at home and did not require medical evaluation. Deaths were rare. Our data is limited by what is documented by the SPI while actively managing a case.

Primary Presenter: David Sheneman

Project Title: Relationship Between Patient Characteristics and Critical Illness in COVID-19

Primary Mentor: Samuel Windham

Secondary Mentor(s): Kristine Erlandson

Thematic Area: Clinical Science

Abstract:

Background: While several studies have explored hospitalization risk factors with the novel coronavirus (COVID-19) infection, the risk of poor outcomes during hospitalization has primarily relied upon laboratory or hospital-acquired data. Our goal was to identify clinical characteristics associated with intubation or death within 7 days of admission.

Methods: The first 436 patients admitted to the University of Colorado Hospital (Denver metropolitan area) with confirmed CoVID-19 were included. We hypothesized that a combination of clinically available risk factors would reasonably predict CoVID-19 severity. Demographics, comorbidities, and select medications were collected by chart abstraction. Missing height for calculating body mass index (BMI) was imputed using the median height for patients' sex and race/ethnicity. Adjusted odds ratios (aOR) were estimated using multivariable logistic regression and a minimax concave penalty (MCP) regularized logistic regression explored prediction.

Results: Participants had a mean (SD) age 55 (17), BMI 30.9 (8.2), 55% were male and 80% were ethnic/racial minorities. Unadjusted comparisons by outcome are shown (Table 1). Male sex (aOR: 1.60, 95% CI (1.02, 2.54)), increasing age (aOR: 1.25 (1.08, 1.47)); per 10 years), higher BMI (aOR 1.03 (1.00, 1.06)) and poorly controlled diabetes (hemoglobin A1C $\geq 8\%$) (aOR 2.33 (1.27, 4.27)) were significantly ($p < 0.05$) associated with greater odds of intubation or death. Minority status tended to be associated with higher odds (aOR: 1.8 (1.01, 3.36); $p = 0.052$). Surprisingly, need for hospital interpreter was associated with decreased odds (OR: 0.58 (0.35, 0.95) of intubation/death. Our final MCP model included indicators of A1C $\geq 8\%$, age > 65 , sex and minority status, but predicted intubation/death only slightly better than random chance (AUC = 0.61 (0.56, 0.67)).

Conclusion: In a hospitalized patient cohort with COVID-19, male sex, poorly controlled diabetes, increasing age and BMI were significantly associated with early intubation or death. These results complement larger cohort studies and highlight risk differences across metropolitan areas with varying COVID-19 prevalence, demographics, and comorbid disease burden. Notably, our predictive model had limited success, which may suggest unmeasured factors also contribute to disease severity differences.

Primary Presenter: Richard Smith

Project Title: PURIFYING ANTIBODIES TO CITRULLINATED PROTEIN ANTIGENS FROM RHEUMATOID ARTHRITIS PATIENT SERUM AND CROSS-REACTIVITY WITH FECAL POOL BACTERIA

Primary Mentor: Kristi Kuhn

Secondary Mentor(s):

Thematic Area: Basic Biomedical Science

Abstract:

There is mounting evidence that Rheumatoid Arthritis (RA) may originate at a mucosal surface: Microbial dysbiosis occurs in new onset seropositive RA (Scher, eLife 2013); autoantibodies such as Rheumatoid Factor (RF) and Antibodies to Citrullinated Protein Antigens (ACPA), including Cyclic Citrullinated Peptide (CCP), are found at mucosal surfaces in individuals with and at risk for RA (Willis, Arthritis & Rheumatology 2013); and individuals at risk and with RA have IgA autoantibodies and expanded IgA plasmablasts in their circulation (Kinslow, Arthritis & Rheumatology 2016). Our unpublished data demonstrate ACPA positivity is also present in the feces of 30-50% of at-risk subjects regardless of serum ACPA status. Using previously published methods in which CCP3+ antibodies in sera are bound to the commercial ELISA and then uncoupled (Scherer, Arthritis & Rheumatology 2010), ACPA was purified from biospecimen 's serum and re-confirmed by ELISA. We utilized pools of banked feces that contain a broad sampling of individuals as to capture a diversity of ACPA from these samples and applied purified serum ACPA. Our results found that ACPA purified from serum did recognize a small subset of bacteria, which suggest cross-reactivity between antigens that may arise from molecular mimicry. Furthermore, these results may provide insight into bacterial antigen candidates for future exploration into the beginning of the disease progression of RA in the mucosal surface.

Primary Presenter: Jamie Solis

Project Title: JCV GCN PML: A Clinical Case Series

Primary Mentor: Carlos Franco

Secondary Mentor(s): Avindra Nath

Thematic Area: Clinical Science

Abstract:

JC virus (JCV) granule cell neuronopathy (GCN) was first described in 2005 as a clinical entity distinct from PML. However, the concept of GCN as part of a potential PML spectrum has not been fully explored. Here, we describe two GCN-PML cases in the setting of persistent CSF JC viremia and detail the postmortem findings in a third. Slow progression, low CSF JCV copy numbers, and archetype strain distinguished the postmortem case from the two in vivo cases, which were associated with the neurotropic strain and a more fulminant clinical course. Our findings not only suggest GCN is part of the PML spectrum, but it is part of the spectrum regardless of JCV genotype.

Primary Presenter: Alexandra Sotiros

Project Title: Patient Feedback on A Novel Multidisciplinary Model of Adult Transgender Care in Colorado

Primary Mentor: Rita Lee

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Background: Approximately 20,850 transgender people reside in Colorado.¹ In a state-wide survey, 85% of transgender respondents reported that there were not enough adequately trained health professionals; 53% had been denied services due to their gender identity.² The UHealth Integrated Transgender Program (UCHITP) was created to centralize care of the transgender community in a gender neutral space. Unlike other models of care, UCHITP consists of a multidisciplinary team from internal medicine, endocrinology, psychiatry, and gynecology to provide comprehensive adult care within a single visit.

Goals/Specific Aims: UCHITP should improve transgender patients' access to and experiences with health care. To evaluate our unique model of care, we aimed to obtain the perspectives of all UCHITP patients who had visits within the first year through post-visit phone surveys.

Materials and Methods: After obtaining IRB exemption, we contacted patients for a phone survey. All surveys were conducted in English. We assessed patient satisfaction on a Likert scale (0-10) and open responses about the model of care, patient intake and flow, and areas for clinic improvement.

Results: All of the 73 patients seen at the clinic during the first year were contacted and 34 participated. Respondents self-identified as 9 female, 8 transgender female, 4 male, 10 transgender male, and 3 non-binary. UCHITP was the first source of gender-affirming care for 26%. The average overall satisfaction score was 8/10. The most frequently described concerns were insurance (12%) and long appointment wait times (52%). Twenty-one respondents (62%) saw more than 1 provider during a single visit. Of those, 14 saw them sequentially, 5 saw providers as a panel, and 3 saw them as a combination of sequential and panel. Every person spoke positively about their experience with the format; 1 person expressed frustration about repeating themselves to different providers and another patient complained about waiting between seeing providers. Primary recommendations for improvement were: hire a surgeon (8), improve affordability (4), and provide social work (4) and therapist (3) support. Other suggestions included more information about clinic resources, clear expectations for the first visit, and better communication and follow-up.

Conclusions: An integrated model of delivering services within a single visit received favorable reviews. Streamlining visit times can be helpful for those who have difficulty accessing care, while administrative details remain in need of improvement. In response, we will develop patient information handouts, work on clinic processes, and expand our team to cover more needs.

Primary Presenter: Matthew Spear

Project Title: One-Year Outcomes in Children with Critical Neurological Illness and Prolonged Mechanical Ventilation: Hospital Readmission and New-Onset Epilepsy

Primary Mentor: Aline Maddux

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Objective ""To identify characteristics of children with primary neurologic diagnoses in PICU admissions that increase risk of unplanned health resource utilization during the year after discharge. Additionally, to characterize the frequency and risk factors for post-ICU epilepsy within this cohort.

Design ""Retrospective cohort study of a single-center population matched in the Colorado All Payer Claims Database, 2013-2017.

Patients ""101 children (>18 years at admission), who survived to discharge, were mechanically ventilated for >72 hours, with primary neurologic diagnoses.

Measurements and Main Results ""The primary outcomes were unplanned hospital readmissions and emergency department (ED) visits within 12 months of discharge from index hospitalization. The primary outcome to identify post-ICU epilepsy was insurance claim record of antiepileptic drug use in months 6-12 after index hospitalization discharge. We hypothesized that seizures during index hospitalization would be positively associated with these outcomes. Unplanned rehospitalization and ED visits were common in this cohort, 25% and 47% respectively, and occurred soon after discharge, (respectively, median months: 2.5, 1.6). Having a pre-existing complex chronic condition and having a primary diagnosis of seizures were significantly associated with unplanned health care use. Post-ICU epilepsy was found in 29% of this cohort, and was significantly associated with having any seizures while admitted, regardless of primary diagnosis.

Conclusions ""Many survivors of pediatric neurocritical illness experience unplanned hospital use in the first year after discharge. Post-ICU epilepsy is common amongst this cohort, and was not associated with any specific primary diagnoses, but was associated with any seizures while hospitalized. Prompt, specialized follow-up care for this population could be helpful in preventing unplanned medical care and educating families.

Primary Presenter: Christina Stevens

Project Title: Prevalence of Nocturnal Hypoxemia in a Cohort of Fontan Patients Living at Altitude

Primary Mentor: Joseph Kay

Secondary Mentor(s): Roni Jacobsen

Thematic Area: Clinical Science

Abstract:

Background: Chronic mild hypoxia is common in many Fontan patients. The prevalence and effect of nocturnal hypoxia is not well studied in this patient population and may lead to additional stress on the fragile Fontan cardiac physiology. It is recognized that sleep disordered breathing is common at very high elevations, but its prevalence at elevations such as Denver's at 5,280 ft (1600 m) is less clear. We aimed to evaluate the prevalence of sleep disordered breathing, defined as nocturnal hypoxia or apnea during sleep, in a population of adult Fontan patients living at altitude.

Methods: We performed a retrospective chart review of adult Fontan patients living at altitude followed in our ACHD program (n=47). All charts were first evaluated for documentation of a polysomnography. For patients who had polysomnography, we evaluated Apnea Hypopnea Index (AHI, events/hour), baseline oxygen (O₂) saturation, sleep time spent below 88% O₂ saturation, and lowest O₂ desaturation.

Results: In our Fontan patient population living in Colorado, only 12 of the 47 patients had assessment for sleep disordered breathing (26%). There was significant hypoxia in 9 of the 12 patients (75%), with an average drop in saturation of 8.1%. Half of the patients spent more than 5% of sleep time with oxygen saturations below 88%. A minority of patients tested (17%) had sleep apnea (defined as AHI>5).

Conclusions: Significant nocturnal hypoxia was present in 75% of our Fontan cohort who had screening studies. Sleep disordered breathing can lead to elevated pulmonary vascular resistance, which is poorly tolerated in this population. The high prevalence of oxygen desaturation within our study population suggests that screening for sleep disordered breathing should be considered for all Fontan patients living at altitude. However, further research is necessary to determine whether the apparently high prevalence of nocturnal hypoxia in Fontan patients living at altitude is associated with increased morbidity and mortality, as well as if a similarly high prevalence of nocturnal hypoxia exists for patients with Fontan physiology living at lower elevations.

Primary Presenter: Anne Strong

Project Title: CLINICAL UTILITY OF ELECTRORETINOGRAMS FOR EVALUATING VIGABATRIN TOXICITY IN CHILDREN

Primary Mentor: Jennifer Jung

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Title: Clinical utility of electroretinograms for evaluating vigabatrin toxicity in children

Background: Vigabatrin is an anti-epileptic drug approved for the treatment of infantile spasms and refractory complex seizures in the pediatric population. Unfortunately, visual field defects, electroretinogram (ERG) findings, and retinal changes associated with vigabatrin use have been well documented in the literature. In response to reports of adverse ocular effects, ophthalmologists and neurologists resorted to performing ERGs with general anesthesia every 3 to 6 months as a screening tool for vigabatrin induced retinal toxicity in nonverbal pediatric patients.

Objective/Purpose: Given the high cost of ERG screening and risks of general anesthesia, this study sought to determine if there are changes in clinical management in response to ERG results.

Methods: We retrospectively reviewed the medical records of patients who received ERGs at Children's Hospital of Colorado from 2009 to 2012. Age, indication for ERG, ERG data, and clinical management of vigabatrin were extracted from the records. ERGs were interpreted according to LKC Technologies normative values. A physician trained in ERG analysis interpreted each ERG.

Results: One hundred and seventy ERGs were performed during the study period, and 147 ERGs were available for analysis. Every patient received general anesthesia for the procedure. Thirty-three ERGs were performed in 29 patients specifically as screening for retinal toxicity due to vigabatrin use, and 30 were available for analysis. Within this cohort, only 2 ERGs were normal (6.6%), and 28 were abnormal (93.3%). In patients who received abnormal results, 1 patient discontinued vigabatrin in response to the screening.

Conclusions: In our study cohort, clinical management generally did not change in response to an abnormal screening result. Given the need for general anesthesia in the pediatric population receiving ERG testing, and minimal change in clinical decision making in the face of abnormal results, ERG screening for retinal toxicity due to vigabatrin in the pediatric cohort should be reconsidered.

Significance: ERG screening for vigabatrin induced toxicity is costly, not without risks, and does not change clinical management, and thus, should not be performed.

Primary Presenter: Erin Sturman

Project Title: A Systematic Review of Diagnosis and Treatment of Acute Limb Ischemia during Pregnancy and Postpartum Period

Primary Mentor: Rafael Malgor

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: Acute limb ischemia (ALI) carries significant overall morbidity and mortality. Pregnant and postpartum women are physiologically hypercoagulable, but little is known about the impact of ALI in this cohort of patients. The goal of this systematic review was to gather available data on diagnosis and treatment of ALI during pregnancy and the postpartum period.

Methods: A systematic review of studies on patients with ALI during pregnancy and puerperium was performed following the PRISMA guidelines. Three databases including Pubmed Medline, EMBASE, and Cochrane library were queried. Manuscripts, which provided data on diagnosis and treatment of ALI in pregnant and postpartum patients, were included regardless of language or study design. Outcomes of interest included type of treatment for ALI (open and endovascular), morbidity and mortality.

Results: Fourteen manuscripts out of 6,222 references were included with a total of 14 patients. The median age of patients was 31.5 years. Embolism was the slightly more common etiology than thrombosis, present in 8 (57%) patients. All patients had a pregnancy complication or concomitant medical condition which might have predisposed to arterial occlusion either directly or indirectly by leading to iatrogenic arterial injury, with peripartum cardiomyopathy being the most common and occurring in 6 (43%) patients. Open surgery was the preferred treatment option in 11 (79%) patients followed by anticoagulation alone. No endovascular procedures were described. One patient underwent major amputation on presentation and an additional patient required major amputation for recurrent ALI. No deaths occurred. Twelve (86%) patients had complete recovery with no other ALI-associated sequelae.

Conclusions: ALI is rare in pregnant and postpartum women despite their transient physiologic hypercoagulability and is almost uniformly associated with pregnancy complications. Open surgical revascularization or anticoagulation alone appears to have acceptable outcomes as the majority of patients present with embolism or thrombosis without underlying systemic arterial disease.

Primary Presenter: Alexis Sunshine

Project Title: The predictive value of preoperative apparent diffusion coefficient (ADC) for facial nerve outcomes after vestibular schwannoma resection: clinical study

Primary Mentor: Samy Youssef

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Diffusion MRI has been used to predict intraoperative consistency of tumors. Apparent diffusion coefficient (ADC) has shown predictive value as an imaging biomarker in many CNS tumors but has not been studied in a large cohort of patients with vestibular schwannoma. In this study, we examine the utility of ADC as a predictive biomarker for intraoperative tumor characteristics and postoperative facial nerve outcome. Middle-range preoperative ADC in vestibular schwannoma suggests a less favorable postoperative HB score. Preoperative measurement of ADC in vestibular schwannoma may provide additional information regarding prognostication of facial nerve outcomes.

Primary Presenter: Lillian Svete

Project Title: Differential expression of fetal miRNAs in response to obesogenic pregnancy

Primary Mentor: Kristen Boyle

Secondary Mentor(s):

Thematic Area: Basic Biomedical Science

Abstract:

An emerging field in obesity research is investigating how exposure to a maternal obesogenic environment in utero may predispose the fetus to developing these conditions later in life. In animal models, fetal exposure to a high fat diet has been shown to have a causal relationship in the development of obesity, metabolic associated fatty liver disease (MAFLD), high blood pressure, dyslipidemia, cardiovascular impairment, insulin resistance, hyperglycemia, systemic inflammation, and oxidative stress. Fetal cardiometabolic risk factors associated with maternal obesity and high fat diet are thought to be due in part to epigenetic modifications to genes involved in stem cell differentiation, metabolism, and inflammation. Several studies have explored miRNA expression patterns in tissues from offspring exposed to a maternal obesogenic environment. In this literature review, we discussed differential miRNA expression in offspring exposed to maternal obesity in various tissues, that when dysregulated, propagate metabolic disease. We also discussed the known roles of these miRNAs in the context of inflammation, metabolism, and stem cell fate.

Primary Presenter: Emily Swenson

Project Title: Evaluation of Strabismus Surgery in University of Colorado Ophthalmology Residents

Primary Mentor: Jasleen Singh

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Purpose: To evaluate proficiency in strabismus surgery among University of Colorado ophthalmology residents using a modified strabismus surgery evaluation rubric.

Methods: The Modified Strabismus Surgery Evaluation Rubric was created to augment the validated ICO-OSCAR: strabismus tool. The modified rubric assessed residents in 21 pre-op, surgical, and post-op steps based on a Likert scale of 1 (novice) to 5 (expert). Rubrics were compiled and analyzed in Matlab and Excel to investigate overall proficiency and proficiency in each of the individual components. Proficiency was defined as scoring a 4 on the Likert scale for at least 2 consecutive cases. Evaluations were completed by 5 University of Colorado faculty attending physicians for ophthalmology residents during their pediatrics rotation at the Children's Hospital of Colorado. The 109 rubrics used in the analysis were completed by attending physicians for 9 total residents.

Results: On average, residents were proficient in all components of the rubric by the end of 18 cases and proficient in the surgical steps by the end of 20 cases. Strongest skills included discharge paperwork and consent (8 and 9 cases until proficient, respectively) while the weakest skill was hooking the rectus muscle (23 cases until proficient).

Conclusions: Compiled data from the Colorado strabismus surgery rubric identified areas of strengths and weaknesses within the University of Colorado ophthalmology residents. While more data is needed, these initial results can be used to improve resident training at a program level.

Primary Presenter: Andrew Tannous

Project Title: Inflammatory Signaling in Acutely Induced Hyperinsulinemia and Hyperlipidemia in Normal Weight Women-The Reprometabolic Syndrome

Primary Mentor: Nanette Santoro

Secondary Mentor(s): Andrew Bradford

Thematic Area: Basic Biomedical Science

Abstract:

Context: Obesity, is a state of chronic inflammation, characterized by elevated lipids, insulin resistance and relative hypogonadotropic hypogonadism. We have defined the accompanying decreased LH, FSH, ovarian steroids and reduced pituitary response to GnRH as Reprometabolic syndrome, a phenotype that can be induced in healthy normal weight women by acute infusion of free fatty acids and insulin.

Objective: To identify potential mediators of insulin and lipid-related reproductive endocrine dysfunction.

Design, Setting, Participants : Secondary analysis of crossover study of eleven eumenorrheic reproductive aged women of normal BMI (<25 kg/m²) at an academic medical center.

Intervention: Participants underwent 6-hour infusions of either saline/heparin or insulin plus fatty acids (Intralipid plus heparin), in the early follicular phase of sequential menstrual cycles, in random order. Euglycemia was maintained by glucose infusion. Frequent blood samples were obtained.

Main Outcome Measures: Pooled serum from each woman was analyzed for cytokines, interleukins, chemokines, adipokines, FGF-21 and markers of endoplasmic reticulum stress (CHOP and GRP78). Paired t tests were used to compare results across experimental condition.

Results: Except for MIP-1b, no significant differences were observed in serum levels of any of the inflammatory signaling or ER stress markers tested.

Conclusion: Acute infusion of lipid and insulin, to mimic the metabolic syndrome of obesity, was not associated with an increase in inflammatory markers. These results imply that the endocrine disruption and adverse reproductive outcomes of obesity are not a consequence of the ambient inflammatory environment, but may be mediated by direct lipotoxic effects on the hypothalamic-pituitary-gonadal axis.

Primary Presenter: Walter Taylor

Project Title: Long-term Healthcare Utilization in Children with Neonatal Abstinence Syndrome

Primary Mentor: Caleb Ing

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Objective: To evaluate healthcare utilization in Medicaid enrolled children with neonatal abstinence syndrome (NAS) in the first 2 years of life.

Study design: A retrospective, longitudinal cohort study evaluating Medicaid enrolled children born in New York (1999-2011) and Texas (1999-2010) was performed. Healthcare utilization, including inpatient days, emergency department and outpatient visits, and filled prescriptions in children after birth hospitalization was assessed. A tapered propensity-matching methodology was used, matching each child with NAS with 5 children without NAS, first on demographics, then on both demographics and clinical covariates (clinical diagnoses and congenital anomalies at birth). Poisson and negative binomial regression were used to calculate healthcare utilization ratios (HUR).

Results: In the first 2 years of life, children with NAS (n = 3799) had increased healthcare utilization with more inpatient days and emergency department visits than demographically similar children without NAS. This increased utilization however did not persist after matching on clinical covariates and performing multiple comparisons adjustment (inpatient days [HUR, 1.01; 95% CI, 0.88-1.16; P = .89], total emergency department visits [HUR, 1.06; 95% CI, 1.01-1.11; P = .02]). Children with NAS conversely had 9% fewer outpatient office visits (HUR, 0.91; 95% CI, 0.87-0.95; P < .0001).

Conclusions: A diagnosis of NAS does not appear to be an independent predictor of increased healthcare utilization in the first 2 years of life. These results differ from some other published studies, but may suggest that the increased healthcare utilization observed in children with NAS is due to higher incidences of perinatal complications and congenital anomalies in children with prenatal drug exposures.

Primary Presenter: Dylan Therwhanger

Project Title: ARE OUTCOMES IN PATIENTS WITH PRESUMED HEAD INJURIES THAT UNDERGO RSI ARE IMPACTED BY INSTITUTIONAL PRACTICES AND MEDICATION CHOICE?

Primary Mentor: Stacy Trent

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Rapid sequence intubation procedures have been subject to change over the past ten years as new paralytic medications have come into wider practice. Traditionally succinylcholine has been the most popular medication for this procedure but the past decade has seen a significantly large increase in the use of rocuronium, a newer agent on the market (20). Many conflicting studies have been performed on the outcome differences between these medications. For the most part, it is up to institutional and provider preference for which medication to use during RSI.

Hypothesis/Objective: Our hypothesis with this study is threefold:

- * Choice of pharmacologic management of RSI in ED patients with presumed head injury varies significantly across institutions.
- * Patient and institutional characteristics are significantly associated with variation in pharmacologic management of RSI in ED patients with presumed head injury.
- * Patient outcomes are significantly associated with variation in pharmacologic management of RSI in ED patients with presumed head injury

The purpose of the study is to prove that not only do procedural differences exist between institutions, but that these differences are leading to significant differences in patient outcomes.

Methods: This will be a retrospective chart review study using the NEAR database, which is an intubation database to which participating institutions can upload intubation data for research purposes. Patient MRNs will be taken from the NEAR database and then input into Epic. The emergency department and neurosurgery charts will be examined for the following parameters: whether a head injury was present (a head injury must be confirmed by imaging study), what the patient's GCS at time of arrival was, whether ICP monitoring was initiated in the ED, whether Mannitol was administered, the intubation medication used, if the patient underwent emergent neurosurgery within 4 hours of arrival, if the patient survived to hospital discharge, and what the disposition at discharge was. These measures will be compared across institutions to first determine whether significant differences exist between institutions, and, if so, whether these differences lead to significant differences in patient outcomes.

Current Progress: Currently we have encoded into an Excel spreadsheet data from approximately 400 patients from Denver Health. We are actively collecting more data for input. We will then

collect data from other institutions and run statistical analyses. The study is in its very early stages.

Primary Presenter: Amanda Tompkins

Project Title: Can empathy be taught to medical students? Redesign and re-evaluation of experiential empathy training curriculum

Primary Mentor: Mark Deutchman

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Empathy and a positive patient-provider relationship have been shown to increase patient adherence to treatment plans, improve patient outcomes and have also been shown to have a protective effect against physician burnout. Resilience in physicians has also been shown to improve a physician's ability to empathize with patient experience and improve health outcomes. Research has shown that throughout medical education, especially in years with increased clinical experience, student empathy scores decrease. The Adopt-A-Disease Empathy Training program was developed as an experiential learning intervention to increase student empathy towards those living with chronic diagnoses. This curriculum has been executed twice with no significant results. In this study, the Jefferson Scale of Empathy for Students (JSE-S) was used to assess changes in empathy and the Brief Resilience Scale (BRS) was used to assess resilience as a possible modulating variable. The JSE-S was administered before and after the intervention while the BRS was administered after successful completion of the study. Participants were also afforded the opportunity to give free-text written feedback. Results analyzed to assess changes in empathy before and after the intervention and what other demographic and collected data may inform how empathy varies by gender, age or resiliency. There was a significant increase in JSE-S following the intervention, indicating that experiential empathy training programs could be a valuable addition to undergraduate medical education curriculum to benefit future patients and could benefit learners through the prevention of future burnout.

Primary Presenter: Allee Torres

Project Title: Ketamine Administration in Prehospital Combat Injured Patients With Traumatic Brain Injury: A 10-Year Report of Survival

Primary Mentor: Vikhyat Bebarta

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: The Tactical Combat Casualty Care (TCCC) guidelines recommend ketamine as the primary battlefield analgesic in the setting of moderate-to-severe pain and hemodynamic compromise. However, despite recent studies failing to support the association between ketamine and worse outcomes in head trauma, TCCC guidelines state that ketamine may be sustained in a combat setting between ketamine recipients and non-recipients.

Methods: This is a secondary analysis of previously published data in the Department of Defense Trauma Registry from January 2007 to August 2016. We isolated patients with an abbreviated injury scale of 3 or greater for the head body region. We compared mortality between prehospital ketamine recipients and non-recipients.

Results: Our initial search yielded 28,222 patients, of which 4,183 met the inclusion criteria: 209 were ketamine-recipients and 3,974 were non-recipients. The ketamine group had a higher percentage injured by explosives (59.81% vs. 53.57%, $p<0.001$) and gunshot wounds (28.71% vs. 22.07%, $p<0.001$) and were more frequently located in Afghanistan (100% vs. 68.0%, $p<0.001$). The ketamine group had higher rates of tourniquet application (24.4% vs. 8.5%, $p<0.001$) and had lower survival proportion (75.1% alive vs. 83.0%, $p=0.003$). All differences were significant. On univariable analysis, the ketamine group had worse odds of survival with (OR: 0.62; 95%CI: 0.45-0.86). When controlling for the presence of an airway intervention and mechanism of injury, the finding was non-significant (OR: 1.09; 95% CI: 0.76-1.55).

Conclusions: In our prehospital combat study, after controlling for confounders, we found no association between administration of prehospital ketamine and worse survival outcomes for casualties with head injuries. However, despite the lack of difference in overall survival noted, those who received ketamine and died had a higher risk ratio for time to death.

Primary Presenter: Katherine Turner

Project Title: Implementing a Diagnostic Error Trigger Tool in Pediatric Emergency
Departments and Urgent Care Sites

Primary Mentor: Irina Topoz

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: Diagnostic error (DE) is a significant source of morbidity and mortality. Identifying sources of DE and opportunities for healthcare improvement requires continuous case review. However, no systematic approach to screening large volumes of patients for DE has been described in the pediatric acute care setting. It 's also unknown to what extent reviewers can agree on presence or absence of DE. This project sought to use the Safer Dx Instrument within interprofessional review teams to identify cases of DE and subsequently design and implement an efficient trigger tool for DE in the pediatric acute care setting based on common characteristics between cases of DE. with the goal of using the tool to identify cases that warrant further team-based review. We hypothesized that cases in which a patient was seen in the ED and returned to care within seven days resulting in a hospital admission would be more likely to contain a DE. Among these cases, we hypothesized that there would be identifiable common characteristics between them such that a profile of a potential DE could be established.

Methods: Cases for review were identified from the medical records of EDs and UC centers across the Children 's Hospital Colorado (CHCO) health system and included all patients who were seen at any CHCO ED/UC site between April 2018 and September 2018, discharged home, subsequently returned to care within seven days of initial visit, and were ultimately admitted to the hospital. Each case was reviewed by an interprofessional review team which included ED providers and registered nurses (RNs). Team members were presented with all the clinical data associated with each episode of care including provider notes, vital signs, laboratory results, and diagnostic imaging. They were advised to review all available data independently of other reviewers and to complete the Safer Dx Instrument without discussing their findings with other reviewers.

Results: There were 165 cases reviewed by two interprofessional review teams. Of the cases reviewed, 21 (12.7%) had significant agreement among reviewers on presence of a DE. Cases determined to contain a DE were compared to those without a DE on the following characteristics: median patient age in years, location of initial visit, number of visits, time of arrival on each visit up to four visits, days between the initial visit and the final visit, and days between each visit. None of the characteristics reviewed revealed significant differences between the two groups.

Conclusions: This study demonstrates that interprofessional case review is feasible utilizing a standardized review template. While a consistent set of characteristics was not discovered among the DEs identified in this study, the work summarized here lays the groundwork for future efforts

in healthcare improvement. By continuing to iterate and increasing the efficiency of the case review process, we hope to maximize the rate at which we improve the safety of healthcare delivery to decrease the risk of morbidity and mortality to our future patients.

Primary Presenter: Uriel Villalobos

Project Title: Incidence Outcome and Health Care Utilization of Dog Bites at Children Hospital Colorado

Primary Mentor: Todd Wine

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Background: Dog bites in children have always been a major problem in the U.S. and other parts of the world where children and dogs coexist in the same household. The most common location of dog bites in young children is the head and neck region, which happens in approximately 82% of attacks.

Objectives: A retrospective review of charts from patients treated at Children 's Hospital Colorado was performed to find out what resources are required for complete healing/treatment of dog bites. The purpose is to make parents who have children and dogs in their household more aware of the personal and health care burden of dog bites.

Methods: Children aged 0-18 years, treated for head and neck bites at CHCO from 2012 to 2017, were included in our study. Demographics, dog breed, wound location, hospital course, management, and complications were recorded for each individual patient by one investigator using EPIC electronic medical care system and Research Electronic Medical Capture (REDCap) system for data collection.

Results: Four-hundred and sixty children aged 0 to 18 years (mean, 5.23 years) were included. The cheek (47.8%), mouth (33.3%), and eye area (23.5%) were the most commonly bitten areas. Labrador retriever (n=31), pit bull (n=27), and chihuahuas (n=18) were the most commonly involved dog breeds. One-hundred and twenty-three (26.7%) of patients required repair only using local anesthetic at the emergency department, 100 (21.7%) required conscious sedation in addition to local anesthetics, fifty-seven (12.4%) patients required repair at the operating room, and 180 (39.1%) patients required no repair at all. Despite thorough irrigation and debridement (I&D) of wounds before primary closure/treatment and use of antibiotics, infections happened in 69 (15%) of patients.

Conclusion: Physical limitations and parents ' unawareness of the dangers that dogs pose to children make them vulnerable to dog bite injuries to the head and neck region. Most patients successfully recover after treatment at the emergency department, with only a small percentage requiring intervention in the operating room. Infection rates of bites tend to be low, but further investigation regarding their prevention must be done.

Primary Presenter: Michael Vrolijk

Project Title: Teaching How to Care for Trans/Gender Non-Conforming Patients: It Is Easier Than You Think

Primary Mentor: Alison Shmerling

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

This study demonstrates the importance of an hour lecture and patient panel in arming medical professionals with the communication skills necessary for serving transgender and gender non-conforming patients. While many programs may teach the medical side of transitioning, a well-documented barrier for trans/gender non-conforming patients arises from communication: using incorrect pronouns, gendered language, and lack of practitioner exposure. All medical professionals must be equipped in order to address this barrier, since trans/gender non-conforming patients require care from every specialty and can face often unintentional prejudiced language when seeking care.

In an effort to equip students with the necessary communication skills, 41 physician assistant students attended a one-hour lecture followed by an hour patient panel. The lecture reviewed bias, the difference between sex, gender, gender expression, and sexual identity as well as terms that can be used in place of gendered language and other ways to create a safe, comfortable clinical environment for all patients. The patient panel had one person identifying as gender non-conforming and a transwoman. Students completed a survey the week before and immediately following the lecture evaluating their comfort and knowledge communicating with trans/gender non-conforming patients. The surveys found a statistically significant difference in student understanding and comfort around barriers to care, inclusive language, educating other healthcare practitioners, and the differences between sex and gender.

This project shows that students need education surrounding communication with transgender and gender non-conforming patients and that a two-hour lecture and patient panel can increase student competency and confidence. Future directions include extending this study to other student groups and residents.

Primary Presenter: Corey Walsh

Project Title: Qualitative Definitions of LGBTQIA+ Inclusivity in the Colorado Healthcare Environment

Primary Mentor: Rita Lee

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Despite national improvements in LGBTQIA+ inclusivity, local governmental policy and public attitudes continue to influence the health of this community. This study emphasizes perspectives among rural and non-urban LGBTQIA+ patients to further define attributes of inclusive healthcare provision through a thematic, qualitative approach. Participants (n=28) joined semi-structured focus groups in Denver, Ft. Collins, Colorado Springs, and Grand Junction. They were more likely to identify as white (78.6%) and transgender or gender diverse (71.4%), and a majority of patients (85.7%) lived in rural or non-urban regions outside of the Denver metropolitan area. Focus group themes were identified, such as inclusive language use, comfort with sexual history taking and exams, advanced communication skills, cohesion among all team members, LGBT training credentials, provider connection to community, ability to provide specialized and preventive care, importance of LGBTQIA+ symbolism, and value for the individual. Specific examples of each were provided in detail, including notable direct quotations. This study describes a more inclusive healthcare environment for those traditionally under-represented in LGBTQIA+ medical literature; results were used to create a variety of publicly available resources for patients and healthcare providers in Colorado. Patients discussed tangible solutions to meet these identified needs, which should be a call to action for providers to continue to strive for more patient-centered care.

Primary Presenter: Taylor Wand

Project Title: Virtual Reality Based Mindfulness for Burnout Prevention in a Family Medicine Residency

Primary Mentor: Jen Caragol

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Background: Burnout among family medicine physicians and residents is a significant problem within the American medical system, affecting physician health and patient care. It is imperative to address this issue with new strategies and techniques. . There is substantial evidence that initiating and maintaining a mindfulness practice can increase resiliency and work satisfaction while reducing psychological illness and burnout. We explored using Virtual reality (VR) as a way for residents who have little free time and work in high stress environments to practice mindfulness.

Objectives: Evaluate if VR is a useful and practical tool to initiate and/or help maintain a mindfulness practice for busy family medicine residents.

Methods: Six family medicine residents attended two didactic lectures on mindfulness and VR and then completed ten meditations using the VR program over one month. Qualitative data was then collected through interviews to better understand resident"s views on using VR as a tool to practice mindfulness.

Results: Advantages of using VR to practice mindfulness proposed by residents: ø Guided meditations with visual and auditory stimuli helped residents øescape • the busy clinical environment for the short mindfulness practice. ø Immersive meditations were helpful for resetting and relaxing after stressful encounters. ø VR is a good way to initiate a mindfulness practice for beginners.

Challenges: ø Residents felt pressed for time even with the short nature of the VR guided meditations. They claimed that even a small amount of dedicated time set aside for mindfulness would help them maintain their practice. ø Some residents felt that they had too much screen time already and VR added to that.

Conclusions: VR is a novel modality for implementing and sustaining a mindfulness practice for family medicine residents. It can be used in a busy clinical setting and can increase resilience and reduce burnout leading to improved physician well-being and patient care. Dedicated time set aside for a short mindfulness session during a busy clinic day is an important aspect of making this approach practical for residents. Further quantitative research regarding this 21st century modality as a tool for practicing mindfulness should be explored.

Primary Presenter: Sean Wickers

Project Title: Four for the Price of One: Achieving Competencies of Multiple Clerkships with Rural Family Physicians

Primary Mentor: Roberto Silva

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Introduction: Longitudinal Integrated Clerkships (LICs) allow medical students to participate in the comprehensive care of patients over time and meet core clinical competencies over several disciplines concurrently. Most urban LICs have large pools of preceptors that include many subspecialists. In rural communities family physicians often provide primary care in addition to emergency, inpatient, and obstetric care. We will examine how requirements of multiple core clerkships can be met with a small group of rural preceptors led by family physicians. Methods: We will examine a pilot program that combined five traditional clerkships (primary care, ob-gyn, surgery, inpatient medicine, and emergency care) into LICs in rural communities. Students logged all patient experiences including patient age, complaints and diagnoses, level of student involvement, clinical setting, and preceptor. Students also logged involvement in procedures and surgeries. We will examine how learning objectives of clerkships traditionally led by subspecialists can be met with rural preceptors. Results: Medical students were able to meet the majority of required core competencies while working with family physician preceptors. On average, students met greater than 97% of competencies met on average across all 5 traditional clerkship blocks included in the LIC. Discussion: Our findings support the case that a large number of sub-specialist preceptors or an urban setting are not required to teach the core competencies of the clerkship year. This research lays an important foundation for further research to explore the possibility of rural LICs as a method to increase rural practice and address rural health shortages in Colorado.

Primary Presenter: Tyler Wieman

Project Title: Patient Companion Program: A Curriculum to Promote Patient Advocacy and Education in the Geriatric Population

Primary Mentor: Janna Hardland

Secondary Mentor(s):

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Purpose/Aim: The Patient Companion Project was created to provide meaningful volunteer opportunities to undergraduate pre-health volunteers while benefiting patients living in a long-term care setting. This curriculum emphasizes education about pertinent geriatric topics, including elder abuse, health literacy, advanced care planning, palliative care, barriers to healthcare, patient advocacy, motivational interviewing, evidence-based medicine, isolation and its effects on the geriatric population, medical aid in dying, depression, PTSD, dementia, movement disorders, pain management, behavioral changes, Medicare/ Medicaid and HIPPA education, while providing companionship to long term care patients in the hopes of improving health outcomes.

Background: Volunteer and clinical experiences are important for admission of students to health professional programs yet combining these experiences can be difficult with busy class schedules and/or part-time employment. Additionally, geriatric patients often face challenges in health care with reduced access to resources, limited health care literacy, language barriers, and lack of social support. These patients are at increased risk of isolation, mood disorders and experience a large burden of illness and healthcare utilization. Pairing these groups offers an opportunity to benefit both the undergraduate volunteers as well as the paired geriatric patients.

Methods: We recruited the pre-health students from the University of Colorado at Denver and the University of Colorado at Boulder by presenting at their institutions via their pre-med programs as utilizing pre-professional emails. We coordinated with the Colorado State Veteran's Home Recreational Coordinator to pair our pre-health students with isolated veterans without severe cognitive disease for a period of 2 years. These undergraduate volunteers will meet with their assigned veteran twice every month. As a group, we meet every month for 1-2 hours for one of our educational lectures, journal club, book discussion, and to touch base with the undergraduate volunteers about their experience. The undergraduate volunteers document all their visits on an after-visit survey in order to monitor their experience, as well as fill out surveys monitoring their confidence about the curriculum's learning objectives. We have also created quality of life surveys that can be implemented in the future of this project, in hopes to gather data before our volunteers are paired with their patient, at the one year mark and after 2 years of being paired with their patient. We will also provide surveys to the current and prior pre-health volunteers at the end of their dedicated 2 years regarding what significance the Patient Companion Project had on their life and their consideration of the medical field as a career field.

Summary of Progress: Our preliminary survey results show improvement in confidence in knowledge-based, value-based, and skill-based learning objectives after 6 months of the established educational curriculum.

Our future goal for this curriculum is to create a simple, straightforward guideline that can be replicated by other institutions. Once the COVID-19 pandemic wanes and the nursing home community is safe again, we will ask our volunteers to return to their in-person visits with the option to continue letter writing as well. We will also set up shadowing opportunities for the volunteers once facilities allow for the safe return of pre-med students. Our monthly lectures will continue with Zoom for the convenience of our lecturers as well as our volunteers unless a hands-on workshop is scheduled. Our hope is that other interesting programs will be able to adopt our curriculum and implement it at their home programs.

Primary Presenter: Brett Wiesen

Project Title: Use of the Surgical Risk Preoperative Assessment System (SURPAS) Reduces Patient Anxiety and Improves Patient Satisfaction during Informed Consent for Surgery

Primary Mentor: Robert Meguid

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Background: The objective of this study was to determine the effects of using the Surgical Risk Preoperative Assessment System (SURPAS) on patient satisfaction and surgeon efficiency in the surgical informed consent process as compared to surgeons' usual consent process.

Study Design: Patient perception of the consent process was assessed via survey in two cohorts: 10 surgeons in different specialties used their usual consent process for 10 patients; these surgeons were then taught to use SURPAS and employed it during the informed consent process of 10 additional patients. The data were compared using Fisher's exact test and the Cochran-Mantel-Haenszel test.

Results: 100 patients underwent the usual consent process (USUAL) and 93 underwent SURPAS-guided consent (SURPAS). 82% of SURPAS were very satisfied and 18% were satisfied with risk discussion vs. 16% and 72% of USUAL. 75.3% of SURPAS reported the risk discussion made them more comfortable with surgery vs. 19% of USUAL. 90.3% of SURPAS reported somewhat or greatly decreased anxiety vs. 20% of USUAL. All p-values were <0.0001. 97.9% of SURPAS patients reported enough time spent discussing risks vs. 72.0% of USUAL.

Conclusion: The SURPAS tool improved the informed consent process for patients compared to the usual consent process, in terms of patient satisfaction, making patients feel more comfortable and less anxious about their impending operations. Providers should consider integrating the SURPAS tool into their preoperative consent process.

Primary Presenter: Derek Wilson

Project Title: Significant Reduction in Prehospital Evaluation and Door-to-Treatment Times with a Mobile Stroke Unit.

Primary Mentor: Robert Kowalski

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Background: The University of Colorado Mobile Stroke Unit (MSU) provides ambulance-mounted CT scanning and tele-stroke neurologic assessment in the Aurora, CO, metropolitan area. As one of the first U.S. medical centers to utilize a mobile stroke protocol we sought to compare operational characteristics of the MSU during its first year with standard management (SM) of prehospital stroke alerts at a Comprehensive Stroke Center.

Methods: The study compared patient and stroke characteristics, ambulance response, neurologic evaluation, and treatment between the MSU, and SM patients for the same ambulance service area. Variables included time from stroke alert (MSU or ambulance dispatch) to tPA administration, as well as time from arrival at the door of MSU or ED to first brain CT and to IV tPA administration. Patients were dichotomized into those with time from door to needle greater and less than the American Stroke Association "Target" study goal of 45 minutes.

Results: Between Jan. 15, 2016 and Jan. 9, 2017, 47 patients received prehospital management with the UC MSU, and 73 received standard management. Median age was 66 years (IQR 57-77), and 45% were female, with no difference between MSU and SM patients. Thirteen (28%) of patients were treated with IV tPA on the MSU, compared with 16 (22%) through SM. Median time was significantly shorter from door to first CT on the MSU than SM [4 minutes (IQR 4-5) MSU vs. 9 minutes (IQR 6-15) SM, $p < 0.001$]. Median time from dispatch to IV tPA administration was shorter on the MSU [39 minutes (IQR 35-45) MSU vs. 65 minutes (IQR 49-96) SM, $p < 0.001$], and for door to IV tPA [26 minutes (IQR 20-29) MSU vs. 37 minutes (IQR 24-65) SM, $p = 0.022$]. MSU patients were more likely to have door-to-needle times meeting the ASA goal of < 45 minutes [13 (100%) MSU vs. 11 (69%) SM, $p = 0.048$].

Conclusions: Patients treated via the MSU benefited from quicker time to CT, neurologic evaluation, and, critically, significantly shorter time from dispatch to tPA administration, compared with pre-hospital stroke alerts arriving from the same service area. These results suggest prehospital management with an MSU has potential to aid the goal of earlier thrombolysis after ischemic stroke symptom onset.

Primary Presenter: Gabriel Yepes

Project Title: Adolescent male substance use disorder and the “with limited prosocial emotions” specifier: brain activation during decision associated with increasing other harm and self-benefit

Primary Mentor: Joseph Sakai

Secondary Mentor(s):

Thematic Area: Clinical Science

Abstract:

Important work has examined reward processing, motivational drive, and inhibition, among other areas but limited work has explored the role of social cognition in substance use disorders. Aim: To image prosocial decision making and examine the relationship with adolescent substance use disorders (SUD) and the limited prosocial emotions specifier (LPE). Methods: Adolescents males with SUD+LPE (n=21), SUD without LPE (n=21) and controls (n=24) played a game of prosocial decision making in 3T research-dedicated MRI. We modeled trial-by-trial changes in activation for decisions where (1) other harm increased but benefit-to-self was held constant, and (2) benefit-to-self increased but other harm was held constant. Analyses were completed within controls, across the three groups, and for all two-group comparisons. Results: Within controls, activation in the insula, inferior frontal gyrus, temporal-parietal junction, and other regions was reduced as the magnitude of harm to others increased. Analysis of variance showed variation in a similar set of regions. Pairwise-group analyses showed differences in similar regions in both SUD groups relative to controls. As benefit-to-self increased activation in control participants increased in the posterior cingulate cortex, precuneus, parahippocampal gyrus, middle frontal gyrus, parietal regions, and other areas. Adolescents with SUD+LPE showed greater activation in task-sensitive regions than those with SUD without LPE and controls. Conclusions: Using a game of prosocial decision making, our results discriminate associations with LPE specifically and separately with SUD. These findings align with an emerging literature suggesting the importance of social cognition in substance use disorders.

Primary Presenter: Gerald Yeung

Project Title: Occupational health and safety considerations of on-demand workers in the gig economy: An analysis of online forum postings

Primary Mentor: Jeremy Long

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Background: The gig economy has engaged a growing number of workers. Digital matching services in the gig economy are changing power dynamics for these contingent workers while forgoing traditional employer-employee relationships. How this impacts the occupational health of on-demand workers has not been extensively researched.

Additionally, financially dependent gig workers are more likely to be non-white. Gig workers of color are at risk of discriminatory employment practices and the effects of gig work on workers of color need further evaluation.

Method: In this study, we assess self-reported occupational health and safety-related concerns for on-demand workers. We used a constant comparison method to qualitatively analyze one year of candid discussions from publicly accessible online forums used by on-demand drivers and couriers regarding on-demand worker's health and safety concerns while working for digital matching services. We additionally analyzed a subset of discussions in which on-demand workers related their occupational health and safety concerns to their self-identified race and/or ethnicity.

Results: Workers use the forums to discuss problems and seek and share solutions to challenges they encounter in their work. Many of the topics workers discussed reflect what is already known about this kind of work: they express concerns about musculoskeletal pain, the risks of car crashes, and dangers from interacting with the public. However, these digital matching services create a work environment that increases susceptibility to health and safety hazards. These discussions also reveal coping strategies which themselves represent occupational health risks, from self-medication to fatigued driving to carrying weapons.

Additionally, workers related several safety concerns to their race or ethnicity. These include accusations of trespassing while delivering packages, being stopped by police for looking out of place, and being harassed for their perceived ethnicity.

Conclusion: We found that gig workers utilizing digital matching services are more susceptible to safety hazards found in those who partake in similar work. Additionally, the coping mechanisms that these workers resort to may introduce new and different occupational health risks. As more contingent workers are engaging in on-demand work in the gig economy, interventions and policies need to be developed to protect this rapidly growing underserved subset of workers.

Additionally, gig workers of color utilizing digital matching services were concerned about and encountered situations that could expose them to workplace violence. In addition to the dangers associated with interacting with the public, the reported frequency of police interactions potentially puts black workers at risk of facing police violence. Policies need to be developed to protect this growing underserved population of workers. For minority workers, specific interventions are needed to address the racial disparities in safety and working conditions.

Primary Presenter: Tessa Zangara

Project Title: Epidemiology and Outcomes of Necrotizing Soft Tissue Infections: A Population-Based Study of California Hospitalizations in 2016

Primary Mentor: Lisa Ferrigno

Secondary Mentor(s):

Thematic Area: Public Health and Epidemiology

Abstract:

Purpose: Soft tissue infections (STI) encompass a wide spectrum of disease, ranging from cellulitis to necrotizing soft tissue infections (NSTI) which have a mortality rate as high as 20-40%. Diagnosis of NSTI is hampered by a lack of characterization. More research is needed to determine the epidemiology of NSTI, the spectrum of disease over time, and risks for severe disease.

Methods used: Retrospective analysis of the California Office of Statewide Health Planning and Development Patient Discharge Database for the year 2016 was used. Patients were selected using ICD-10 codes representative of the spectrum of STI and NSTI as the principal diagnosis code. Population-based incidence for was calculated using the census-obtained population.

Summary of results: 1925 patients were included. The incidence of NSTI within this population is 4.9/100,000. 68% are male and 49% are white with a median age of 55. Common comorbidities include HTN (61%), DM (60%), and IVDU (39%). Common anatomic locations include the lower extremity (37%) and perineum (27%). 32% of patients experienced severe sepsis with 15% going into septic shock. 24% were placed on mechanical ventilation. The mortality rate was 15%. Of those that survived, 52% were discharged home.

Conclusions: The prevalence of NSTI is higher than previously reported, especially among 50-59-year-old white males. Common comorbidities include DM, HTN, and IVDU. Many, but not the majority, required advanced ICU care, with 50% being discharged home and approximately 15% succumbing to the disease. This study increases the availability of epidemiological data for this disease process. Future goals include characterizing NSTI in diabetic patients for earlier prevention, diagnosis, and management.

Primary Presenter: Zainab Zullali

Project Title: Addressing Infant Mortality: Healthcare Provider Understanding of Racial Disparities

Primary Mentor: Rita Lee

Secondary Mentor(s): Janet Meredith

Thematic Area: Public Health and Epidemiology

Abstract:

Background: Black infant mortality (IM) is at 2-3 times the rate of their White counterparts in the United States. Several studies consistently demonstrate that genetics, income levels, maternal education, and other socioeconomic factors do not fully account for these differences, leading to a growing consideration of racism and bias itself, particularly its role in patient/provider relationships, as a key contributing factor in racially disparate healthcare outcomes. Few studies have assessed healthcare provider awareness of the racial disparity in IM between Black and White infants, their perspectives on root causes, and their proposed solutions to this disparity as compared to current literature. We seek to understand where improvements can be made in healthcare workers' understanding and assuming a professional responsibility in addressing racial differences in IM as a healthcare crisis. Methods: We have created an anonymous survey to collect qualitative and quantitative data about physician perspectives, which includes rating scales, written responses, demographic information, and multiple-choice responses. Outcomes: 92 responses were recorded from providers. While a vast majority (85-92%) of respondents agreed that racial disparities in IM existed nationally and in Colorado, only around 60% agreed that it existed in their own practice. Only 65% of respondents agreed that the racial disparity in IM is growing in Colorado. While the majority (84%) of respondents agreed that socioeconomic factors did not account for the racial disparity in IM, when asked to select the contributing factors from a list, many selected unsubstantiated factors such as maternal education, income, and social habits. Most respondents were able to identify racism itself as a contributing factor. While most respondents were able to correctly identify low birthweight and prematurity, only 30% overall correctly identified SIDS and safe sleep practices as contributing factors. Themes of the proposed solutions included increasing the number of Black healthcare providers, increased access to healthcare and prenatal care, and education of providers on implicit bias. Conclusion: Healthcare providers appear hesitant in recognizing the existence of racial disparities in their own communities, as opposed to in the population at large. Additionally, we find that there is a substantial percentage of providers who still recognized unsubstantiated beliefs about contributing factors (such as abuse, income, education) in the racial disparity in IM, while not recognizing unsafe sleep practices, a known contributing factor. This study demonstrates a need for better provider education, which could serve to decrease potential provider bias when giving care to Black patients and families.