University of Colorado
Anschutz Medical Campus

ANNUAL STUDENT MSA CAPSTONE PRESENTATIONS

April 24, 2023

ANSCHUTZ MEDICAL CAMPUS

Strauss Health Science Library

Poster Sessions

Session 1: 2:00 pm – 3:00 pm

Session 2: 3:00 pm – 4:00 pm

Session 3: 4:00 pm – 5:00 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 of 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!

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Erin Vipler
Stephanie Wesolowski
Sarah Wherry
Brian Wolfe
Allison Wolfe
Dan Wood
Sarah Young
Eric Young
Xiaoli Yu
Shanta Zimmer

Primary Presenter: Jordan Andersen

Project Title: *Treatment of acute sickle cell pain in pediatrics: An ethical analysis from a high-altitude medical school*

Primary Mentor: Jackie Glover

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Treatment of acute sickle cell pain in pediatrics: An ethical analysis from a high-altitude medical school. Sickle cell disease (SCD) is an inherited hemoglobinopathy which results in the polymerization of hemoglobin and is characterized by the severe acute pain of vaso-occlusive crises. SCD overwhelmingly affects people of color with the highest incidences in Black and Hispanic populations. While strides in treatment and understanding of the disease have been made in recent decades, data collection and reporting on the population level is inconsistent. Pediatric SCD patients represent a highly vulnerable population at the intersection of socioeconomics, race, and medicine. This ethical analysis provides context to the barriers which impede adequate care in this population and provides a recommendation for a supplemental ethics and humanities curriculum around SCD with particular focus on medical schools where students may have limited exposure to sickle cell disease.

Primary Presenter: Kseniya Anishchenko

Project Title: *High-risk Disease and Poor Follow-up: The Importance of Renal Mass Biopsy in a Cohort of Veterans*

Primary Mentor: Granville Lloyd

Thematic Area: Clinical Science

Abstract:

Objective: To assess the clinical utility of renal mass biopsy (RMB) in our multistate system. RMB is useful in the management of masses ‰¤4 cm (T1a), but evaluation of RMB in the uniquely vulnerable Veteran population is lacking.

Methods: About 136 RMB in 130 patients performed between 06/2015 and 11/2020 were identified in this Quality Improvement analysis. Demographics, size, pathology, treatment, and biopsy complications were analyzed. Of 101 T1a masses, 89 were either diagnostic or not decompressed cysts and 77 met inclusion criteria for follow-up imaging compliance analysis.

Results: The median age was 66 years. The diagnostic rate was 94.1% (128/136) for all masses and 94.1% (95/101) for T1a renal masses, with a complication rate of 2.2%. Among solid T1a masses, unexpectedly aggressive lesions (Fuhrman Grade 4, Type 2 papillary or sarcomatoid features) were identified in 8/89 (9.0%). Fifty-seven (64%) patients were treated with cryoablation or surgery and 32 (36%) patients elected active surveillance (AS). A neoplastic finding (oncocytoma or renal cell carcinoma (RCC)) was present in 16 patients choosing AS (50%) compared to 52 patients choosing treatment (91%). Compliance with National Comprehensive cancer Network-recommended imaging was 50% and 47% for AS and treatment groups, respectively.

Conclusion: In this VA cohort, we found a significant incidence of high-risk lesions and poor compliance with follow-up imaging. Aggressive biopsy protocols with high consideration of treatment may be appropriate to limit risk in those lost to follow-up. Given that 9% of our small renal masses were highly aggressive, biopsy may be critical in the selection of AS candidates.

Primary Presenter: Jeremy Ansah-Twum

Project Title: *Knotted Transosseous-Equivalent Technique for Rotator Cuff Repair Shows Superior Biomechanical Properties Compared With a Knotless Technique: A Systematic Review and Meta-analysis*

Primary Mentor: Armando Vidal, MD

Thematic Area: Clinical Science

Abstract:

Purpose: To compare the biomechanical properties of the knotted versus knotless transosseous-equivalent (TOE) techniques for rotator cuff repair (RCR). Methods: A systematic review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines using PubMed, Embase, and the Cochrane Library to identify studies that compared the biomechanical properties of knotted and knotless TOE RCR techniques. The search phrase used was as follows: (Double Row) AND (rotator cuff) AND (repair) AND (biomechanical). Evaluated properties included ultimate load to failure, cyclic displacement, stiffness, footprint characteristics, and failure mode. Results: Eight studies met the inclusion criteria, including a total of 67 specimens in each group. Of 6 studies reporting on ultimate load to failure, 4 found tendons repaired with the knotted TOE technique to experience significantly higher ultimate load to failure compared with knotless TOE repairs (knotted range, 323.5-549.0 N; knotless range, 166.0-416.8 N; $P < .05$). Of 6 studies reporting on failure stiffness, 2 found knotted TOE repairs to have significantly higher failure stiffness compared with knotless TOE repairs (knotted range, 30.0-241.8 N/mm; knotless range, 28.0-182.5 N/mm; $P < .05$), whereas 1 study found significantly higher failure stiffness in knotless TOE repairs compared with knotted TOE repairs ($P = .039$). Cyclic gap formation favored the knotted TOE group in 2 of 3 studies (knotted range, 0.6-5.2 mm; knotless range, 0.4-9.1 mm; $P < .05$). The most common mode of failure in both groups was suture tendon tear. Conclusions: On the basis of the included cadaveric studies, rotator cuff tendons repaired via the knotted TOE technique display superior time-zero biomechanical properties, including greater ultimate load to failure, compared with rotator cuffs repaired via the knotless TOE technique. Suture tearing through the tendon remains a common failure method for both techniques. Clinical Relevance: The results of this systematic review provide helpful insight into the biomechanical differences between 2 popular techniques for RCR. Although these results should be carefully considered by surgeons who are using either of these techniques in the operating room, they should not be mistaken for direct clinical applicability because cadaveric studies may not directly correlate to clinical outcomes.

Primary Presenter: Joel Ayers

Project Title: *The Effect of County Disparity Index on Time to Molecular Testing in Non-Small Cell Lung cancer Patients in Colorado*

Primary Mentor: Tejas Patil

Thematic Area: Public Health and Epidemiology

Abstract:

It has been widely known that disparities in incidence and mortality exist for lung cancer patients. Race has traditionally been studied as an important predictor of such disparity. However, socioeconomic factors have been shown to correlate with important delays in lung cancer testing, which is used to guide treatment decisions. This €œtime to molecular testing€ is a crucial step in the pathway toward treatment choice, which may ultimately affect survival. It is therefore important to understand where disparities impact patients as they access testing and treatment for lung cancer so that all patients may access the benefits of recent advancements in targeted therapy. The current study seeks to understand how the socioeconomic status of patients in the state of Colorado, as measured by a County Disparity Index and Rural-Urban Continuum Code, impacts their time to molecular testing. We hypothesize that counties with an increased Disparity Index will demonstrate a longer time from diagnosis to molecular testing when compared to patients from counties with a lower Disparity Index. Preliminary results suggest that a disparity in timely molecular testing exists in the state of Colorado. Future analysis needs to be performed to investigate the effects of the Disparity Index and Continuum Code on molecular testing, initiation of treatment, and survival.

Primary Presenter: Amelia Barber

Project Title: *Rural Track Module: Managing Dehydration and Other Illnesses of the Mountains*

Primary Mentor: Mark Deutchman

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Abstract

Much of rural Colorado resides at high altitude where there is a decrease in temperature, ambient humidity, and partial pressure of oxygen. Such environmental features can become maladaptive and cause dehydration. Further illness risks accompany Colorado mountain towns because of weather exposures, physical exertion events taking place in the mountains, and patient co-morbidities less tolerant to altitude change. Dehydration is a significant source of morbidity and mortality as both a symptom and primary disorder under these conditions. It requires management appropriate to patient presentation during diagnosis and treatment of the underlying disorder. This teaching module is designed for the medical professional students in the Rural Track at the University of Colorado Anschutz Medical Campus who are likely to encounter patients with conditions involving dehydration in their future practice. This module consists of patient vignettes designed to have students make treatment and diagnostic decisions concurrently while forming a differential diagnosis in different clinical settings. Students will have to select treatment decisions to appropriately manage symptoms while receiving more information on their patient for proper diagnosis and definitive treatment. The patient vignettes center on a classic presentation of an illness common to Colorado mountain towns with dehydration management, but will vary in severity of illness, patient demographics, and clinical setting.

Aim

The aim is to use case-based learning to better prepare future physicians to care for patients in rural Colorado. Professional students of the rural track are expected to better grasp management during diagnosis of dehydration conditions as part of this teaching module.

Primary Presenter: Hailey Buckingham

Project Title: *Modified Written Exposure Therapy Feasibility and Acceptability in Mental Health Healthcare Providers*

Primary Mentor: Meredith Mealer

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Mental health professionals encounter difficult work conditions that contribute to high rates of anxiety, depression, posttraumatic stress disorder (PTSD) and burnout syndrome (BOS). This study sought to determine if a modified written exposure therapy (WET) protocol is feasible and acceptable to mental health professionals. Participants completed a WET protocol consisting of 30-minute writing sessions, done once a week over the course of 5 weeks. Feedback was given based on cognitive reframing and flexibility techniques and was used to guide the following writing session. Measures of depression, anxiety, PTSD, BOS, and resilience were obtained before and after the intervention along with participants completing a satisfaction survey. The modified WET protocol for mental professionals was both feasible with future adjustments and acceptable. A sufficiently powered, randomized clinical trial is needed to assess the effects of this intervention in decreasing rates of anxiety, depression, PTSD, and BOS and the effects of improving resiliency.

Primary Presenter: Andrew Burns

Project Title: *Ambulatory Blood Pressure in Older Adults at Low versus High Altitude: The Colorado High Altitude Monitoring Pressure Study (CHAMPS)*

Primary Mentor: Linda Keyes

Thematic Area: Clinical Science

Abstract:

Introduction: Blood pressure (BP) after acute high altitude exposure varies between individuals and is most accurately measured by 24-hour ambulatory BP (ABP) monitoring. Understanding impacts of altitude on BP is essential in the creation of evidence-based travel guidelines.

Objective: Compare 24-hour ABP at low/high altitude in participants with/without preexisting hypertension.

Methods: This was a prospective observational cohort study of adult lowlanders, comparing 24-hour ABP at low (<1,000 m) versus high-altitude (2,800-3,000 m). BP was monitored every 30 minutes while awake, hourly overnight for 24-hour using Welch-Allyn6100 ABP monitors.

Results: 19 participants completed the high-altitude study (mean age 64, 11 with underlying hypertension). 12 participants completed low/high altitude measurements. We found no difference in average 24-hour MAP between low/high altitude in all-comers, mean diff 4mmHg, [95% CI: -4-11 mmHg], p=0.3. Participants without preexisting hypertension had a greater increase in 24-hour MAP from low-high altitude on average compared to those with preexisting hypertension (average change +11 mmHg vs -2 mmHg, respectively, p=0.042). Asymptomatic, severely elevated BP was common at both altitudes.

Conclusions: In these older adults, BP was similar at low and high altitude, with high individual variation. Our data suggest that BP is more likely to increase at high-altitude in those without underlying hypertension, and to stay the same/decrease in those with hypertension.

Primary Presenter: Candace Cephers

Project Title: *Hip Arthroscopy and Peri-Acetabular Osteotomy: Same Day versus Different Day Outcomes*

Primary Mentor: John Maloney

Thematic Area: Clinical Science

Abstract:

There are many risk factors and etiologies of the cause of developmental hip dysplasia. It can be diagnosed at any point during infancy or later in adolescence and treatment is dependent on time of diagnosis. In this study, we looked at adolescent onset of hip dysplasia and the definitive surgical treatment for it. Hip Arthroscopy and a periacetabular osteotomy can be performed on the same day or different days to treat dysplasia of the acetabulum or femoral head and damage to surrounding soft tissues. In this retrospective study we looked at the outcomes of the Arthroscopy/PAO combination surgery, complications, and return to activity. We found that there is no significant difference in long term outcomes if these surgeries were performed on the same day or different day in terms of pain or return to activity and identified that there is minimal risk for complications, and overall, is a safe treatment option for adolescent hip dysplasia.

Primary Presenter: Arun Chandnani

Project Title: *Mental Health and Substance Use in Colorado Healthcare and Graduate Students During COVID-19:*

A Mixed-Methods Investigation

Primary Mentor: Chris King

Thematic Area: Public Health and Epidemiology

Abstract:

I. Abstract

Background: The COVID-19 pandemic continues to impact mental health by exacerbating anxiety, fear, and substance use worldwide. Several studies have demonstrated increased substance use and declining mental health in students abroad, but no investigation has assessed the COVID-19 pandemic€™s effects on mental health and substance use in graduate and healthcare students in the United States.

Objective: Researchers sought to quantify and qualify the ongoing COVID-19 pandemic€™s impacts on Colorado graduate and healthcare students€™ mental health and substance use.

Methods: Investigators utilized an online, institutionally-distributed survey to assess changes in various mental health metrics and substance use in Colorado healthcare and graduate students during the COVID-19 pandemic from June 2020 to February 2021. An augmented Fear of COVID- 19 Scale (FCV-19S) academic survey served as the primary data collection vessel. Researchers utilized mixed methods to describe results both quantitatively and qualitatively.

Results: Students who reported higher levels of depression, exhaustion, loneliness, nervousness, and anger had significantly higher FCV-19S scores. Higher FCV-S19 scores were also significantly associated with increased levels of alcohol consumption, binge drinking, and cannabis use. Qualitative analysis elucidated recurring themes regarding use frequency, substances used, and the reasons underlying use. Finally, further qualitative analysis revealed three common student concerns: worries regarding the length of the pandemic, its impact on education/finances, and its social impact.

Conclusions: The COVID-19 pandemic has negatively impacted the wellbeing of Colorado healthcare and graduate students, directly causing increases in substance use while simultaneously exacerbating their feelings of fear, anxiety, and helplessness.

Primary Presenter: Jessica Chandrasekhar

Project Title: *Universal, School-Based Mental Health Program Implemented Among Racially and Ethnically Diverse Youth Yields Equitable Outcomes: Building Resilience for Healthy Kids*

Primary Mentor: Jill Kaar

Thematic Area: Public Health and Epidemiology

Abstract:

Although suicide is a leading cause of mortality among racial and ethnic minority youth, limited data exists regarding the impact of school-based mental health interventions on these populations, specifically. A single-arm pragmatic trial design was utilized to evaluate the equity of outcomes of the universal, school-based mental health coaching intervention, Building Resilience for Healthy Kids. All sixth-grade students at an urban public middle school in Colorado Springs, Colorado were invited to participate. Students attended six weekly 1:1 sessions with a trained health coach discussing goal setting and other resilience strategies. 285 students (86%) participated with 252 (88%) completing both pre- and post-intervention surveys. Students were a mean age of 11.4 years with 55% identifying as girls, 69% as White, 13% as a racial minority, and 18% as Hispanic. While Hispanic participants demonstrated significantly lower scores for baseline measures of self-efficacy, no significant differences by race and ethnicity for self-efficacy remained at the post-intervention survey. In addition, racial minority students exhibited significantly greater improvements in personal and total resilience compared to White and Hispanic students, controlling for baseline scores. Overall, our data together suggests that Building Resilience for Healthy Kids may represent an equitable and accessible option for improving youth mental health.

Primary Presenter: Andrea Chau

Project Title: *Stigma and social isolation in patients with non-epileptic seizures*

Primary Mentor: Laura Strom

Thematic Area: Clinical Science

Abstract:

OBJECTIVE: Despite the prevalence of stigma associated with non-epileptic seizures (NES), few studies have examined the impact of stigma on patients with NES. We quantitatively characterized the prevalence, severity, and sociodemographic associations of three types of stigma reported by patients with NES.

METHODS: Participants were sampled among patients referred to the University of Colorado NES Clinic for treatment. Patients with NES completed questionnaires to measure different types of stigma. The Epilepsy Stigma Scale (ESS) measured both perceived and internalized stigma, the Internalized Stigma of Mental Illness (ISMI-9) measured internalized stigma, and the Quality of Life in Neurological Disorders Stigma Short Form (Stigma Short Form) measured both internalized and experienced stigma. One-way ANOVA and pair-wise differences in the mean were used to analyze the association between stigma and sociodemographic characteristics.

RESULTS: Of 126 patients who participated in the study, the median age was 33.7 years old, 79.4% identified as female and 16.7% identified as male. In our sample, 73.8% reported feeling internalized stigma on the ISMI-9, with 32.5% reporting severe levels of internalized stigma. Higher levels of stigma were associated with reported suicidal thoughts ($p=0.03$), single relationship status ($p=0.05$), or unemployment ($p=0.02$). Patients reported a mean total score of 4.9 (SD 1.4) on the ESS, indicating perceived stigma. Higher levels of perceived stigma were associated with single relationship status ($p=0.05$) and not driving ($p=0.05$). On the Stigma Short Form, patients rated a mean T-score of 61.3, which was 1SD above a clinical reference population. Higher levels of stigma were associated with not driving ($p=0.02$).

CONCLUSION: Internalized stigma is not only prevalent and severe, but it is also associated with suicidal thoughts. Socially isolating factors were associated with experienced, perceived, and internalized stigma. Future studies should further examine the impact of internalized stigma on quality of life, the relationship between stigma and social isolation, and targets for stigma mitigation.

Primary Presenter: Shea Claflin

Project Title: *Shockwave Lithotripsy to Correct Carotid Stent Compression*

Primary Mentor: Devin Zarkowsky

Thematic Area: Clinical Science

Abstract:

BACKGROUND

Carotid artery atherosclerotic disease and stenosis is a risk factor for the development of transient ischemic attack (TIA) and stroke. Calcification of atherosclerotic lesions can make percutaneous intervention more difficult to perform and has been shown to negatively impact the outcome of these procedures. Intravascular lithotripsy (IVL) is an emerging technology used to treat calcification in blood vessels. Previous studies have demonstrated efficacy of IVL in treating both peripheral vascular disease and coronary artery disease, though there is little literature surrounding the successful, novel IVL use in the carotid arteries. Therefore, it appears that lithotripsy in conjunction with controlled balloon deployment could be a useful tool in treating heavily calcified carotid artery stenosis in patients who are poor surgical candidates.

CASE REPORT

We report the case of a 79-year-old female who has a complicated history of multiple ischemic strokes, TIA, and seizures secondary to bilateral carotid artery disease, atrial fibrillation, and microangiopathy from suspected cerebral amyloidosis. The patient was status-post bilateral transcarotid artery revascularization (TCAR) when she re-presented with a witnessed seizure and subsequent in-hospital stroke due to restenosis of the right internal carotid artery stent with a near-complete vessel occlusion. During repeat TCAR, lithotripsy with a 5 x 60 mm Shockwave balloon was used to predilate the lesion due to heavy calcifications. This was followed by 5 x 40 mm chocolate balloon angioplasty of the stent. One-month follow-up carotid duplex study revealed no evidence of significant re-stenosis.

CONCLUSION

In conjunction with the embolic protection of TCAR, Shockwave intravascular lithotripsy pre-dilation and Chocolate balloon angioplasty can be used to successfully manage heavily calcified plaques in re-stenosed carotid artery atherosclerotic lesions in patients who are poor surgical candidates or who require a greater degree of neuroprotection. Nonetheless, it is imperative to weigh the risks and benefits of undergoing such procedures on an individualized basis for each patient.

Primary Presenter: Jordan Coburn

Project Title: *Comparing Post-Operative Complications Associated with Bone-Anchored Hearing Aid (Baha®) Connect and Attract Implantation in Pediatric Patients*

Primary Mentor: Stephen Newton

Thematic Area: Clinical Science

Abstract:

Objective: To evaluate and compare post-operative complication rates and parental satisfaction rates associated with bone-anchored hearing aid (Baha®) Connect and Attract device implantation.

Methods: A retrospective chart review was performed of patients who have had a Baha® Connect or Attract implantbetween the years of 2001 and 2020 at Children€™s Hospital Colorado. Scripted parental surveys were also completed. Demographic information was compared between groups using chi squared tests, Fisher€™s exact tests, and paired t tests. Post operative and parental survey information was compared between groups using Mann-Whitney U tests.

Results: 115 subjects who underwent Baha® implantation were identified, 70 with Attract and 45 with Connect devices. The mean/standard deviation age at implant for Connect and Attractdevices was 9.1/4.5 and 8.7/3.6 years. Connect patients were significantly more likely to experience complications than Attract patients (91.1% compared to 50.0%), p = < .001. Connect patients were also significantly more likely to undergo revision surgery (57.8% compared to 12.9%), p = < .001. Bilateral device implantation was a significant risk factor for experiencing complications across both groups, p < .001. The most common complications for Connect/Attract were infectionand skin irritation respectively. 61 parents underwent scripted survey, 31 for Connect and 30 for Attract. 73% of parents across both groups reported being €œsatisfied€ or €œvery satisfied.€ Parental satisfaction rates and willingness to recommend surgery to others was not significantly different between groups.

Conclusion: Recipients of Baha® Attract device implantation experience a much lower rate of complications and revision surgeries than Baha® Connect. However, this decreased rate didnot translate into an obvious difference in reported parent satisfaction between groups.

Key Words: Pediatric, Pediatric otology, hearing implant

Level of Evidence: 4.

Primary Presenter: William Coburn

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

Primary Mentor: Kathleen Flarity

Thematic Area: Public Health and Epidemiology

Abstract:

Background

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

Methods

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

Results

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

Discussion/Conclusions

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

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

Primary Presenter: Adele Collins

Project Title: *Investigating the Impact of Tumor Biology and Social Determinants on Time to Diagnosis and Stage at Presentation of Wilms Tumor*

Primary Mentor: Adam Green

Thematic Area: Clinical Science

Abstract:

Delays in diagnosis and time to diagnosis have been used interchangeably in scientific literature, but few have ever studied whether it is appropriate to do so. While the terms are related, we hypothesize they are distinct terms with time to diagnosis being defined as the aggressiveness of the tumor and being affected by intrinsic factors like tumor biology while delays in diagnosis are due to extrinsic factors such as socioeconomic status leading to a presentation at a higher stage than it would have without the barriers. We conducted a retrospective study on 306 patients diagnosed with Wilms Tumor at Children€™s Hospital Colorado between 1971 and 2016 identifying patient barriers as extrinsic markers and using histology and loss of heterozygosity at time of diagnosis as intrinsic markers. Multivariable logistic regression was performed. Patients with Medicaid were more likely to present greater than four days after initial symptom compared to private insurance and those with housing concerns were more likely to be diagnosed greater than 9 days from initial symptom. Tumor biology was noted to be associated with higher stage at diagnosis. Patient barriers were not associated with higher stage. These findings suggest the interplay between tumor biology, patient barriers, and diagnosis are more complex than our hypothesis, but they play an important role in when a patient seeks medical care and prognosis.

Primary Presenter: Evan Cornish

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

COVID Virtual Summer Camp Project

Primary Mentor: Madiha Abdel-Maksoud

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Background and Objectives:

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

Methods:

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

Results:

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

Conclusions:

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

Primary Presenter: Tiffany Cung

Project Title: *Serotonin Syndrome After Methylene Blue Administration: A Case Report*

Primary Mentor: Sarah Perman

Thematic Area: Clinical Science

Abstract:

INTRODUCTION

Serotonin syndrome is a potentially fatal toxidrome that commonly present in the emergency departments. It is usually caused by medications or drug interactions that increase the level of serotonin in the nervous system that produce surplus amount of serotonin receptor activities.

CASE REPORT

A 61-year-old man with history of ischemic cardiomyopathy with left ventricular assist device presented to the emergency department due to low flow alarms from his device. He was admitted for an open heart transplant and device removal. During the procedure, because of hemodynamic instability, he was given methylene blue to improve his blood pressure. During the post-operative period, he developed serotonin syndrome most likely triggered by the methylene blue and its interactions with his home antidepressants. He was appropriately managed through supportive care and benzodiazepine.

CONCLUSION

Methylene blue has potential to cause serotonin syndrome when patients have a history of taking other serotonergic agents. Understanding the toxidrome, the common serotonergic agents involved, the clinical presentation, and the appropriate treatment is of utmost importance to achieve the best outcomes for patients. It is important for emergency physicians to consider this diagnosis with altered patients, especially when they have history of polypharmacy and on serotonergic medications.

Primary Presenter: Yasmine Dakhama

Project Title: *Upstanding and Interrupting Biases: Understanding the Impact of Different Curriculum Delivery Models*

Primary Mentor: Dr. Anna Neumeier

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Introduction: Within clinical learning environments, medical students are uniquely faced with power differentials that make acts of racism, discrimination, and microaggressions (RDM) challenging to address. Experiences of microaggressions and mistreatment are correlated with higher rates of positive depression screening and lower satisfaction with medical training. Previously, we demonstrated that our RDM curriculum for medical students beginning clerkship rotations increased student awareness of instances of RDM (from 34% to 46%), knowledge of communication strategies to mitigate RDM (presession€¯M€¯= 3.4, postsession€¯M€¯= 4.6,€¯p€¯< .01), and confidence to address RDM (presession€¯M€¯= 3.0, postsession€¯M€¯= 4.4,€¯p€¯< .01). This current study expands upon this curriculum and examines its efficacy among two different medical student class cohorts. It also compares outcomes of two different modes of curriculum delivery €“ virtual vs in-person. We additionally examine if there are differences in the educational impact of the curriculum between students within the same cohort who self-identified as under-represented in medicine (URM) compared to those who do not identify as URM.

Methods:€¯A case-based curriculum was previously developed to practice communication responses to address RDM using an adapted 6Ds approach as described in our previous work. Cases were collected through volunteer submission and revised to maintain anonymity. Faculty and senior medical students cofacilitated the small-group sessions. During the sessions, students reviewed the communication framework, explored their natural response strategies, and practiced all response strategies.€¯

Results:€¯***still editing***

Of --- participants in cohort A (Jan 2022, virtual),--- (--%) completed the pre-session evaluation survey, and --- (--%) completed both pre-and post-session surveys. Of --- participants in cohort B (Sept 2022, in-person), --- (--%) completed the pre-session evaluation survey, and --- (--%) completed both pre-and post-session surveys.

Cohort B (in-person) showed a significant difference in incoming knowledge about different strategies to deal with RDMs aimed at other members of the medical team (3.26 vs 3.56, $p < 0.05$) and aimed at self ($p < 0.01$) compared to cohort A (virtual). For all other questions (Q5c-

Q6d), both cohorts had the same self-reported baseline knowledge (explore each of these content wise). There were no statistical differences in the end of session measured outcomes regarding understanding or comfort in responding to instances of RDMs when comparing the two sessions. All students from cohort A and B reported an increase in knowledge content from the pre-session to the post-session measured outcomes. Additionally, there was no statistical difference in how much €˜more effective€™ one curriculum was versus the other (i.e., both curricula €“ online and virtual €“ resulted in equal educational outcomes).

*** Old data/results: Of 196 workshop participants, 152 (78%) completed the evaluation surveys. Pre- and postsession survey cohort comparison demonstrated a significant increase in students€™ awareness of instances of RDM (from 34% to 46%), knowledge of communication strategies to mitigate RDM (presession€¯M€¯= 3.4, postsession€¯M€¯= 4.6,€¯p€¯< .01), and confidence to address RDM (presession€¯M€¯= 3.0, postsession€¯M€¯= 4.4,€¯p€¯< .01).€¯*** (from abstract of paper)

Primary Presenter: Rebecca Dinkel

Project Title: *Tzanck Smear in Dermatologic Practice*

Primary Mentor: Cory Dunnick

Thematic Area: Clinical Science

Abstract:

The Tzanck smear was introduced in the 1950s and has been used for the diagnosis of erosive, vesiculobullous, tumoral, and granulomatous disease. The Tzanck smear is rapid, easy to perform, and relatively inexpensive. Results from this diagnostic test can be obtained at the bedside, often within several minutes. Tzanck smears have high diagnostic reliability for erosive/vesiculobullous and granulomatous lesions. For some lesions, the sensitivity of Tzanck smears can exceed 80% while the specificity can be as high as 90% depending on the expertise of the user. However, for more challenging diagnoses, Tzanck smear should be used in conjunction with more advanced techniques to ensure an accurate clinical diagnosis. This article reviews the background, indications, construct, and applications of the Tzanck smear to highlight this commonly used diagnostic tool in dermatology.

Primary Presenter: Erica Dolph

Project Title: *Does Leuprolide Acetate Predict Successful Pain Relief After Hysterectomy and BSO in Endometriosis Patients?*

Primary Mentor: Jaime Arruda

Thematic Area: Clinical Science

Abstract:

Study Objective:

Evaluate whether patients with endometriosis-associated pelvic pain who achieve pain relief with leuprolide acetate (Lupron) are more likely to achieve pain relief after hysterectomy and bilateral salpingo-oophorectomy (BSO).

Design:

Retrospective chart review.

Setting:

Academic teaching hospital.

Patients or Participants:

Patients who underwent trial of leuprolide acetate prior to hysterectomy and BSO for endometriosis.

Interventions:

We performed a retrospective chart review of patients from 2015-2021 who had a diagnosis of endometriosis and underwent a trial of leuprolide acetate prior to hysterectomy with BSO for pelvic pain (n=31). We reviewed pre-operative records, operative notes, and postoperative records to assess whether patients achieved pain relief following ovarian suppression with leuprolide acetate or definitive surgical management with hysterectomy and BSO.

Measurements and Main Results:

31 patients underwent a trial of leuprolide acetate prior to hysterectomy and BSO for endometriosis. Fifteen patients reported complete pain relief with leuprolide acetate therapy (€œLupron responders€□) and 16 reported incomplete or no pain relief (€œLupron non-responders€□). The groups were similar in age, ethnicity, race, BMI, parity, number of past treatments for pelvic pain, mode of hysterectomy, blood loss during surgery, presence of adhesions, and surgical complications. There was a significant difference between the two groups as to whether they achieved complete pain relief after hysterectomy with BSO. Among Lupron responders, 73.7% reported complete pain relief after surgery. For Lupron non-responders only 37.5% reported complete pain relief after surgery (p=.045).

Conclusion:

Lupron responders were more likely to achieve pain relief with hysterectomy and BSO. A trial of leuprolide acetate prior to surgery may be helpful to predict which patients will benefit from hysterectomy and BSO for endometriosis-related pelvic pain.

Primary Presenter: Alisha Eskew

Project Title: *Development of Evaluation Plan of the Patient Experience of In-Person and Virtual Integrated Behavioral Health Care in Family Medicine*

Primary Mentor: Bethany Kwan

Thematic Area: Clinical Science

Abstract:

To develop a plan for evaluation of the patient experience of the virtual and in person integrated behavioral health services, a literature review and expert discussions were conducted, the information obtained from the literature review and expert input was integrated to find the best matching patient experience survey for the model, and questions were developed for patient interviews based on topics not covered by the survey. It was found that important measures of patient experience include continuity of care and integration (relationships and cohesiveness among providers), patient centeredness (privacy/confidentiality, cultural sensitivity, non-judgmental, individualized care plans, including the patient, and respect), addressing stigma, cost, convenience (wait time, scheduling), patient education, trust and empathetic connection between patient and provider, and health outcomes. Additionally, factors contributing to the patient experience of telepsychiatry include technology glitches, security, empathetic connection, convenience, and cost benefit. Among several survey options considered, the best-suited surveys were used to develop a patient experience measure as well as patient interview guide specific to in person and virtual integrated behavioral healthcare as an evaluation plan for the patient experience. Topics that are addressed in the patient interviews include relationships between providers (cohesiveness and communication), patient centeredness, cost (insurance and billing), patient education, and health outcomes (including coping skills and future treatment plan). Future steps include conducting, analyzing, and sharing results of the surveys and interviews with the operations team of the project to ultimately make the necessary changes to improve patient care and expand the use of the model.

Primary Presenter: Josue Estrella

Project Title: *Making it Complicated: Does Disparity in Access to Care Lead to More Perforated Appendicitis*

Primary Mentor: Catherine Velopulos

Thematic Area: Clinical Science

Abstract:

Introduction: Delays in obtaining care may lead to perforated appendicitis, increasing risk of morbidity and mortality. We previously explored the role of social determinants in patients undergoing cholecystectomy, finding that emergent presentation is associated with neighborhood Social Vulnerability Index (SVI). We hypothesize that social vulnerability is associated with increased incidence of perforated appendicitis.

Methods: We retrospectively identified patients presenting to our urban, academic hospital with acute appendicitis during a 9-month timeframe (11/2019 €“ 7/2020). Patients were classified as perforated or non-perforated. Patient SVI was determined using geocoding at the census tract level. Because rates of perforation were higher in older patients, we performed a subset analysis of patients ‰¥ 40 years.

Results: 190 patients were included. Patients with perforated appendicitis (n = 48, 25%) were older and were more likely to present to a clinic versus the emergency department (P = 0.009). Perforated patients had longer delay before seeking care (56% versus 6% with > 72 hours of symptoms, P < 0.001). However, there were no differences between groups in terms of sex, race/ethnicity, insurance type, language barrier, having a primary care physician, or any of the SVI subscales. Of patients ‰¥ 40 years, a higher proportion were perforated (28/80, 35%) despite similar rates of delayed care. In this cohort, higher overall SVI as well as the socioeconomic status and household composition/disability subscales were associated with perforation.

Conclusions: Contrary to our hypothesis, while perforation was associated with delayed care in this population, we did not find overall that social vulnerability or individual social determinants accounted for this delay.

Primary Presenter: Spencer Evans

Project Title: *Mechanisms of Bodily Harm in Emergency Department Youths with ADHD*

Primary Mentor: Matthew Rustici

Thematic Area: Clinical Science

Abstract:

Objectives: We sought to perform a review of emergency department data to illuminate whether there is a difference in the prevalence of severe injuries in patients with ADHD compared to patients without ADHD. We hope to illuminate whether providers should consider inquiring whether their pediatric patients have ADHD to improve long term outcomes.

Methods: This study is a retrospective cohort study of patient records contained in the TriNetX database, specifically of pediatric patients in this database who presented to an emergency department. We specifically looked at the risk difference in patients <25 years of age with ADHD, no ADHD, inattentive type ADHD, hyperactive type ADHD, and combined type ADHD who presented with any fracture, a central fracture, an upper limb fracture, a lower limb fracture, an accidental overdose, a burn injury, a drowning incident, a gunshot wounds, suffocation, and a suicide attempt.

Results: Comparison between the no-ADHD cohort and the inattentive, hyperactive/impulsive, combined, and overall ADHD cohorts revealed differences in the majority of outcomes studied. Patients with overall ADHD had significant differences in rates of all outcomes aside from the upper limb fracture. Patients with combined or hyperactive/impulsive ADHD had significant differences in all but drowning, and the inattentive cohort had significance all events.

Conclusion: The stark difference between severe injury presentations in the pediatric emergency department between children with ADHD and without ADHD suggests that providers should consider inquiring whether patients have ADHD to educate them on their risk for severe injuries.

Primary Presenter: Jackson Fein

Project Title: *Correlation of Vaccine-Preventable Illness and Vaccination Rates in the Community*

Primary Mentor: Jessica Cataldi

Thematic Area: Public Health and Epidemiology

Abstract:

The state of Colorado has relatively low vaccination rates for varicella, DTaP, and PCV13 as compared to the rest of the United States. Gaps in vaccination coverage present a risk for vaccine preventable diseases (VPDs) in both children and adults. We hypothesize in €œCorrelation of Vaccine-Preventable Illness and Vaccination Rates in the Community€ that geographic areas with lower vaccination rates will experience higher rates of corresponding VPDs and that newly available data from Colorado schools can be used to demonstrate and monitor this association. The results of this research could be used as a communication tool for key stakeholders in communities across the state, in addition to highlighting the importance of local data collection to educators, parents, and healthcare workers. In this study, we will assess vaccination rates and VPD incidence to investigate this relationship geographically and temporally via Spearman correlation and univariate and multivariable modeling. Longitudinal presentation of these data identified fluctuating vaccination rates in the state of Colorado, in addition to increasing cases of pneumococcal disease. Correlation and linear modeling analyses either did not reveal statistically significant relationships between vaccination rate and corresponding disease incidence in Colorado counties, or these relationships were not meaningful in the context of this study. Limitations to the validity and scope of this data, in addition to confounding variables that are more difficult to account for, likely prevented this study from identifying such a relationship. Despite this, school-based vaccination data may still prove useful for public health purposes, but future investigations may consider alternative uses for such data in addition to prospective data collection.

Primary Presenter: Zihan Feng

Project Title: *Open Chest Duration Following Congenital Cardiac Surgery Increases Risk for Surgical Site Infection*

Primary Mentor: Matthew Stone

Thematic Area: Clinical Science

Abstract:

Surgical site infections (SSI) following congenital heart surgery (CHS) remain a significant source of morbidity. Delayed sternal closure (DSC) is often required to minimize the potential for hemodynamic instability. The purpose of this study was to determine the incidence of SSI among patients undergoing DSC versus primary chest closure (PCC) and to define a potential inflection point for increased risk of SSI as a function of open chest duration (OCD). A retrospective review of our institutional Society of Thoracic Surgeons dataset is to identify patients undergoing CHS at our institution between 2015 and 2020. Incidences of SSI were compared between DSC and PCC patients. DSC patients were evaluated to determine the association of OCD and the incidence of SSI.2582 operations were performed at our institution between 2015 and 2020, including 195 DSC and 2387 PCC cases. The incidence of SSI within the cohort was 1.8% (47/2,582). DSC patients had significantly higher incidences of SSI (17/195, 8.7%) than PCC patients (30/2387, 1.3%, $p < 0.001$). Further, patients with an OCD of four or more days had a significantly higher incidence of SSI (11/62, 17.7%, $p = 0.006$) than patients with an OCD less than 4 days (6/115, 5.3%). The incidence of SSI following CHS is higher in DSC patients compared to PCC patients. Prolonged OCD of 4 days or more significantly increases the risk of SSI and represents a potentially modifiable risk factor for SSI predisposition. These data support dedicated, daily post-operative assessment of candidacy for chest closure to minimize the risk of SSI.

Primary Presenter: Justin Fichtner

Project Title: *Cataract inhibitors: Present needs and future challenges*

Primary Mentor: Mark Petrash

Thematic Area: Clinical Science

Abstract:

Cataracts result from opacification of the ocular lens and represent the leading cause of blindness worldwide. After surgical removal of the diseased lens material and implantation of an artificial intraocular lens, up to 50% of cataract patients develop a secondary lens defect called posterior capsular opacification (PCO). While vision can be restored in PCO patients by a laser-mediated capsulotomy, novel therapies involving inhibition of aldose reductase are now being developed to prevent PCO development and complications of laser capsulotomy. A question we wished to address was whether cataract surgeons believe there is an unmet need for a preventative PCO therapy, whether they would prescribe such a therapy were it available, and to assess their perceptions regarding the benefits of and obstacles to adopting novel PCO therapies in the place of laser capsulotomy. We gathered perspectives from adult, pediatric, and veterinary cataract surgeons using an online questionnaire. From 161 surgeon responses, we found that the majority of adult, pediatric, and veterinary cataract surgeons (78% n = 35, 88% n = 37, and 96% n = 71 respectively) believed there is an unmet need for preventative PCO therapy, with more than 95% expressing interest in incorporating such therapy into surgical protocols. Perceived benefits included optimizing visual outcomes, avoiding the need for additional procedures, eliminating complications related to neodymium:yttrium-aluminum-garnet laser, preserving the posterior capsule particularly in patients receiving multifocal intraocular lens implants, providing a viable solution for PCO in animals, and using it in developing countries that lack access to neodymium:yttrium-aluminum-garnet lasers. Perceived obstacles included potential lack of reimbursement by insurance companies, and the need for strong efficacy and safety profiles. Among adult surgeons, 70% (n = 31) indicated that preventative PCO therapy could add value to premium intraocular lens packages. Our studies revealed that cataract surgeons overwhelmingly support the development of preventative PCO therapy, and that clinical trials will play a critical role to test the safety and efficacy of specific therapeutic agents.

Primary Presenter: Ephrat Fisseha

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

Primary Mentor: Lisa Abuogi

Thematic Area: Global Health

Abstract:

ABSTRACT

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

Primary Presenter: Mitchell Frydenlund

Project Title: *Inpatient Pediatric Palliative Care Consult Requests and Recommendations*

Primary Mentor: Mark Brittan

Thematic Area: Clinical Science

Abstract:

Little is known about the requests for and recommendations from inpatient pediatric palliative care (PPC) consults and whether they differ by patient location (ward vs. intensive care unit) or patient type (new vs. established with PPC). This is a Single-center, retrospective cohort study comparing PPC consult requests and recommendations for children who received a PPC consult between January 1, 2018 and June 30, 2019. Comparisons were made by patient location and patient type using bivariate statistics. Three hundred twenty-seven PPC encounters were evaluated. Symptoms were more likely to be addressed in consults for ward patients than for intensive care unit patients. Compared with established patients, consults for new patients occurred significantly later in the hospital course and were more likely to be for psychosocial support or goals of care. Discussion: We found variability in PPC consult requests and recommendations that may inform future work and targeted education.

Primary Presenter: Jackson Fulk-Logon

Project Title: *Metastatic Solid Pseudopapillary Neoplasm: Case Series and Scoping Review*

Primary Mentor: Rashikh Choudhury

Thematic Area: Clinical Science

Abstract:

Solid pseudopapillary neoplasms (SPN) are rare low-grade pancreatic tumors with low potential for local recurrence and metastasis; however, despite its rarity, SPN recurrence has been described in several case reports. Herein we present a case series of metastatic SPN and a historical literature review of recurrence and metastasis.

A retrospective review of all patients who were diagnosed with SPN and underwent a second operation for recurrence was performed. For the scoping review, PRISMA guidelines were followed to review published cases of SPN between 1970 and 2022. Seven keywords commonly used to describe SPN were used to search PubMed, Ovid, and Web of Science. Duplicate articles and cases were filtered out, and cases that met inclusion criteria based on the number of demographic and clinical features documented were included for analysis.

A total of 33 patients with SPN were included. Among these, 4 had recurrence or metastasis (mSPN). Most of these patients were men, with an average age of 54. Local recurrence occurred in 2 patients and distant liver metastasis in the other two. Median time to recurrence was 72 months (range 48-120) among our series. All mSPN patients were alive, with no major complications described at the time of this report. Interestingly, one patient has undergone 6 tumor resections over the last 10 years. The characteristics of our patients are in agreement with previously published data on mSPN, including a higher incidence in older men and a similar time to recurrence (60 months). However, the incidence in our center was slightly higher than previous reports (12.1% vs. 9.5%).

SPNs recur in 12% of patients after surgical resection. Surgical resection offers favorable long-term outcomes for patients with metastatic SPN and is the treatment of choice.

Primary Presenter: Juan Galindez Mingo

Project Title: *EXPLORING BARRIERS FACED BY PRE-HEATLH VOLUNTEERS AT A STUDENT RUN FREE CLINIC*

Primary Mentor: Kari Mader

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Students interested in pursuing a career in health care through higher education often face barriers of entry into these health professional programs. Many of these pre-health students volunteer at student run free clinics (SRFC) to help support local underserved patient populations. There is limited published data that focuses on studying the barriers faced specifically by pre-health volunteers at SRFCs. This report looks to further characterize this population and the barriers they face in hopes of providing targeted support for these dedicated volunteers. A needs assessment was conducted through a voluntary survey distributed to the pre-health volunteers at DAWN, an SRFC in Aurora, CO resulting in quantitative and qualitative data encompassing demographics, pre-health challenges, and desired resources. Results showed pre-health volunteers at DAWN (N=51) were more likely to self-identify as disadvantaged compared to national applicant pools for medical school. Qualitative data showed themes were centered around an abundant need for more shadowing experiences and access to information. Ninety-four percent showed interest in mentoring. A comparatively higher prevalence of underrepresented minority applicants at DAWN may indicate SRFCs as suitable locations for interventions geared towards expanding diversity in health care. Notable prevalence of first-generation status and desire for application advising presents a great opportunity for support through personalized mentoring. Limited access to financial resources influences multiple facets of a pre-health volunteer€™s ability to pursue graduate education, presenting an actionable need that could have a significant impact. Data collected from this study will be utilized to design and implement initiatives geared towards supporting pre-health volunteers at DAWN and may serve as a guide for other organizations with pre-health students facing similar challenges.

Primary Presenter: Valerie Gao

Project Title: *Clinical Effectiveness of CGM Use in Pregnancies Affected by Type 1 Diabetes*

Primary Mentor: Sarit Polsky

Thematic Area: Public Health and Epidemiology

Abstract:

Background: Continuous glucose monitoring (CGM) has been shown to improve neonatal outcomes in pregnancies affected by type 1 diabetes (T1D), however its effectiveness has not been assessed in a racially and socioeconomically diverse setting.

Objective: The aim of this study was to examine the clinical effectiveness, assessed through maternal glucose control and maternal and neonatal health outcomes, of CGM use compared to self-monitoring of blood glucose (SMBG) in pregnancies associated with T1D in a real-world setting.

Research Design and Methods: We retrospectively identified 160 pregnancies at the Barbara Davis Center for Diabetes (BDC) managed with either CGM therapy (n=82) or SMBG (n=78) over a 6.5-year period (1/1/14 to 8/31/20) for T1D. Obstetric care was provided at obstetric practices across Colorado and Wyoming. CGM use was defined as >60% wear in the 2nd and 3rd trimesters of pregnancy. Baseline characteristics and maternal/fetal outcomes data were obtained from the BDC electronic medical record system and the vital statistics departments of Colorado and Wyoming. We used student€™s t-test for continuous variables and chi-squared test for categorical variables to compare outcomes between groups.

Results: At baseline, CGM users were less likely to have Medicaid. CGM users were more likely to meet HbA1C goals in all trimesters ($p<0.01$ in each trimester). More than half of the women in the SMBG group did not meet HbA1C goals in any trimester ($p=0.004$). CGM use significantly increased the likelihood of meeting trimester-specific HbA1c goals in each trimester throughout pregnancy among women with T1D. CGM users had infants with lower mean birth weights (grams and percentile) and lower rates of large-for-gestational-age infants.

Conclusions: CGM use significantly improved maternal glucose levels and neonatal health outcomes in a racially and socioeconomically diverse cohort in a real-world setting.

Primary Presenter: Mason Gedlaman

Project Title: *Factors Influencing College Football Players€™ Beliefs About Incurring Football-Related Dementia*

Primary Mentor: Christine Baugh

Thematic Area: Public Health and Epidemiology

Abstract:

Background: Football participation is associated with risks to acute and long-term health, including the possibility of incurring football-related dementia. Concerns have been raised regarding media coverage of these risks, which may have influenced athletes' beliefs. However, little is known about football players' views on football-related dementia. The risk-perception literature suggests that related risk perceptions and features of individual cognition, such as the ability to switch to reasoned, deliberative thinking, may influence individual perception of a long-term risk.

Purpose: To evaluate factors influencing college football players' belief that they are likely to incur football-related dementia in the future.

Study design: Cross-sectional study.

Methods: Members of 4 National Collegiate Athletic Association Division I Power 5 Football teams participated in this survey-based study, providing responses to demographic, athletic, and risk-posture questions, and completed the cognitive reflection test. Logistic regressions were used to evaluate relationships between beliefs about football-related dementia and factors including athletic and demographic characteristics, football risk posture, health-risk posture, and cognitive reflection test score.

Results: About 10% of the 296 participating athletes thought football-related dementia was likely to occur in their future. Skill players had lower odds than linemen of believing that football-related dementia was likely (odds ratio [OR], 0.35; 95% CI, 0.14-0.89). For each additional suspected concussion in an athlete's career, his odds of believing football-related dementia was likely increased by 24% (OR, 1.24; 95% CI, 1.07-1.45). Acute and chronic football-related risk perceptions, as well as non-football-related health-risk perceptions, were positively associated with athletes' belief that football-related dementia was likely. Higher cognitive reflection test scores, a measure of ability to switch to slow, deliberative thinking, was positively associated with odds of believing football-related dementia was likely (OR, 1.57; 95% CI, 1.12-2.21).

Conclusion: Some athletes view football as generally riskier, while others view football as generally lessri sky. These risk postures are informed by athletes' concussion history, primary playing position, and ability to switch from fast, reactive thinking to slow, deliberative thinking. Ensuring that athletes are appropriately informed of the risks of participation is an ethical obligation of universities; sports medicine clinicians are appropriate facilitators of conversations about athletes' health risks.

Primary Presenter: Matthew Genelin

Project Title: *Patient Pill Organization Strategies and Adherence Measured in a Cross-Sectional Study of Hypertension*

Primary Mentor: Stacie Daugherty

Thematic Area: Clinical Science

Abstract:

ABSTRACT

Background: The strategies patients use to organize medications (eg, pill dispenser) may be reflected in adherence measured at follow-up. We studied whether medication organization strategies patients use at home are associated with adherence measured using pharmacy-fills, self-report, and pill counts.

Design: Secondary analysis of data from a prospective randomized clinical trial

Setting: Eleven US safety-net and community primary care clinics

Patients: Of 960 enrolled self-identified Non-Hispanic Black and White patients prescribed antihypertensive medications, 731 patients reported pill organization strategies and were included.

Variable: Patients were asked if they use any of the following medication organization strategies: finish previous refills first; use a pill dispenser; combine same prescriptions; or combine dissimilar prescriptions.

Outcomes: Adherence to antihypertensive medications using pill counts (range 0.0-1.0 percent of days covered), pharmacy-fill (proportion of days covered > 90%), and self-report (adherent/non-adherent).

Results: Of 731 participants, 38.3% were men, 51.7% were ‰¥ age 65, 52.9% self-identified as Black or African American. Of the strategies studied, 51.7% finished previous refills first, 46.5% used a pill dispenser, 38.2% combined same prescriptions and 6.0% combined dissimilar prescriptions. Median (IQR) pill count adherence was 0.65 (0.40-0.87), pharmacy-fill adherence was 75.7%, and self-reported adherence was 63.2%. Those who combined same prescriptions had significantly lower measured pill count adherence than those who did not (0.56 (0.26-0.82) vs 0.70 (0.46-0.90), $p<0.01$) with no significant difference in pharmacy-fill (78.1% vs. 74%, $p=0.22$) or self-reported adherence (63.0% vs. 63.3%, $p=0.93$).

Conclusion: Self-reported medication organization strategies were common. Combining same prescriptions was associated with lower adherence as measured using pill counts but not pharmacy-fills or self-report. Clinicians and researchers should identify the pill organization strategies used by their patients to understand how these strategies may influence measures of patient adherence.

Primary Presenter: Alexis Gerk

Project Title: *Left Ventricular Electro-Mechanical Discoordination Is Present In Patients With Tetralogy of Fallot Not Meeting Conventional Criteria for Pulmonary Valve Replacement*

Primary Mentor: Max Mitchell

Thematic Area: Clinical Science

Abstract:

Background: Pulmonary regurgitation (PR) and right ventricular (RV) dilation influence timing of pulmonary valve replacement (PVR) in patients with repaired Tetralogy of Fallot (rTOF). Left ventricular (LV) function is an independent marker of TOF patient outcomes. New markers of electromechanical discoordination have recently been described. Systolic stretch fraction (SSF) quantifies the ratio of ventricular myocardium inappropriately relaxing during systole. Diastolic relaxation fraction (DRF) quantifies the inappropriate myocardial contraction during diastole. We analyzed LV electro-mechanical discoordination (EMD) using SSF and DRF in rTOF patients with PR who do not meet commonly used criteria for PVR and have mild to moderate RV dilation. LV intracavitary flow (LVICF) organization was also assessed to examine correlation with RVEDVi.

Hypothesis: Patients with rTOF will have abnormal LV EMD and abnormal LVICF.

Methods: Patients (n=18) and healthy controls (n=20) with rTOF and PR underwent cardiac MRI. LV EMD was analyzed using SSF and DRF derived from strain and strain rate analysis considering individual LV myocardial segments. Temporal-geometric LV end-diastolic volumes were separated and quantified as percentage of direct flow, retained inflow, delayed ejection flow, and residual volume. Rank-sum test was used to compare groups. SSF and DRF were assessed for linear correlations with RVEDVi by Pearson method.

Results: There were 9 male and 9 female TOF patients (Mdn age 15, range 9-55). TOF patients had increased RVEDVi (118 ± 23 ml/m2, $p<0.001$) and increased RVESVi (56 ± 13 ml/m2, $p<0.001$) compared to controls. RV EF was lower in TOF patients but within normal physiologic range (53 ± 6%, $p=0.008$). LV size indices and EF did not differ. TOF patients had increased SSF (Mdn 0.035, IQR 0.015-0.052, $p=0.002$) and significantly decreased DRF (Mdn 2.735, IQR 2.358-2.959, $p<0.0001$). RVEDVi correlated with increased SSF ($R=0.51$, $p=0.011$) and decreased DRF ($R=0.62$, $p=0.007$). Direct flow was significantly decreased in the rTOF patients (26.1% vs 35.5%, $p=0.011$), whereas residual volume was significantly increased (24.6% vs 16.6%, $p=0.014$).

Conclusions: TOF patients with PR and mild to moderate RV dilation have significant LV EMD during both systole and diastole. The degree of systolic and diastolic EMD correlates with RV dilation. SSF and DRF are unique and sensitive early markers of LV dysfunction compared to conventional MRI metrics.

Primary Presenter: Rachel Graham

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

Primary Mentor: Angela Sauaia

Thematic Area: Global Health

Abstract:

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

Background

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

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

Methods

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

Results

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

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

Conclusions

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

Primary Presenter: Ryan Griffin

Project Title: *A Nomogram to Predict Prolonged Total Length of Stay Following Curative Intent Cytoreductive Surgery*

Primary Mentor: Steven Ahrendt

Thematic Area: Clinical Science

Abstract:

Introduction: Cytoreductive surgery (CRS) with or without heated intraperitoneal chemotherapy (HIPEC) is associated with significant morbidity and unplanned readmissions. Enhanced recovery after surgery protocols have been shown to decrease initial postoperative length of stay (LOS) without evidence of decreasing readmission rates among this patient population. The purpose of this study was to evaluate preoperative and intraoperative factors associated with a prolonged total (initial + readmission) LOS > 14 days and to create a nomogram to predict the probability of prolonged hospital stay.

Methods: Patients who underwent curative intent CRS with or without HIPEC at a large academic medical center from January 2017-January 2020 were included. A multivariable logistic regression model was used to examine factors associated with a total LOS >14 days, and a nomogram predicting a total LOS >14 days was created. The performance of the nomogram was evaluated using a receiver operating curve and the area under the curve.

Results: We identified 159 patients who underwent curative intent CRS. The mean total LOS was 13.8 days and 40 patients had a total LOS > 14 days. Of the patients who experienced a total LOS > 14 days, 22 patients had one or more unplanned 90-day readmissions. On multivariate analysis age >60 (Odds Ratio (OR)=3.5, peritoneal cancer index >20 (OR=2.3), ileostomy (OR=3.7, gastrectomy with gastrojejunostomy (OR=2.8), colonic anastomosis (OR=3.5), and enterocolic anastomosis (OR=2.3) were significantly associated with a LOS>14 days. These variables were used to create a nomogram to predict the risk of prolonged total LOS. The area under the receiver operating curve was 0.83.

Conclusions: This nomogram allows for the early postoperative identification of high-risk patients for a prolonged total LOS. These patients can be targeted with early inpatient and home parenteral nutrition support, aggressive physical therapy, and routine screening for intraabdominal infection to prevent common causes for prolonged hospital stay and readmission.

Primary Presenter: Zachary Haave

Project Title: *Single-dose intravenous ketamine or intramuscular naltrexone for high-utilization inpatients with alcohol use disorder: pilot trial feasibility and readmission rates.*

Primary Mentor: Dale Terasaki

Thematic Area: Clinical Science

Abstract:

Title: Single-dose intravenous ketamine or intramuscular naltrexone for high-utilization inpatients with alcohol use disorder: pilot trial feasibility and readmission rates.

Background/Significance:

Alcohol use disorder (AUD) impacts 15 million Americans leading to 5 million annual emergency department (ED) visits and 2 million hospital admissions. Hospitalization is a vital opportunity to intervene, and two single-dose pharmacologic interventions (intramuscular naltrexone or intravenous ketamine) given before discharge may be effective at reducing re-admissions and ED utilization. The impacts on reducing hospital utilization of these two interventions are not well known in patients with AUD.

Methods:

Our open-label, pilot trial randomized participants (n=44) to 1) extended-release naltrexone injection (n=14), 2) intravenous ketamine infusion (n=13), or 3) enhanced-linkage alone (n=17). Adult hospitalized participants with severe AUD and at least one past-year admission were recruited through the addiction consult census at an urban, safety-net hospital. The primary clinical outcome was 30-day all cause hospital readmission rate with a key secondary outcome being 30-day ED visits. Demographics, adverse childhood experiences (ACE), Timeline Follow Back drinking history (TLFB), and depressive symptoms (PHQ-9), are recorded at baseline and addiction clinic follow-up visits.

Results:

Most participants were non-Hispanic (63.6%), white/Caucasian (56.8%), males (79.6%) whose highest level of education was high school/GED (54.6%), with a substantial portion without stable housing (38.6%). Clinically, they had a mean of 10.9 past-year ED visits, 3.2 hospital admissions, and a mean of 12.0 daily drinks at baseline. Compared to the LA arm, both the KET arm and NTX arm had lower 30-day readmission rates and ED visits, though the differences were not statistically significant. No major adverse events were reported for either intervention.

Conclusion:

Ketamine and naltrexone showed promise as potential treatments in high-risk patients with AUD, in this small open label pilot study. Though the lower readmission rates and ED visits demonstrated were not statistically significant, participants in our study rated ketamine infusions and naltrexone injections as highly acceptable. Furthermore, ease of administration in a hospital

setting was demonstrated. This necessitates further research into these potentially effective interventions in combating AUD.

Primary Presenter: Steve Haberkorn

Project Title: *A Quality Improvement Project to Reduce Sugammadex Cost and Waste by Using Aliquots*

Primary Mentor: Mark Twite

Thematic Area: Clinical Science

Abstract:

Title: A Quality Improvement Project to Reduce Sugammadex Cost and Waste by Using Aliquots

Authors: S Haberkorn, M Twite, K Klockau, G Whitney, D Faulk

Background: Sugammadex is supplied in 200mg/2ml manufacturer vials that potentially contain enough medication for multiple patient doses. However, vials are single use, resulting in medication waste. The aim of this QI project was to reduce medication cost and waste by aliquoting sugammadex into 50mg/0.5ml pre-filled syringes from larger vials (500mg/5ml). Quantitative neuromuscular blockade (NMB) monitoring was used to guide sugammadex dosing and ensure complete reversal.

Methodology: All patients undergoing procedures in the general ORs and cardiac catheterization labs, who required rocuronium and reversal with sugammadex, were included. Exclusion criteria were patients expected to remain intubated and emergency cases. The OR pharmacy aliquoted sugammadex into 50mg/0.5ml syringes at a cost of $21.01 per syringe. Standard vials of sugammadex (200mg/2ml) cost $109.79 each. Quantitative NMB monitoring was conducted using Senzime Tetragraph,,¢ monitors, which require a $27 sensor per case.

Results: From October 10th to December 9th, 2022, 203 procedures were included in the analysis: 87 used 50mg/0.5ml aliquots, 75 used standard 200mg/2ml vials, and 41 did not require sugammadex because the patient achieved reversal without an agent. Mean cost of sugammadex was $1.65/kg for aliquot cases and $2.58/kg for vial cases. Net savings was $4,203.04 for aliquot cases and $3,723.76 for cases not requiring reversal. Had vial cases used aliquots, those cases would have saved an additional $1433.19, for a total net savings of $9,359.99 or $46.11 per patient.

Conclusions: Use of sugammadex aliquots (50mg/0.5ml), in combination with quantitative NMB monitoring, resulted in $46.11 net savings per patient. Approximately 8,000 patients receive NMB and reversal at our institution per year, which could result in an estimated $368,866.60 annual cost savings. True annual savings may be higher or lower than this, depending on several factors.

Primary Presenter: Colton Hageman

Project Title: *Implementation of the Cardiac Neurodevelopmental Care Optimization (CINCO) Program:*

An Interdisciplinary & Generalizable Approach to Inpatient Neurodevelopmental Care

Primary Mentor: Jesse Davidson

Thematic Area: Clinical Science

Abstract:

Abstract

Background. Children with congenital heart disease (CHD) are at risk for neurodevelopmental delays, and length of hospitalization is a predictor of poorer long-term outcomes. Multiple aspects of hospitalization impact neurodevelopment, including sleep interruptions, limited holding, and reduced developmental stimulation. We aimed to address modifiable factors by creating and implementing an interdisciplinary inpatient neurodevelopmental care program in our Heart Institute.

Methods. In this quality improvement study, we developed an evidence-based approach to neurodevelopmental care across the continuum of hospitalization for patients with CHD using three plan-do-study-act cycles. With input from multi-level stakeholders including parents/caregivers, we co-designed interventions that comprised the Cardiac Inpatient Neurodevelopmental Care Optimization (CINCO) program. These included medical/nursing orders for developmental care practices, developmental kits for patients, bedside developmental plans, caregiver education and support, developmental care rounds, and a specialized volunteer program. We obtained data from the electronic health record for patients aged 0-2 years admitted for >7 days to track implementation.

Results. There were 619 admissions in 18 months. Utilization of CINCO interventions increased over time, particularly for the medical/nursing orders and caregiver handouts. The volunteer program launch was delayed but grew rapidly and within six months, provided over 500 hours of developmental interaction with patients.

Conclusions. We created and implemented a low-cost program that systematized and expanded upon existing neurodevelopmental care practices for patients aged 0-2 years in the cardiac inpatient units. Feasibility was demonstrated through increasing implementation rates over time. Key takeaways include the importance of multi-level stakeholder buy-in and embedding processes in existing clinical workflows.

Primary Presenter: Benjamin Hakakian

Project Title: *How Mobile Health May Improve Addiction Treatment for Patients and Providers*

Primary Mentor: Steven Lowenstein

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

How Mobile Health Technology May Improve Addiction Treatment for Patients and Providers is a literature review exploring substance use disorder (SUD) in the context of mobile health (mHealth) apps. There is an immense cost tied to substance use disorders which has steadily increased over the last several years. While individuals seeking treatment may initially have success, the chronicity and relapsing nature of the disease adds to the expense and makes it particularly difficult to treat from a provider perspective. This prompted the need to look into creative methods of treatment that may give the necessary support to patients while alleviating the burden for healthcare workers and maintaining healthcare resources. As most people have access to smartphones with the advent of smartphone apps, the objective of our literature review was to investigate how smartphone apps can be a complement to the treatment of substance use disorder. We focused on barriers that exist in treatment of SUD, including both personal characteristics as well as structural barriers. We then looked into the current design of smartphone apps used for SUD treatment. Through our review, we found that smartphone apps have the potential to complement the treatment of SUD by giving continual support to patients and keeping them in treatment longer, ease the stress of administering treatment for providers, and decrease healthcare costs due to SUD. Through our search we also recognized that while there are benefits, there are also limitations to relying on smartphone apps such as the lack of benefit for individuals who do not have access to a smartphone or are not familiar with how to use one. In addition, there are very few evidence-based apps on the market, and for the ones that do exist, there are language barriers faced by minority populations. We also recognize that this is a new area of research and further work, such as performing qualitative interviews with individuals who have used these apps, needs to be done.

Primary Presenter: Ali Hakimi

Project Title: *Comparison of Handheld Ultrasound Devices used in Carotid and Abdominal Aortic Vascular Studies*

Primary Mentor: Juliana Wilson

Thematic Area: Clinical Science

Abstract:

Introduction: Point-of-Care Ultrasound (POCUS) has become common in many clinical care settings. Many devices exist with several different, mostly overlapping functions. This study is one of the first studies to compare the image quality of commercially available handheld POCUS devices.

Methods: A prospective study was conducted to evaluate the image quality and clinical utility of the Butterfly IQ, GE Vscan, Phillips L12-4 (Linear), and Phillips S4-1 (Phased array) devices. An expert panel of reviewers examined the compiled images and answered a survey-based questionnaire. Repeated measures ANOVA will be used to compare scores.

Results: Twenty-five participants met the inclusion criteria. Most participants were female (52%). Mean BMI was 23.70 ± 3.71. Further evaluation of images is still pending panel review.

Conclusion: Despite the variety of commercial POCUS options, additional peer-reviewed data comparing these devices is needed.

Primary Presenter: Ilsa Hale

Project Title: *INTRODUCING €˜THE PAUSE€™ PRACTICE TO THE UNIVERSITY OF COLORADO HOSPITAL CODE TEAM: A QUALITY IMPROVEMENT PROJECT*

Primary Mentor: Jeanie Youngwerth

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

ABSTRACT

Background

Many organizations are now paying attention to healthcare burnout, and it has become an internationally recognized issue requiring attention within the healthcare industry. In-hospital patient death can pose a serious challenge to healthcare provider resiliency - contributing to burnout, depression, and work dissatisfaction in healthcare.1 It is theorized that The Pause could be a useful tool in protecting healthcare worker resiliency in a setting where patient deaths are often unavoidable.2

The Pause3 is a simple practice observed by healthcare providers immediately following a patient death. It is a post-resuscitation, 30-60 second moment of silence in the room. This practice is designed with the intention of not only of honoring the patient€™s life but acknowledging the team€™s efforts to care for the patient and providing an early opportunity to begin the emotional healing process after the challenging experience of a resuscitation that ended in death.

Methods

We implemented the practice of The Pause with the code team at University of Colorado Hospital. We measured its effect on resiliency by surveying code team members before and after implementing The Pause. Healthcare worker resiliency was measured using the Brief Resiliency Coping Scale (BRS), a validated brief survey that aims to quantify resiliency and coping ability.4

Results

The data collected showed a baseline high resiliency level among healthcare workers surveyed. After introducing The Pause, the resiliency as measured by BRS scores showed no significant change.

Conclusion: While The Pause did not significantly improve the BRS ratings, the ratings did remain at €œnormal resiliency.€ It may be possible that The Pause still supports a culture of resiliency that may already exist in the UCH setting. Further research is warranted to investigate the effects of The Pause practice in healthcare settings.

Primary Presenter: Jared Hanson

Project Title: *Clinical Outcomes of Pectoralis Major Tendon Repair with and without Platelet-Rich Plasma*

Primary Mentor: Peter J. Millett, MD

Thematic Area: Clinical Science

Abstract:

Abstract

Purpose: To assess clinical outcomes following pectoralis major tendon (PMT) repairs and to compare outcomes of PMT repairs augmented with and without leukocyte-poor platelet-rich plasma (LP-PRP).

Methods: A retrospective review of prospectively collected data was performed of patients who underwent a PMT repair from May 2007 to June 2019 with a minimum of 2-year follow-up. Exclusion criteria included revision PMT repair, PMT reconstruction, and concomitant repair of another glenohumeral tendon/ligament. LP-PRP was injected surrounding the PMT repair before wound closure. Patient-reported outcome (PRO) data were collected preoperatively and evaluated at final follow-up using the American Shoulder and Elbow Surgeons Score (ASES), Single Assessment Numeric Evaluation Score (SANE), Quick Disabilities of the Arm, Shoulder and Hand Score (QuickDASH), and Short Form 12 physical component summary (SF-12 PCS), patient satisfaction with outcomes.

Results: Twenty-three men (mean age, 38.6 years; range, 20.5-64.3 years) were included in the final analysis. Mean time from injury to surgery was 30 days (range, 3-123 days). Follow-up was obtained for 16 of 23 patients (70%) at a mean of 5.1 years (range 2.0-13.0 years). Significant improvement in PROs was observed (ASES: 59.0 / 92.4, P= .008; SANE: 44.4 / 85.9, P= .018; QuickDASH: 44.4 / 8.5, P= .018; and SF-12 PCS: 42.5 / 52.6, P= .008). Median satisfaction was 9 of 10 (range, 6-10). Patients receiving LP-PRP had superior ASES (99.6 vs 83.0, P= .001), SANE (94.8 vs 74.6, P= .005), QuickDASH (0.24 vs 19.1, P= .001), and patient satisfaction (10 vs 9, P= .037) scores compared with those without PRP. PROs were unchanged based on chronicity, mechanism of injury, or tear location. One patient had revision surgery at 3.4 years due to adhesions.

Conclusions: PMT repair produces improved PROs at final follow-up when compared with preoperative values.

Level of Evidence: Level III, retrospective comparative therapeutic trial.

Primary Presenter: Nikolai Harroun

Project Title: *BMPR1A Specific Juvenile Polyposis Syndrome : A Specific Gene with Specific Needs.*

Primary Mentor: Seth Septer

Thematic Area: Clinical Science

Abstract:

BMPR1A Specific Juvenile Polyposis Syndrome : A Case Series. Juvenile polyposis syndrome (JPS) is a heterogenous condition both phenotypically and genotypically, that leads to increased risk of gastrointestinal cancers and other extraintestinal manifestations. The risks of these consequences of the condition depend on the specific genetic mutation leading to the syndrome in each individual. The two major genes where mutations lead to JPS are SMAD4 and BMPR1A. The majority of these cases that are well documented in literature, including the screening guidelines for colon cancer, are primarily in relation to SMAD4 mutations. There has been a call for increased investigation into BMPR1A mutation and the potential differences in condition compression compared to SMAD4 mutations. This case series documents four cases of pediatric patients with diagnosed JPS and have BMPR1A mutations. Through a deep chart review of each patient, identifying their initial symptoms, family history of polyps and other conditions, their endoscopic screening procedures to date, and their current state of health, we were able to identify a major trend for BMPR1A mutation JPS patients. We found that all four patients presented with symptoms secondary to their JPS and polyps identified on colonoscopy prior to the recommended screening initiation by current JPS guidelines. This further supports the fact that JPS is a heterogeneous condition with multiple genetic loci that can be the underlying cause. It also supports that BMPR1A mutation-possessing patients may require specific screening guidelines because of their specific phenotypes.

Primary Presenter: Alexandra Hazen

Project Title: *Metaplastic Breast Carcinoma*

Primary Mentor: Kshama Jaiswal

Thematic Area: Clinical Science

Abstract:

Metaplastic breast carcinoma is a rare subtype of breast cancer associated with a very poor prognosis given its chemo-resistive and aggressive qualities. It is an important diagnostic consideration when there is a suspicion for breast cancer given it often requires multiple treatment modalities (chemotherapy, radiation, and hormone therapy). We present a case of a patient diagnosed with metaplastic breast carcinoma to highlight some of the key imaging features that may help differentiate it from other more common breast cancers.

Primary Presenter: John Hesling

Project Title: *Characterizing Pediatric Supermassive Transfusion and the Contributing Injury Patterns in the Combat Environment*

Primary Mentor: Vikhyat Bebarta

Thematic Area: Clinical Science

Abstract:

Background: Trauma is the leading cause of pediatric mortality in the United States. Often, these patients require supermassive transfusion (SMT), which we deï¬□ne as receipt of >80 mL/kg blood products, double the proposed volume for standard pediatric massive transfusion (MT). Evaluating the blood volumes, injury patterns, clinical ï¬□ndings, and prehospital interventions predictive for SMT are critical to reducing pediatric mortality. We de-scribe the pediatric casualties, injury patterns, and clinical ï¬□ndings that comprise SMT.

Methods: We retrospectively analyzed pediatric trauma data from the Department of Defense Trauma Registry from January 2007€“2016. We stratiï¬□ed patients into two cohorts based on blood products received in the ï¬□rst 24 h after injury: 1) those who received 40€“80 mL/kg (MT), or 2) those who received >80 mL/kg (SMT). We evaluated demographics, injury patterns, prehospital interventions, and clinical ï¬□ndings.

Results: Our original dataset included 3439 pediatric casualties. We identiï¬□ed 536 patients who met inclusion parameters (receipt of ‰¥40 mL/kg of blood products [whole blood, packed red blood cells, fresh frozen plasma, platelets, or cryoprecipitate]). The MT cohort included 271 patients (50.6%), and the SMT cohort comprised 265 patients (49.4%). Survival to discharge was signiï¬□cantly lower (78% for SMT, 86% for MT; p <0.011)in the SMT cohort. Multivariable analysis of injury patterns revealed serious injuries (Abbreviated Injury Scale 3€“6) to the extremities (OR 2.13, 95% CI 1.45€“3.12) and abdomen (OR 1.65, 1.08€“2.53) were associated with SMT. Wound dressings (41% versus 29%; p = 0.003), tourniquets (23% vs 12%; p = 0.001), and IO access (17% vs 10%; p = 0.013) were more common in the SMT group. Age-adjusted hypotension was signiï¬□cantly higher in the SMT group (41%, n = 100 vs 23%, n = 59; p < 0.001) with no statistical difference detected in tachycardia (87%, n = 223 vs 87%, n = 228; p =0.932).

Conclusions: Our research demonstrates that pediatric SMT patients are at increased risk of mortality. Our study highlights the seriousness of extremity injuries in pediatric trauma patients, identifying associations between severe injuries to the extremities and abdomen with the receipt of SMT. Prehospital interventions of wound dressing, tourniquets, and IO access were more frequent in the SMT cohort. Our research determined that hypotension was associated with SMT, but tachycardia was not a reliable predictor of SMT over MT.

Primary Presenter: Clayton Hoffman

Project Title: *Massive Pulmonary Embolism with Cardiac Arrest During Routine Tibial Bypass Surgery*

Primary Mentor: Donald Jacobs

Thematic Area: Clinical Science

Abstract:

We report the case of a massive pulmonary embolism with intra-operative cardiac arrest in a 48-year-old male during routine surgical tibial bypass successfully managed by catheter-based interventions. Our experience supports the trending shift in pulmonary embolism therapy guidelines to include endovascular approaches and emphasizes the need for vascular surgeons to adapt their training protocols.

Primary Presenter: Alexander Hoffner-Heinike

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

Primary Mentor: Scott Auerbach

Thematic Area: Clinical Science

Abstract:

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

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

Methods:

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

Results:

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

Conclusion:

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

Primary Presenter: Jack Hop

Project Title: *The presence of subcutaneous gas on postoperative radiographs following total shoulder arthroplasty does not influence rates of periprosthetic joint infection*

Primary Mentor: Jonathan Bravman

Thematic Area: Clinical Science

Abstract:

Purpose

The purpose of this study is to evaluate the significance of subcutaneous gas on postoperative radiographs following total shoulder arthroplasty (TSA) and assess whether it is associated with the ultimate development of a periprosthetic joint infection (PJI).

Introduction

As the incidence of TSA continues to rise, the associated complications must also be evaluated. Although rare, PJI remains one of the most devastating complications following TSA with significant consequences on patient outcomes. Early diagnosis of shoulder PJI remains elusive, and many previously identified biomarkers have poor sensitivity and specificity. Additionally, non-virulent organisms comprise a majority of shoulder PJIs, adding to the complexity of diagnosis. Radiographs are standard of care following TSA and are often the first imaging modality to assess for PJI. Many patients have subcutaneous gas present on postoperative and follow up radiographs following TSA, the significance of which remains unknown, though the presence of which has raised concern for PJI.

Methods

A retrospective review of all TSA€™s performed at a single academic institution between January 2010- March 2020 was completed. All patients undergoing primary TSA with postoperative radiographs and clinic follow up were included, including all patients with PJI (n=13 infections). Radiographs were evaluated by two MSK radiologists with a Cohen€™s kappa test for interrater reliability.

Results

Of 582 total patients who underwent TSA, 13 of the 13 (100%) patients who developed PJI and 563 of the 569 (97.7%) patients without PJI had subcutaneous gas on immediate postoperative radiographs ($p= 0.87$). On follow-up radiographs, subcutaneous gas was present on 5 of the 13 (38.5%) patients who developed a PJI and 190 of 559 (34.0%) patients who did not develop a PJI ($p= 0.771$). Subcutaneous gas was present in a higher percentage of patients who underwent reverse TSA (RTSA) than anatomic TSA at the time of follow-up radiograph (41.8% vs. 22.8%, $p< 0.0001$), and the time to gas resolution was longer in these patients (52.93 vs. 24.79 days, $p= 0.0001$). Time to gas resolution was an average of 34.38 days in the patients that developed PJI and 41.54 days in patients who did not develop a PJI ($p= 0.421$).

Conclusion

The presence of subcutaneous gas on immediate postoperative and subsequent radiographs following TSA, and the duration of time to resolution of the gas, are not correlated with increased risk of shoulder PJI. The current evidence suggests that subcutaneous gas is an expected postoperative finding without any known correlative pathologic sequelae.

Primary Presenter: Stacee Horwitz

Project Title: *Metabolic Phenotype Contributions to Birthweight in Maternal Obesity*

Primary Mentor: Theresa Powell

Thematic Area: Basic Biomedical Science

Abstract:

Context

Pregnant women that are obese are more likely to deliver a large for gestation age (LGA) infant, which is associated with increased perinatal morbidity and risk to develop metabolic and cardiovascular disease later in life. However, the mechanisms underpinning fetal overgrowth remain to be fully established.

Objective

Identify maternal, placental, and fetal factors that are associated with fetal overgrowth in obese pregnant women.

Methods

Maternal and umbilical cord plasma and placentas were collected from women with obesity delivering LGA (n=30) or AGA (n=21) infants at term. Maternal and umbilical cord plasma analytes were measured using multiplex sandwich assay and ELISA. mTOR and insulin signaling activity was determined in placental homogenates and glucagon-like peptide-1 receptor (GLP-1R) protein expression and amino acid transporter activity were measured in syncytiotrophoblast microvillous membrane (MVM) and basal membrane (BM). GLP-1R signaling was measured in cultured primary human trophoblast cells.

Results

Maternal plasma glucagon-like peptide-1 (GLP-1) was higher in OB-LGA pregnancies and positively correlated to birthweight. Umbilical cord plasma insulin, C-peptide, and GLP-1 was increased in OB-LGA infants. OB-LGA placentas were larger but showed no change in insulin/mTOR signaling or amino acid transport activity. We detected GLP-1R expression in the human placenta and is predominately expressed in the MVM. Lastly, we found GLP-1R activation stimulates the ERK1/2 pathway in primary human trophoblast cells.

Conclusion

Elevated maternal GLP-1 is associated with fetal growth in maternal obesity. GLP-1R is expressed in the syncytiotrophoblast and activates the ERK1/2 pathway. We speculate maternal GLP-1 acts as a novel regulator of placental function and fetal growth.

Primary Presenter: Jin Huang

Project Title: *Mental Health and Substance Use in Colorado Healthcare and Graduate Students During COVID-19: A Mixed-Methods Investigation*

Primary Mentor: Marilyn Coors

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Background: The COVID-19 pandemic continues to impact mental health by exacerbating anxiety, fear, and substance use worldwide. Several studies have demonstrated increased substance use and declining mental health in students abroad, but no investigation has assessed the COVID-19 pandemic€™s effects on mental health and substance use in graduate and healthcare students in the United States.

Objective: Researchers sought to quantify and qualify the ongoing COVID-19 pandemic€™s impacts on Colorado graduate and healthcare students€™ mental health and substance use, hypothesizing that greater COVID-19-related fear would correlate with higher substance use rates across metrics.

Methods: Investigators utilized an online, institutionally-distributed, mixed-methods survey to assess quantitative and qualitative changes in various mental health metrics and substance use in Colorado healthcare and graduate students during the COVID-19 pandemic from June 2020 to February 2021. An augmented Fear of COVID-19 Scale (FCV-19S) academic survey served as the primary data collection vessel.

Results: Students who reported higher levels of depression, exhaustion, loneliness, nervousness, and anger had significantly higher FCV-19S scores. Higher FCV-19S scores were also significantly associated with increased levels of alcohol consumption, binge drinking, and cannabis use. Qualitative analysis elucidated recurring themes regarding use frequency, substances used, and the reasons underlying use. Further qualitative analysis revealed three common student concerns: worries regarding the length of the pandemic, its social impact, and educational/financial impact.

Conclusions: The COVID-19 pandemic has negatively affected the well-being of Colorado healthcare and graduate students, directly increasing substance use while simultaneously exacerbating feelings of fear, anxiety, and helplessness.

Primary Presenter: Amanda Hunt

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

Primary Mentor: Brandon Wojcik

Thematic Area: Clinical Science

Abstract:

ABSTRACT

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

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

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

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

Primary Presenter: Ryan Imber

Project Title: *Preincision versus Postincision Frequent Door Openings During Total Joint Arthroplasty*

Primary Mentor: Heather Young

Thematic Area: Public Health and Epidemiology

Abstract:

Introduction

Surgical site infections (SSIs) are a serious complication of total hip and total knee arthroplasty procedures and a source of significant morbidity.1 Risk factors for the development of SSIs commonly fall into three categories 1) patient-related factors 2) surgical technique 3) operating room environment.2 Of these factors, the operating room environment stands out as the factor that health care professionals have the most control over and can optimize to prevent SSIs. Frequent door openings in the OR are believed to disrupt laminar airflow3 and positive pressure.4 Several studies have implicated frequent door openings in the OR with higher rates of airborne contamination3, 5 and subsequently increased rates of SSIs.6

High rates of door openings during total hip and total knee arthroplasty have been previously established in the literature.1, 5, 7, 8 However, the difference in door openings between the pre-incision period and the post-incision period has not been clearly defined. This is significant, as previous studies have shown an increase in airborne contamination during the pre-incision period as compared to the post-incision period.3 Therefore, the purpose of this study was to understand the reasons for door openings in the pre-incision and post-incision period, in order to provide insight on how to best develop interventions for these two periods.

Methods

This is a cross-sectional, observational study. Data was recorded at three large academic institutions between June 2019 and August 2020. Total hip and knee arthroplasty procedures were included in this study. Revision procedures secondary to an infected joint met exclusion criteria. Observations were made by 4 observers who all underwent identical training and used a standardized data collection form. The number of door openings was recorded as well as the reason for the door openings and the period in which the door was opened. Additionally, distractions associated with door openings were recorded and rated according to severity using a nine-point scale that was adopted from Healey et al. 9

Pre-incision period was defined as the time between the opening of the sterile instrument tray to the first incision. The post-incision period was defined as the time between the first incision and the application of the bandage. A distinction was made in the observations between the opening of the substerile door, which leads to a sterile room and hallway door, which leads to a non-

sterile corridor. This study met classification for €œnot human subject research€ by our institutional review board. Data was analyzed using the Wilcoxon two-sample median test.

Results

25 pre-incision sessions and 26 post-incision sessions were observed. 11 were total knee arthroplasty and 15 were total hip arthroplasty. The pre-incision period was a median of 56 (IQR 49-63) minutes. The median duration of surgery (post-incision period) was 81 (IQR 67-91) minutes. Overall, there were 0.56 (IQR 0.40-0.70) door openings/minute in the pre-incision period and 0.34 (IQR 0.26-0.45) door openings/minute in the post-incision period. This study found a significant difference between these two periods, with p=0.0036.

Reasons for pre-incision period door openings were as follows: 25% due to nurses obtaining supplies, 20% due to the surgical team (attending, residents and medical students) entering and leaving the OR to check on the progress of the surgical preparation and 19% was classified as other, this includes things such as medication deliveries and nursing students entering and leaving (Figure 1A). Reasons for post-incision period door openings were as follows: 18% due to nurses obtaining supplies, 18% due to the vendor obtaining supplies, 17% were classified as other, this includes things such as radiology techs entering and leaving the OR for x-ray dependent cases or case related questions (Figure 1B).

Discussion

We found a median of 0.56 (IQR 0.40-0.70) door openings/minute in the pre-incision period and 0.34 (IQR 0.26-0.45) door openings/minute in the post-incision period. These numbers are similar, although somewhat lower than previously reported door openings, such as Bedard et al.8 who reported a rate of 0.84 door openings/minute in the pre-incision period and a rate of 0.54 door openings/minute in the post-incision period.

While there is growing literature on the effect of door openings during the post-incision period, little is known about the effect of door openings during the pre-incision period. 1, 8 This study found a significant difference in door openings between these two periods. This is a significant finding, both for the creation and implementation of a door opening intervention and to further elucidate the effect of door openings on SSIs. Previous quality improvement interventions aimed at decreasing the number of door openings have struggled to create a sustainable change.7 This study demonstrated that the pre-incision and post-incision period are significantly different and should be treated as such in the creation and implementation of a successful door opening intervention.

Additionally, given the previously reported significant increase in airborne contamination during the pre-incision period3 and the high rate of pre-incision door openings (0.54 door openings/minute) found in this study, it is reasonable to hypothesize that the airborne contamination associated with door openings3, 5, 10 may affect the sterility of the instrument tray during the pre-incision period. Contamination of the sterile instrument tray during the pre-incision period may contribute to the increased risk of SSIs seen with frequent door openings.

Further research is needed to understand the possible effect door openings have on the sterility of the instrument tray as well as to find a sustainable intervention to decrease door openings.

Acknowledgements

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Potential Conflicts of Interest. All authors report no conflicts of interest relevant to this article.

Thank you Notes. Add later

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Primary Presenter: Mackenzie Isbell

Project Title: *Does marijuana use in pregnancy increase the risk for abnormal fetal biometrics on prenatal ultrasound?*

Primary Mentor: Heather Straub

Thematic Area: Clinical Science

Abstract:

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Introduction

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Does marijuana (MJ) use in pregnancy increase the risk for abnormal fetal biometrics on prenatal ultrasound and at delivery?

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Methods

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Patients who delivered from Jan 2012 to December 2018 with urine drug screens (UDS) were reviewed. Patients < 18, multifetal pregnancy, no delivery data or no prenatal ultrasound were excluded. Controls were matched on age, parity, insurance and delivery year. Maternal demographics, fetal biometry, and standard neonatal measurements were compared between positive and negative MJ UDS patients.

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Results

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A total of 413 patients were included in the analysis; 224 were MJ positive. Patients were generally < 35., multiparous, Non-Hispanic White with public insurance. There was a higher frequency of depression (37% vs 21%, p< 0.01), opiate use (4% vs 0%, p < 0.01), self-reported tobacco use (47% vs 22%, < 0.01), & positive UDS for other substances (13% vs 6%, p=0.02) in MJ positive patients. In patients with positive MJ UDS, there were no significant differences on prenatal ultrasound for estimated fetal weight, head circumference, abdominal circumference, femur length or cerebellar measurements. There was a higher frequency of humerus length < 10% for negative MJ UDS (12.6% vs 5.3%, p=0.03). At delivery, the median head circumference was larger in MJ negative patients (33.5 vs 33.0 cm, p = 0.03), otherwise there was no difference in birthweight or length.

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Conclusion

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Positive UDS for MJ in pregnancy does not appear to impact fetal growth parameters on second trimester ultrasounds. However, the median head circumference was significantly larger in UDS negative patients.

Primary Presenter: Tennyson Jellins

Project Title: *Pediatric Head and Neck Manifestations Associated with Multiple Endocrine Neoplasia Syndromes*

Primary Mentor: Brian Herrmann

Thematic Area: Clinical Science

Abstract:

INTRODUCTION: Multiple endocrine neoplasia (MEN) syndromes are a group of hereditary cancer syndromes that can predispose children to endocrine neoplasms developing within the head and neck.

OBJECTIVE: To examine the neoplastic manifestations of MEN in the pediatric head and neck.

METHODS: Retrospective chart review of children treated for MEN between 2005 and 2022.

RESULTS: Fifty-three patients were identified with genetically confirmed MEN (fifteen MEN1, thirty-four MEN2A, and four MEN2B) and 3 patients were identified with clinical diagnoses of MEN1. Family history of MEN was present in 91% (51/56) of patients, with 50/51 having a family history of cancer. The mean age of surgical intervention was 9.8 years (SD 4.8), with earlier surgery in MEN2 than MEN1 patients (mean age 8.7 vs 12.7 years). The male to female ratio for all patients was 1.06:1. Thyroid malignancies were identified in 36% (9/25) of thyroidectomy specimens (21 MEN2A, 4 MEN2B), with medullary thyroid carcinoma (MTC) present in five MEN2A patients and three MEN2B patients (89%), and papillary thyroid carcinoma (PTC) present in one MEN2A patient (11%). Nearly 90% (8/9) of thyroid malignancies were occult, with some occurring earlier than predicted by current guidelines. Neck dissections were performed in 24% (2 MEN1, 2 MEN2A, and 4 MEN2B), with two MEN2B (50%) demonstrating occult cervical lymph node (LN) metastases. The remaining neck dissections were disease free. Additional histopathologic findings included C-cell hyperplasia in 57% (12/21) of MEN2A thyroidectomy patients. Of the eight MEN1 parathyroidectomy patients, one demonstrated parathyroid hyperplasia and three presented with parathyroid adenoma.

CONCLUSION: MEN syndromes predispose individuals to early neoplasia within the pediatric head and neck, with MEN2B having higher risk for occult locoregional disease at the time of presentation. Early identification, multidisciplinary care, and judicious use of prophylactic surgery are important components in the care of children with MEN syndromes, given that moderate and high risk MEN2A patients demonstrated early tumorigenesis relative to current guidelines.

Primary Presenter: Aspen Johnston

Project Title: *Subclinical Autonomic Neuropathy in Type 2 Diabetes*

Primary Mentor: Jane Reusch

Thematic Area: Clinical Science

Abstract:

Subclinical Autonomic Neuropathy in Type 2 Diabetes

Aspen Johnston1, Layla Abushamat1,4,5, Daniel Enge1,3, Ethan Clark1,5, Judy Regensteiner2,3 and Jane E.B. Reusch1,3,5

1Divisions of Endocrinology, Metabolism & Diabetes, 2Cardiology, 3Ludeman Family Center for Women€™s Health Research, 4Department of Bioengineering, University of Colorado Anschutz Medical Campus, Aurora, CO, 5Section of Cardiovascular Research, Baylor College of Medicine, Houston, TX, 6Rocky Mountain Regional VA Medical Center, Denver, CO

People with type 2 diabetes (T2D) develop excess cardiovascular disease and decreased cardiorespiratory fitness (CRF), a predictor of premature mortality. T2D includes impaired insulin sensitivity, vasodilation, and mitochondrial function. These cardiac and systemic abnormalities may contribute to impaired CRF. Cardiac autonomic neuropathy (CAN) is a common complication of T2D that is often not detected until late in disease progression. Because autonomic nerves (ANS) innervate the heart and vasculature, dysfunction impairs control of both heart rate and vascular dynamics. ANS dysfunction can manifest with decreased heart rate variability (HRV), prolonged QT, impaired exercise tolerance, and impaired blood pressure regulation which can result in arrhythmia, ischemia, and sudden death.

To characterize ANS function in T2D, we evaluated ANS function by measuring HRV during cycled breathing and Valsalva, and postural heart rate and blood pressure. We hypothesized that ANS function would be decreased in participants with uncomplicated T2D and would correlate with cardiac measures.

Data from subjects ages 22-70 with (N=53) and without (N=56) uncomplicated diabetes were included. In participants with diabetes, both HRV with cycled breathing and with Valsalva decreased in T2D. HRV with respiration decreased with age >50. Decreased HRV with respiration correlated with increased age in T2D but not in OWC. There were no significant changes in postural BP or HR with age >50 or T2D. Notably, Valsalva ratio was significantly positively correlated with end-diastolic volume (EDV) (Pearson€™s r 0.58, p=0.02) and stroke

volume (SV) (Pearson€™s r 0.55, p=0.03); HRV with respiration was significantly positively correlated with longitudinal, diastolic peak strain rate (SR) (Pearson€™s r 0.68, p=0.007) and postural BP was significantly positively correlated with circumferential and longitudinal, systolic peak SR (Pearson€™s r =0.45 and 0.48 and p-value=0.05 and 0.04, respectively) and significantly negatively correlated with radial and circumferential peak strain (Pearson€™s r =-0.49 and -0.48 and p-value=0.03 and 0.03, respectively).

These data suggest development of subclinical cardiovascular autonomic neuropathy associated with cardiac dysfunction is present in people with otherwise uncomplicated T2D prior to development of symptoms and it is exacerbated with age. Detecting these changes early may offer opportunities for intervention to restore cardiometabolic health.

Primary Presenter: Revati Kalluri

Project Title: *Second Opinion Review of Outside Breast Imaging: An Analysis of the Frequency that Additional Testing is Recommended and Radiology/Pathology Outcomes.*

Primary Mentor: Gretchen Ahrendt

Thematic Area: Clinical Science

Abstract:

Second Opinion Review of Outside Breast Imaging: An Analysis of the Frequency that Additional Testing is Recommended and Radiology/Pathology Outcomes.

Introduction: Second opinion review of outside imaging for breast cancer patients is a common practice performed at many institutions across the United States. However, it is unknown whether the additional imaging and biopsies ordered as a result of second opinion review leads to actionable change in the patient€™s treatment plan. The purpose of this study is 1) to evaluate the frequency that additional imaging and/or biopsies are recommended based on second opinion review and 2) to determine how frequently these additional interventions yield new or malignant results.

Methods: Breast cancer patients who had diagnostic imaging and biopsies performed at an outside facility and presented to our multidisciplinary clinic at an academic breast center between 2018 and 2020 were retrospectively reviewed. Patients who pursued follow-up care at another institution were excluded. Recommendations for additional diagnostic evaluation were compared between outside facility and our multidisciplinary team. Additional imaging or biopsies performed and their results were recorded. Frequency of additional testing and new or malignant results were summarized with descriptive statistics.

Results: 181 patients were seen in our clinic during this time period, 14 of which received follow-up care elsewhere and were excluded. 167 patients were thus included in the final analysis. Figure 1 summarizes a breakdown of additional testing recommendations. Of the 151 patients in which additional testing was not recommended by the outside facility, we recommended additional testing in 48 (32%). Of the 16 patients in which additional testing was recommended by the outside facility, we also recommended additional testing in 7 (44%). Only one of these seven patients were provided recommendations that differed from the outside facility. Overall, based on second opinion review, our multidisciplinary team provided recommendations for additional testing that differed from the outside facility in 49 of 167 (29%) patients. 60 imaging procedures (11 mammograms, 23 ultrasounds, 24 magnetic resonance imaging, 2 other) and 25 biopsies (12 ipsilateral breast, 7 contralateral breast, and 6 axillary biopsies) were performed among these 49 patients. From these 60 additional imaging orders, additional lesions were found in 22 (37%), lesions larger than originally described in 4 (7%), and no additional findings in 23 (38%). From these 25 additional biopsies, 17 (68%) were found to be malignant on pathology and 8 (32%) benign.

Conclusions: Overall, second opinion review was valuable in determining 17 additional malignant lesions that were not noted at the primary consultation. This study focused on

determining the frequency in which additional testing was recommended and the concordance of these recommendations with outside facilities. Future analysis includes determining how often our recommendations for additional testing yield actionable changes towards patients€™ treatment plan. This will help inform us of the utility and impact that second opinion review has towards thepatient€™s diagnostic work-up.

Figure 1. Additional Testing Recommendations by Outside Facility and Multidisciplinary Clinic

Primary Presenter: Grace Katzenson

Project Title: *Factors in Comfort and Preparedness with Advance Care Planning in Pediatric Clinicians; A Review*

Primary Mentor: Brian Jackson

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Background: Many clinicians and staff members working with pediatric patients over their career will treat seriously or terminally ill children and likely face the death of a patient. However, there is a wide variation of experience, comfort, and preparedness around providing advance care planning (ACP) or end-of-life (EOL) care, and little knowledge of which factors play a role across pediatric medical settings.

Objective: To examine which factors affect self-reported pediatric clinician and staff comfort and preparedness on ACP and EOL care.

Methods: A systematic literature review was performed from EMBASE, CINAHL, MEDLINE, and PsychINFO published between January 2000 to November 2022 and last searched on November 18, 2022. €œAdvance care planning€□, €œadvance directives€□, and €œcode status€□ search terms were used and studies surveying pediatric clinicians and staff about pediatric patients were included. We excluded studies on adult populations (>21 years), literature reviews, collections of abstracts, and those performed outside the United States or not in English. Any measure or self-reported data around knowledge or comfort made a study eligible, we collected reference data regarding the author, year, objective, number of participants, subject characteristics, sample design, intervention (if applicable), comfort items surveyed, factors of comfort/preparedness, and study conclusion.

Results: 1,127 studies were retrieved, with twenty-three meeting all inclusion criteria. Nine were interventional, and fourteen were solely focus groups, interviews, or surveys. All studies discussed various aspects of comfort or preparedness around ACP, EOL care, or pediatric palliative care (PPC), including discussing ACP or goals of care, caring for patients at EOL, discussing or documenting code status, or support or debriefing after a patient€™s death. Twenty studies noted that the presence of educational interventions would have a positive impact on comfort or preparedness in various aspects of ACP or EOL care, with ten noting a benefit to didactic experiences, two to simulated or role-playing educational sessions, and three commenting on both didactic and simulated or role-playing sessions. Other factors found in more than one study include lack of debriefings or grief support after the loss of a patient, lack of a PPC team or difficulty consulting PPC, time limitations, lack of personal experiences in ACP or EOL care, or different comfort levels by hospital role.

Discussion: Limitations of this review include the foundation in subjective data increases the risk of sampling bias and potential lack of generalizability based on low response rates and studies occurring at one or a small number of institutions or programs within an institution. Incorporation of formal ACP and EOL care instruction into training for anyone providing

medical care to pediatric populations is critical. By increasing the comfort and preparedness of clinicians and staff, we can improve the quality of care provided to these patients and their families. Interventions can include didactics, case discussions, or standardized patient sessions, and further research is required to determine the most effective intervention and frequency of education or training provided, as well as how long these interventions have an impact.

Primary Presenter: Emmeline Kim

Project Title: *The utility of the neutrophil-lymphocyte ratio and platelet-lymphocyte ratio in spondyloarthritis associated anterior uveitis*

Primary Mentor: Liron Caplan

Thematic Area: Clinical Science

Abstract:

Abstract

AUTHORS

Kim, Emmeline1, 2; Sen, Rouhin2; Palestine, Alan G.1, 3; Cheng, Elizabeth2; Kerr, Gail6; Reimold, Andreas7; Walsh, Jessica5; Chang, Elizabeth4; Caplan, Liron2

INSTITUTIONS (ALL): 1. Ophthalmology, University of Colorado Anschutz Medical Campus, Aurora, CO, United States.

2. Rheumatology, VA Eastern Colorado Health Care System, Aurora, CO, United States.

3. Rheumatology, University of Colorado Anschutz Medical Campus, Aurora, CO, United States.

4. Rheumatology, Veterans Affairs in Phoenix, AZ, United States.

5. VA Salt Lake City Health Care System, Salt Lake City, UT, United States.

6. Rheumatology, Washington DC VA Medical Center, Washington, DC, United States.

7. Rheumatology, VA North Texas Health Care System, Dallas, TX, United States.

Commercial Relationships Disclosure: Emmeline Kim: Commercial Relationship: Code N (No Commercial Relationship) | Rouhin Sen: Commercial Relationship: Code N (No Commercial Relationship) | Alan Palestine: Commercial Relationship: Code N (No Commercial Relationship) | Elizabeth Cheng: Commercial Relationship: Code N (No Commercial Relationship) | Gail Kerr: Commercial Relationship: Code N (No Commercial Relationship) | Andreas Reimold: Commercial Relationship: Code N (No Commercial Relationship) | Jessica Walsh: Commercial Relationship: Code N (No Commercial Relationship) | Elizabeth Chang: Commercial Relationship: Code N (No Commercial Relationship) | Liron Caplan: Commercial Relationship: Code N (No Commercial Relationship)

ABSTRACT

TITLE: The utility of the neutrophil-lymphocyte ratio and platelet-lymphocyte ratio in spondyloarthritis associated anterior uveitis

ABSTRACT BODY:

Purpose: Studies show anterior uveitis manifests in 21 to 33% of spondyloarthritidies (SpA). Previous research suggests that the neutrophil lymphocyte ratio (NLR) and platelet lymphocyte ratio (PLR) in peripheral blood are biomarkers for sacroiliitis and disease activity (Al-Osami, MH et al. 2020). We supplemented data from a prospective registry with retrospective chart review to assess the role of the NLR and PLR as potential biomarkers for anterior uveitis in patients with SpA.

Methods: Veterans enrolled in the Program to Understand Long-term Outcomes of Spondyloarthritis registry with a diagnosis of uveitis were included. The date of uveitis flare, anterior chamber cell grade, frequency of topical steroid use or use of oral steroid or peri-ocular steroid injection were collected. Those with scleritis were excluded. Episodes of uveitis were classified into either the acute/recurrent uveitis group or chronic/persistent uveitis group based on the Standardization of Uveitis Nomenclature classification criteria. Demographic data, type of SpA, and absolute neutrophil, platelet, and lymphocyte counts within 60 days before and after the uveitis flare were collected. Amongst those with acute/recurrent uveitis, associations between NLR, PLR, and the anterior chamber cell grade, steroid use frequency, and erythrocyte sedimentation rate (ESR) were calculated using linear regression. Neutrophil, platelet, and lymphocyte counts from patients without SpA were also collected as a control group and an unpaired t-test performed to compare mean NLR and PLR.

Results: Thirty three patients with SpA had acute/recurrent uveitis and relevant laboratory data. There were no associations between NLR or PLR and steroid drop frequency or anterior chamber cell grade. There was a statistically significant correlation between steroid drop frequency and ESR ($p = 0.027$). The mean NLR was 2.28 in the acute/recurrent uveitis group and 2.88 in the control group, which was not statistically significant. The mean PLR was 113.4 in the acute/recurrent uveitis group and 185.2 in the control group, which was statistically significant ($p < 0.005$).

Conclusions: While NLR and PLR may be associated with SpA and some ocular inflammatory diseases, they are not viable biomarkers of acute/recurrent uveitis in SpA patients.

Primary Presenter: Hannah Klatzkow

Project Title: *Prevalence of postpartum depression in mothers presenting to a pediatric otolaryngology clinic.*

Primary Mentor: Sarah Gitomer

Thematic Area: Clinical Science

Abstract:

Objectives: To further understand specific risk factors for the development of postpartum depression (PPD) amongst mothers of infants with common otolaryngologic diagnoses.

Methods: A prospective cohort study was performed to screen for PPD in mothers of infants presenting to the pediatric otolaryngology clinic. After obtaining consent for inclusion, subjects were administered the Edinburgh Postnatal Depression Scale, which was completed during the visit. The primary outcome measure was the rate of positive screening, with additional data obtained to include demographic and diagnostic information.

Results: The overall rate for positive PPD screening in included subjects was 18.8%. An increased rate of positive PPD screening was demonstrated amongst the subgroups of frequent noisy breathing (25%) and lip tie (26.7%).

Conclusion: This study provides additional insight into risk factors for the development of PPD. This highlights the potential benefit of increased screening within the population of mothers presenting to the pediatric otolaryngologic clinic, which could improve long-term health outcomes for both mother and child.

Primary Presenter: Elizabeth Konon

Project Title: *Impact of COVID-19 on Asthma Control in a School-Centered Asthma Program*

Primary Mentor: Stanley Szefler

Thematic Area: Public Health and Epidemiology

Abstract:

Background and Objectives: Social determinants of health (SDOH) impact asthma outcomes. The Colorado Comprehensive School-Centered Asthma Program (AsthmaCOMP) strives to improve asthma control, screens for SDOH, and provides SDOH referrals. We hypothesized that children with reported SDOH needs enrolled in AsthmaCOMP would be disproportionately impacted by COVID-19.

Methods: Children who completed the visit immediately prior to the onset of the COVID-19 pandemic were included in the study. Upon enrollment, some caregivers reported one or more SDOH needs (€œSDOHrep+€□) while others reported none (€œSDOHrep-€□). The asthma impairment domain was measured by Childhood Asthma Control Test (cACT) scores and the risk domain was measured by exacerbations defined as hospitalizations, Emergency Department visits, and systemic steroid therapy. Impairment and risk were recorded at baseline, the first year after enrollment representing one-year pre-COVID, and the second year after enrollment representing one-year during COVID. Paired t-tests compared data at baseline to follow-up visits for each group.

Results: The SDOHrep+ group had significant improvement in cACT scores from baseline to pre-COVID (p‰¤ 0.01) and during COVID (p‰¤ 0.01). The SDOHrep- group showed modest improvement in cACT scores. Asthma risk, as indicated by exacerbations, decreased significantly in the SDOHrep+ group. The SDOHrep+ group had a higher percentage of program retention (64%) compared to the SDOHrep- group (47%).

Conclusions: Asthma control improved in both groups as indicated by improvement in cACT scores and/or reduction in asthma exacerbations. The program benefitted both groups, especially those with reported SDOH needs. Future directions include expanding the study to rural Colorado.

Primary Presenter: Helene Kuffel

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

Primary Mentor: Edith Zemanick

Thematic Area: Clinical Science

Abstract:

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

Helene Kuffel1, Edith Zemanick1,2 Jordana Hoppe1,2, Maxene Meier1, Jacob Mark1,2, Elinor Towler1, Brandie Wagner1, Timothy Viger1

1. Univ. of Colorado School of Medicine, Anschutz Medical Campus, Aurora, CO

2. Children€™s Hospital Colorado, Aurora, CO

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

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

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

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

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

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

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

Primary Presenter: Brenda La

Project Title: *A Pediatric Case Report: Necrotizing Sarcoid Granulomatosis*

Primary Mentor: Megan Curran

Thematic Area: Clinical Science

Abstract:

Necrotizing Sarcoid Granulomatosis (NSG) is a rare systemic disease characterized by confluent sarcoid-like granulomas with extensive necrosis and vasculitis. It primarily affects the lungs with varying presentations involving extrapulmonary manifestations in other organs such as the liver, kidneys, and eyes. Since its first description in 1973, the etiology and classification of NSG remains unclear. Since its initial characterization, there have been over 130 cases of NSG reported, with even more rarity in the pediatric population with those of the single digits. Clinical presentation and radiologic features are non-specific and can vary widely, hence it is important to obtain pathologic data to examine histologic features and determine a more accurate diagnosis. Similarly, the presentation as described can imitate various disease processes, such as infection, hypersensitivity reactions, and oncologic processes, which must be excluded before diagnosing NSG. This, alongside its rarity, further makes the proper diagnosis of NSG challenging. The aim of this review is to evaluate and differentiate NSG from other granulomatous diseases processes and determine the diagnostic criteria. The case review is to discuss uncommon manifestations of NSG in pediatric patients, which are rarely described. We present a case of a 17-year-old female presenting with abdominal pain, significant fatigue, fevers of unknown source with hepatosplenomegaly and hepatosplenic lesions found on CT scan and extensive negative infectious workup that ultimately led to a unifying diagnosis of NSG. To the best of our knowledge, there have been no prior cases in the literature describing a similar presentation, notably without respiratory involvement, in a pediatric patient.

Primary Presenter: Hunter Lacouture

Project Title: *RENAL TRAUMA IN PEDIATRIC PATIENTS TRANSFERRED TO TERTIARY CARE CENTER*

Primary Mentor: Vijaya Vemulakonda

Thematic Area: Clinical Science

Abstract:

TITLE: RENAL TRAUMA IN PEDIATRIC PATIENTS TRANSFERRED TO TERTIARY CARE CENTER

CATEGORY: Pediatric Urology

INTRODUCTION AND OBJECTIVE:

The pediatric population is at greater risk of kidney injury during trauma when compared to adults, likely due to their unique anatomy. Patients with severe kidney injuries who present to rural hospitals often need transport to tertiary trauma centers. The purpose of our study is to describe the procedures and outcomes of patients who were transferred from an outside hospital versus those who were initially seen at the tertiary center.

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METHODS:Â

We performed a retrospective chart review of patients age 0-18 years who were seen at a tertiary pediatric hospital for renal trauma. Demographic variables including age, gender, trauma etiology, transfer status, and preexisting genitourinary history were collected. Clinical outcomes collected included clinical complications, number of follow-up visits, long term sequelae, and imaging techniques used. Statistical analyses using Fisherâ€™s Exact and Kruskal-Wallis tests were performed.Â

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RESULTS: We identified 35 patients who met inclusion criteria, 26 of whom were transferred. There was no difference in: diagnostic imaging used (p=0.64), repeat images (p=0.55), immediate complications (p=0.30), follow-up (p=0.10), or number of follow-ups (p=0.31) in transferred vs. Â patients presenting directly. Average time between injury and tertiary center travel time was 2.6 hours for direct presentation and 9.8 hours for transferred (p=0.006). We identified 13 patients who were transferred from an outside hospital <50 miles from the tertiary care center and 13 patients >=50 miles. Between these groups, we found no significant differences in long-term complications (p>0.99) or follow-up (p>0.99). Immediate complication rates were non-significantly greater in patients transferred from >=50 miles away when compared to those transferred from <50 miles away (risk difference: 0.3, p=0.16).

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CONCLUSIONS:Â

Overall, patients who were transferred to a tertiary care center did not significantly differ in incidence of repeat imaging, follow-up, or complications compared to those presenting directly. When comparing patients who transferred <50 miles versus >=50 miles, those who transferred from further away had more immediate complications, although this was not significant. Future studies should be conducted to establish standardized procedures regarding renal trauma management of patients being transferred to tertiary care centers. to optimize rates of re-imaging, complications, and mortality.

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FUNDING: None

Primary Presenter: Jonathan Layne

Project Title: *Metacarpal Neck Osteochondroma: an Atypical Cause of €œTrigger Finger€□*

Primary Mentor: Louis Catalano

Thematic Area: Clinical Science

Abstract:

€œLocking€□ of the digits is a relatively common patient complaint in hand surgery. Typically, this phenomenon arises from either tendon triggering at the A1 pulley or subluxation of tendons around the metacarpal head. While trigger digit and sagittal band injury comprise the majority of diagnoses, clinicians must remain aware of rarer entities that alter underlying osseous anatomy and predispose to €œlocking.€□ Here, we present a case of metacarpal neck osteochondroma causing subluxation of the index metacarpophalangeal (MP) joint radial collateral ligament.

Primary Presenter: Linh Le

Project Title: *Trends in Robotic Port Closure by Surgical Specialty*

Primary Mentor: Jaime Arruda

Thematic Area: Clinical Science

Abstract:

ASSISTANT PORT-SITE FASCIAL CLOSURE AFTER ROBOTIC SURGERY AND ITS EFFECT ON PORT-SITE HERNIAS. L Le, University of Colorado School of Medicine, J Arruda, Department of Obstetrics & Gynecology, University of Colorado School of Medicine

Objective: The goal of this study is to determine if the rate of robotic fascial assistant port closure differs by surgical specialty. Furthermore, since port-site herniation is a recognized complication following robotic-assisted procedures, subsequent analysis aims to assess the relationship between 10/12 mm port-site incision fascial closure and the rate of port-site hernias after a robotic-assisted surgery.

Methods: Retrospective chart review from 2016 to 2019 of patients undergoing robotic surgery by gynecologists, urologists, and general surgeons in which a 10/12 mm assistant port was used.

Results: A total of 519 patients underwent robotic assisted laparoscopy for gynecologic, urologic, and general surgery procedures during the study period. Gynecologists were most likely to suture close the 10/12 mm fascial ports with 99% closure rate. Urologists and general surgeons were less likely to close the 10/12 mm fascial port site with a 23% and 90% closure rate, respectively. There was a statistical difference between the surgical services in the decision to close a 10/12 mm fascial port site, with gynecologists closing the port site at higher rates than the other surgical specialists ($P<0.001$). The overall hernia rate was low for all cases at 0.8%. The fascial hernia rate was 0% for gynecological procedures, 1.1% for urological procedures, and 0% for general surgery procedures. There was no difference between the hernia rates between the surgical specialties. There was also not a difference between the hernia rates whether the assistant port-site fascia was closed or not (0% vs 1.4%).

Conclusions: Gynecologists are more likely than urologists and general surgeons to suture close the 10/12 mm fascial port sites. There was no difference in hernia rates between the surgical specialties despite the difference in the decision on whether or not to close the fascia.

Primary Presenter: Sterling Lee

Project Title: *A Retrospective Review of Opioid Prescribing Practices for At-Risk Pediatric Populations Undergoing Ambulatory Surgery*

Primary Mentor: Melissa Masaracchia

Thematic Area: Clinical Science

Abstract:

OBJECTIVE Pediatric patients with sleep-disordered breathing (SDB) and obesity are at risk for opioid- induced respiratory depression. Although monitoring in the inpatient setting allows for early recognition

of opioid-related adverse events, there is far less vigilance after ambulatory surgery as patients are discharged home. Guidelines for proper opioid dosing in these pediatric subsets have not been established. We sought to determine if at-risk children were more likely to receive doses of opioids outside the recommended range.

METHODS Baseline opioid prescribing data for all outpatient surgery patients receiving an opioid prescription between January 2019 and June 2020 were retrospectively reviewed. Patients with SDB

or obesity were identified. To obtain more information about prescribing practices, we analyzed patient demographics, size descriptors used for calculations, and prescription characteristics (dose, duration, and prescribing surgical service).

RESULTS A total of 4674 patients received an opioid prescription after outpatient surgery. Of those, 173 patients had SDB and 128 were obese. Surgical subspecialties rendering most of the opioid prescriptions included otolaryngology and orthopedics. Obese patients were more likely (64%) to be prescribed opioids using ideal weight at higher mg/kg doses (>0.05 mg/kg; 83.3%; $p < 0.0001$). When providers used actual body weight, lower mg/kg doses were more likely to be used (53.7%; $p < 0.0001$). No prescriptions used lean body mass.

CONCLUSIONS Overweight/obese children were more likely to receive opioid doses outside the recommended range. Variability in prescribing patterns demonstrates the need for more detailed guidelines to minimize the risk of opioid-induced respiratory complications in vulnerable pediatric populations.

Primary Presenter: Jessica Lew

Project Title: *Etonogestrel Contraceptive Implant Uptake And Safety Among Solid Organ Transplant Recipients'*

Primary Mentor: Aaron Lazorwitz

Thematic Area: Clinical Science

Abstract:

Abstract

Objectives: To determine the safety of etonogestrel contraceptive implant use among reproductive-age women who are solid organ transplant recipients.

Study design: We conducted a retrospective cohort study with matching of reproductive-age women (14-45 years) who were solid organ transplant recipients and received care at a tertiary medical center in Denver, Colorado between 2011 and 2019. We identified cases who used an etonogestrel contraceptive implant post-transplant and then matched controls (no hormonal contraceptive use) in a 1:1 ratio according to age, transplant type, and institution. We compared pregnancy patterns, post-transplant infections, immunosuppressant therapy adjustments, and graft complications between cases and controls. We also evaluated implant-related side effect profiles and continuation rates among cases only.

Results: We identified 24 cases and 24 matched controls. When compared to age and transplant organ-matched controls, contraceptive implant users were not at increased risk for adverse transplant-related outcomes. Graft rejection was the most common transplant-related complication in both groups (n = 11, 45.8% cases; n = 10, 41.7% controls). Additionally, outcomes concerning pregnancies, infections and immunosuppressant therapy changes showed no statistically significant difference between either group.

Conclusions: This study provides the first data that the etonogestrel contraceptive implant is likely a safe contraceptive option for reproductive-age women who are solid organ transplant recipients. Given the solid organ transplant recommendations to avoid pregnancy during the first 1 to 2 years post-transplant, healthcare providers should continue to counsel solid organ transplant recipients at risk of pregnancy on the etonogestrel contraceptive implant as an effective and safe method of pregnancy prevention.

Implications: Reproductive age women who are solid organ transplant recipients face additional health risks with unintended pregnancies. The etonogestrel contraceptive implant remains a safe and effective method of contraception for this specific population, with no increase in graft-related complications among contraceptive implant users.

Primary Presenter: Ian Liu

Project Title: *Mental Health and Substance Use in Colorado Healthcare and Graduate Students During COVID-19: A Mixed-Methods Investigation*

Primary Mentor: Marilyn Coors

Thematic Area: Public Health and Epidemiology

Abstract:

* I. Abstract

Background: The COVID-19 pandemic continues to impact mental health by exacerbating anxiety, fear, and substance use worldwide. Several studies have demonstrated increased substance use and declining mental health in students abroad, but no investigation has assessed the COVID-19 pandemic€™s effects on mental health and substance use in graduate and healthcare students in the United States.

Objective: Researchers sought to quantify and qualify the ongoing COVID-19 pandemic€™s impacts on Colorado graduate and healthcare students€™ mental health and substance use.

Methods: Investigators utilized an online, institutionally-distributed survey to assess changes in various mental health metrics and substance use in Colorado healthcare and graduate students during the COVID-19 pandemic from June 2020 to February 2021. An augmented Fear of COVID-19 Scale (FCV-19S) academic survey served as the primary data collection vessel. Researchers utilized mixed methods to describe results both quantitatively and qualitatively.

Results: Students who reported higher levels of depression, exhaustion, loneliness, nervousness, and anger had significantly higher FCV-19S scores. Higher FCV-S19 scores were also significantly associated with increased levels of alcohol consumption, binge drinking, and cannabis use. Qualitative analysis elucidated recurring themes regarding use frequency, substances used, and the reasons underlying use. Finally, further qualitative analysis revealed three common student concerns: worries regarding the length of the pandemic, its impact on education/finances, and its social impact.

Conclusions: The COVID-19 pandemic has negatively impacted the wellbeing of Colorado healthcare and graduate students, directly causing increases in substance use while simultaneously exacerbating their feelings of fear, anxiety, and helplessness.

Primary Presenter: Eleanor Lorton

Project Title: *Experiences and Difficulties Transitioning to Adult Diabetes Clinical Care €“ A Qualitative Study*

Primary Mentor: Shideh Majidi

Thematic Area: Clinical Science

Abstract:

BACKGROUND & OBJECTIVES: Young adults with type 1 diabetes (T1D) undergoing transfer from pediatric to adult care are at an increased risk of acute and chronic health complications due to challenges associated with transitioning healthcare. This study aims to highlight patient-focused areas of improvement that could be used to optimize transition of care.

METHODS: Thirteen (n = 13) patients with T1D between ages 17-25 who had completed a pediatric transfer visit and had an adult diabetes appointment scheduled or completed were randomly selected to complete a telephone questionnaire that included open-ended questions regarding experiences transitioning to adult diabetes care. Interviews were analyzed for themes.

RESULTS: Thirteen young adults with T1D (Mage 23.1 ± 1.5 years; Mduration 13.0 ± 5.4 years; 46% female; 69% private insurance; 69% Caucasian, 23% Hispanic, 8% "Other") completed the interview. Two primary themes emerged regarding "the easiest part of transfer": streamlined process (66.7%) and clinic familiarity (20%). Three themes related to transition challenges were: lack of guidance (25%), difficulty changing providers (18.8%), and patient-provider compatibility (12.5%). In those who suggested areas of improvement, two main themes emerged: distance to clinic (20%) and scheduling (13.3%). Patients described two support systems themes (family €“ 68.8%, significant other €“ 25%) and three themes of support type (diabetes-care €“ 35%, financial €“ 30%, and emotional €“ 25%).

CONCLUSIONS: The majority of patients highlighted that a streamlined process and previous familiarity with the clinic made transferring care easier, while provider compatibility and lack of guidance in the transfer process were barriers. Patients also described a need for improved healthcare access after transition, including more varied clinic locations and appointment options. Young adults also highlighted the continued need for financial, emotional, and diabetes-care support as they transition care. These patient-reported areas of improvement are valuable considerations for creating a patient-centered and effective transition program.

Primary Presenter: Kylie Lousberg

Project Title: *How Mobile Health Technology May Improve Addiction Treatment for Patients and Providers*

Primary Mentor: Steven Lowenstein

Thematic Area: Public Health and Epidemiology

Abstract:

Abstract

How Mobile Health Technology May Improve Addiction Treatment for Patients and Providers is a literature review exploring substance use disorder (SUD) in the context of mobile health (mHealth) apps. There is an immense cost tied to substance use disorders which has steadily increased over the last several years. While individuals seeking treatment may initially have success, the chronicity and relapsing nature of the disease adds to the expense and makes it particularly difficult to treat from a provider perspective. This prompted the need to look into creative methods of treatment that may give the necessary support to patients while alleviating the burden for healthcare workers and maintaining healthcare resources. As most people have access to smartphones with the advent of smartphone apps, the objective of our literature review was to investigate how smartphone apps can be a complement to the treatment of substance use disorder. We focused on barriers that exist in treatment of SUD, including both personal characteristics as well as structural barriers. We then looked into the current design of smartphone apps used for SUD treatment. Through our review, we found that smartphone apps have the potential to complement the treatment of SUD by giving continual support to patients and keeping them in treatment longer, ease the stress of administering treatment for providers, and decrease healthcare costs due to SUD. Through our search we also recognized that while there are benefits, there are also limitations to relying on smartphone apps such as the lack of benefit for individuals who do not have access to a smartphone or are not familiar with how to use one. In addition, there are very few evidence-based apps on the market, and for the ones that do exist, there are language barriers faced by minority populations. We also recognize that this is a new area of research and further work, such as performing qualitative interviews with individuals who have used these apps, needs to be done.

Primary Presenter: Ann Mackey

Project Title: *Comparison of Handheld Ultrasound Devices used in Carotid and Abdominal Aortic Vascular Studies*

Primary Mentor: Juliana Wilson

Thematic Area: Clinical Science

Abstract:

Introduction: Point-of-Care Ultrasound (POCUS) has become common in many clinical care settings. Many devices exist with several different, mostly overlapping functions. This study is one of the first studies to compare the image quality of commercially available handheld POCUS devices.

Methods: A prospective study was conducted to evaluate the image quality and clinical utility of the Butterfly IQ, GE Vscan, Phillips L12-4 (Linear), and Phillips S4-1 (Phased array) devices. An expert panel of reviewers examined the compiled images and answered a survey-based questionnaire. Repeated measures ANOVA will be used to compare scores.

Results: Twenty-five participants met the inclusion criteria. Most participants were female (52%). Mean BMI was 23.70 ± 3.71. Further evaluation of images is still pending panel review.

Conclusion: Despite the variety of commercial POCUS options, additional peer-reviewed data comparing these devices is needed.

Primary Presenter: Colin Malaska

Project Title: *Outlying Factors Increasing Length of Stay in Patients with Staphylococcal Sepsis at the University of Colorado Hospital €“ A Preliminary Quality Improvement Study*

Primary Mentor: Samuel Porter

Thematic Area: Clinical Science

Abstract:

Abstract

Objectives

* Gather data from patients with Staphylococcal sepsis at University of Colorado Hospital (UCH) who exceeded expected length of stay (LoS)

* Determine the factors presumably leading to increased length of stay

* Eventually design and test a novel hospital protocol that addresses these factors

Background

At the University of Colorado Hospital between March of 2021 and March of 2022, patients diagnosed with Staphylococcal sepsis had a median length of stay that was 2.04 days longer than the expected length of stay based on their hospital course and discharge diagnoses. This patient subgroup had significantly longer hospital stays compared to patients with other common diagnoses during this period at UCH. During the same timeframe at UCH, all other diagnoses had a median LoS of -0.41 in comparison to the Staphylococcal sepsis group (statistically significant with a p-value of <0.001 via a Mann-Whitney-U test), which prompted this investigative quality improvement study. Due to the massive breadth of factors possibly influencing hospital stay in this population, there is limited evidence to guide this preliminary single-site study. Therefore, this stage of research sought to help narrow down the controllable factors in our treatment of this diagnosis and identify areas for the improvement of healthcare delivery at this medical center.

Aim Statement

In patients diagnosed with Staphylococcal sepsis at the University of Colorado Hospital between 2021 and 2022, we will determine the main drivers of increased length of stay to later develop and test a novel method of practice that attempts to address these factors.

Methods

A random sample of 15 patients diagnosed with Staphylococcal sepsis at UCH between 2021 and 2022 were used to analyze common factors extending their length of stay. This diagnostic subgroup was defined by sepsis caused by any species of Staphylococcus that was clinically treated as a non-contaminant infectious cause of illness. Of note, none of the patients in this sample had a history of intravenous drug use and further breakdowns of infectious sites and culture speciation are discussed later. Data was gathered from the following categories: medical unit placement, number of sites of infection, total procedures, time to procedure, total consults, time to Infectious Disease team consult, presence of diabetes, degree of glycemic control, social work issues with disposition placement, time in Intensive Care Unit (ICU), and presence of encephalopathy. Basic statistical assessments were performed on the quantitative data to determine medians, means, and standard deviations. Thematic analysis was additionally used to group common findings gathered from notes within the Electronic Medical Record (EMR), combining a variety of factors ranging from comorbid medical treatments to social issues.

Results

Qualitative data from EMR notes was found to fall into five main categories: procedure delays, delays in acceptance to rehabilitation facilities, coordination of care between medical teams, family€™s medical decision making, and the patient€™s overall severity of disease. The primary infectious species that was found in blood cultures was Staph aureus (9 patients with MSSA bacteremia, 5 with MRSA bacteremia). In this sample, the median length of stay difference from the insurance-calculated expected length of stay was 3.5 days. The median number of non-bedside procedures per patient was 1, with 60% of these having a significant delay in a non-bedside procedure (defined as >24 hours from order placement to time of procedure). The median number of consulted healthcare teams for each patient during their hospital stay was 6. Additionally, the amount of time from admit to consultation of an infectious disease team had a median of 1.82 days. Other notable findings included 47% of patients complicated by encephalopathy, 33% requiring ICU time for a median of 3.25 days, 33% with poor glycemic control while inpatient, and 73% of patients facing various disposition issues as defined by social work/case management notes.

Conclusions and Implications

There is little established causative evidence on length of hospital stays that is specific to the diagnosis of Staphylococcal sepsis and generalizable across nationwide hospital systems. After discovering that Staphylococcal sepsis had a significantly longer median LoS from all other diagnoses at the University of Colorado Hospital, this study sought to examine ways to improve how we treat patients with this diagnosis. Between both quantitative analyses and thematic analyses of subjective information from medical notes during admissions, this study attempted to narrow down the large breadth of driving factors that increased LoS in this patient population. Unfortunately, many of the influential factors were found to be less suitable for Plan-Do-Study-Act interventions due to their case-by-case variability and lack of pertinence to the UCH healthcare system. These factors included delays in family meetings to determine the course of medical management, lack of rehabilitation availability from factors such as COVID-19 outbreaks and understaffing, and general case management hurdles such as insurance approvals and transportation coordination.

Therefore, this study centered on the more controllable factors within the UCH hospital system. With the high numbers of consulting teams and procedures per patient, we decided to investigate ways to decrease time-to-procedure and enhance timely communication among the various medical teams. This preliminary study is to provide the basis for the eventual trial of a novel hospital protocol that notifies consulting procedural teams earlier into the admission and creates a multidisciplinary meeting for patients with Staphylococcal sepsis that is akin to a tumor board. The implications of these changes, if successful, would be to reduce both hospital and patient costs, increasing patient turnover for more open beds, and possibly reduce mortality from Staphylococcal sepsis.

Primary Presenter: Austin Mallory

Project Title: *Covered Stents for Endovascular Treatment of Aortoiliac Occlusive Disease*

Primary Mentor: Ehrin Armstrong

Thematic Area: Clinical Science

Abstract:

Purpose: The treatment of aortoiliac occlusive disease (AIOD) has largely shifted to endovascular techniques, with primary stenting constituting the preferred treatment approach. The goal of the current study was to summarize available literature and to determine whether covered stents are superior to bare metal stents for the treatment of AIOD, in terms of both periprocedural and long-term outcomes.

Methods: A meta-analysis of 47 studies was conducted with the use of random effects modeling. The incidence of adverse events during follow up among the individual included studies was synthesized.

Results: Most of the lesions were located at the common iliac arteries and were chronic total occlusions. The procedure was technically successful in almost all cases in both groups, with a low rate of periprocedural complications observed in both groups. The reported primary patency rates for the non-covered and covered stent group during an average follow up of 24.3 months among the individual studies, were 84% and 92% respectively, while surgical or endovascular re-intervention was required in 10% of non-covered stent cases and in 6% of covered stent cases. Eight studies comparing covered vs non-covered stents in terms of patency demonstrated superiority of covered stents (OR: 2.47; 95% CI: 1.01-6.01; p ¼ 0.047 Combining TASC C/D lesions together 12 studies reported 92% (95%CI:89%-95%) primary patency in the covered stent group, while 7 studies reported 75% (95%CI: 60%-88%) primary patency for cases treated with non-covered stents.

Conclusion: This study demonstrated that covered stents are safe and effective when utilized for the treatment of AIOD. Covered stents were associated with a statistically significant higher odds of primary patency in both the overall cohort and in more complex TASC C/D lesions. However, additional high-quality comparative analyses between covered vs bare metal stents and between several types of covered stents are needed to determine the most optimal treatment modality for AIOD.

Primary Presenter: Andrina Mamo

Project Title: *Evaluating medical student assessment of common dermatologic conditions across Fitzpatrick phototypes and skin of color*

Primary Mentor: Robert Dellavalle

Thematic Area: Clinical Science

Abstract:

Skin of color (SOC) has been consistently under-represented in medical school education. The purpose of this study was to assess whether the current medical school curriculum is adequately preparing medical school students to diagnose dermatologic conditions in SOC and non-skin of color (N-SOC). The top eleven dermatologic conditions according to the Global Burden of Disease were examined through the creation of two surveys that posed 22 multiple-choice questions, testing students€™ ability to diagnose a condition based on a patient photo, and 3 personal identification questions about current medical school year, Fitzpatrick skin (FS) type, and prior experience in dermatology. We found that conditions with greatest disparities in accurate visual diagnosis based on FS phototypes (Fitzpatrick I-III vs Fitzpatrick IV-VI) were atopic dermatitis, psoriasis, herpes zoster, malignant melanoma, and impetigo. A majority of students who self-reported a personal FS type of I-III were largely unable to correctly diagnose psoriasis, basal cell carcinoma, and malignant melanoma on FS phototype IV-VI. Our findings emphasize the need for a more diverse representation of patients to be included in comprehensive dermatology curriculums.

Primary Presenter: Alec Mansour

Project Title: *Psychiatric Outcomes Following Ketamine Administration for Orthopedic Surgical Anesthesia*

Primary Mentor: Steven Zeichner

Thematic Area: Clinical Science

Abstract:

Background: Ketamine is a non-barbiturate general anesthetic commonly used in a variety of medical settings for pain and sedation. Its use in treatment for psychiatric illnesses has been increasing in recent years, showing promise in reducing depressive and suicidal symptoms in patients, particularly surgical patients. However, it has a history of association with schizophrenia-like and psychotomimetic symptoms following administration, particularly in patient populations with previous mental illness and youths.

Objective: Using a retrospective cohort study of patient records from a large health database, we sought to investigate psychiatric outcomes in age-specific cohorts following ketamine administration for orthopedic surgical anesthesia.

Methods: This was a retrospective analysis of the TriNetX health database. We identified all patients undergoing orthopedic surgeries with anesthesia. We then performed four total group analyses between cohorts of patients receiving ketamine and cohorts not receiving ketamine. We had three sets of analysis based on age stratification and one ageless: pediatric (<18 years), adult (18€“60 years), elderly (>60 years), and a reference analysis of all patients.

Results: In 406,384 patients studied, nearly every measured event displayed an increased risk for patients receiving ketamine as part of their anesthesia. Apart from anhedonia, which had a decreased risk of occurrence, every event displayed increased incidence in at least two of the cohorts. For all but one event, nicotine use, the significant differences between groups were in concordance with each other.

Conclusion: Our findings suggest ketamine use should be investigated further in different age groups and corresponding psychiatric outcomes.

Primary Presenter: Taylor Marshall

Project Title: *Development of a Klinefelter syndrome specific stature-for-age growth chart*

Primary Mentor: Shanlee Davis

Thematic Area: Clinical Science

Abstract:

DEVELOPMENT OF A KLINEFELTER SYNDROME SPECIFIC STATURE-FOR-AGE GROWTH CHART

TE Marshall1, L Pyle2,3, A Furniss4, SM Davis2,5

1. University of Colorado School of Medicine, Aurora, CO, United States. 2. Department of Pediatrics, University of Colorado School of Medicine, Aurora, CO, United States. 3. Department of Biostatistics and Informatics, University of Colorado School of Public Health, Aurora, CO, United States. 4. Adult & Child Consortium for Health Outcomes Research and Delivery Science (ACCORDS), University of Colorado School of Medicine, Aurora, CO, United States. 5. eXtraOrdinarY Kids Clinic, Children's Hospital Colorado, Aurora, CO, United States.

Background: Condition-specific growth curves can assist in the assessment of pathologic growth in children with various genetic disorders. Klinefelter syndrome (KS) is associated with tall stature; however, the growth pattern in KS prior to reaching adult height is not well described, and a KS-specific growth chart does not currently exist.

Purpose: To generate a KS-specific stature-for-age growth chart for males ages 2-20 years.

Methods: Electronic health records for all male patients with a billing diagnosis of KS (excluding other genetic diagnoses) and at least one outpatient encounter from 2009-2019 at one of six US pediatric institutions participating in PEDSnet were obtained. Measures of height were reviewed for error, including units of measure, duplicates, and non-physiologic outliers. Nonparametric quantile regression was used to model the effect of age on height (R v4.2.1, quantregGrowth), with testosterone prescription and normalization of number of patient encounters as covariates. A stature-for-age growth chart for KS ages 2-20 years was constructed at the 5th, 10th, 25th, 50th, 75th, 90th, and 95th percentiles. The KS-specific nomograms were then overlayed on the Center for Disease Control (CDC) height-for-age reference chart for visual comparison.

Results: Eighty-five percent (986/1,161) of patients with KS had at least one usable height measurement (mean ± SD of 9.1 ± 10.6 measures per patient) between 2-20 years of age. Patients were followed for a mean of 4.2 ± 3.9 years, yielding 8,936 total height measurements for this analysis. Prior to 5 years of age, the 5th%ile for KS is below the CDC 5th%ile, while the 50th and 95th%iles are similar to the CDC reference. After 5 years of age, stature in KS at all percentiles increases greater than the CDC reference percentiles; however, approaching final height the 5th%ile for KS is at the CDC 5th %ile.

Conclusions: Individuals with KS follow unique stature-for-age nomograms relative to the CDC data, particularly in early childhood at lower percentile curves and in later childhood at higher percentile curves. Future directions include generating growth velocity, weight-for-age and BMI-

for-age growth curves from this cohort. These growth curves will aid in the clinical assessment of growth for boys with KS.

Primary Presenter: Laura Maurer

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

Primary Mentor: Amy Nacht

Thematic Area: Global Health

Abstract:

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

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

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

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

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

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

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

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

Primary Presenter: Maxwell Mayeda

Project Title: *Targeting Treg-expressed STAT3 enhances NK-mediated surveillance of metastasis and improves therapeutic response in pancreatic adenocarcinoma*

Primary Mentor: Sana Karam

Thematic Area: Basic Biomedical Science

Abstract:

Abstract

Purpose: Metastasis remains a major hurdle in treating aggressive malignancies such as pancreatic ductal adenocarcinoma (PDAC). Improving response to treatment, therefore, requires a more detailed characterization of the cellular populations involved in controlling metastatic burden.

Experimental design: PDAC patient tissue samples were subjected to RNA sequencing analysis to identify changes in immune infiltration following radiotherapy. Genetically engineered mouse strains in combination with orthotopic tumor models of PDAC were used to characterize disease progression. Flow cytometry was used to analyze tumor infiltrating, circulating, and nodal immune populations.

Results: We demonstrate that although radiotherapy increases the infiltration and activation of dendritic cells (DC), it also increases the infiltration of regulatory T cells (Treg) while failing to recruit natural killer (NK) and CD8 T cells in PDAC patient tissue samples. In murine orthotopic tumor models, we show that genetic and pharmacologic depletion of Tregs and NK cells enhances and attenuates response to radiotherapy, respectively. We further demonstrate that targeted inhibition of STAT3 on Tregs results in improved control of local and distant disease progression and enhanced NK-mediated immunosurveillance of metastasis. Moreover, combination treatment of STAT3 antisense oligonucleotide (ASO) and radiotherapy invigorated systemic immune activation and conferred a survival advantage in orthotopic and metastatic tumor models. Finally, we show the response to STAT3 ASO + radiotherapy treatment is dependent on NK and DC subsets.

Conclusions: Our results suggest targeting Treg-mediated immunosuppression is a critical step in mediating a response to treatment, and identifying NK cells as not only a prognostic marker of improved survival, but also as an effector population that functions to combat metastasis.

Primary Presenter: Meredith McKanna

Project Title: *The Response of Hinsdale County, Colorado to the COVID-19 Pandemic: A Qualitative Case Study*

Primary Mentor: Mark Deutchman

Thematic Area: Public Health and Epidemiology

Abstract:

Historically, it has been recognized that urban solutions to public health issues have not easily been translated to rural areas and often lose their effectiveness in rural settings. Therefore, with the progression of the COVID-19 pandemic, there is an increased need to examine rural areas directly and highlight strategies and challenges in those areas. As such, we sought to examine Hinsdale County, one of the most rural counties in Colorado, and evaluate its response. The primary aim of this study is to identify different strategies utilized by Hinsdale County and their effectiveness in combating the pandemic; the secondary aim is to identify areas of weakness that exacerbated the pandemic and placed strain on the community€™s response. Various community members were interviewed, and their responses were then examined in a qualitative manner using Framework Analysis. Numerous underlying themes in each interview were noted, with the most common being the importance of partnerships, the concern of limited resources, the economic impact on the town, and the lack of applicable public health information for rural areas. As such, the study demonstrated the importance of rural areas creating an interlinked network between their public health, medical, and civilian agencies in preparation for public health emergencies.

Primary Presenter: Corey Meehan

Project Title: *The Incidence of Post-Dural Puncture Headache in Patients Undergoing Posterior Spinal Fusion is Lower in Those That Receive IT Morphine Compared to Patients Who Do Not*

Primary Mentor: Thanh Nguyen

Thematic Area: Clinical Science

Abstract:

The Incidence of Post-Dural Puncture Headache is Lower in Patients Undergoing Posterior Spinal Fusion that Receive IT Morphine Compared to Patients in the General Population.

Introduction:

Spinal fusion is associated with significant postoperative pain, which can be extremely difficult to manage, especially in the pediatric population. One modality that has been shown to improve this pain, without increasing side effects, is with intrathecal (IT) morphine [1-3]. One known risk of IT analgesia is postdural puncture headache (PDPH), which was described after the first spinal anesthetic and is often severe in nature [4]. Incidence of PDPH in children in the current literature varies widely, with some studies citing 1-2% and others as high as 30%. It is highly likely that these variations are due to differences in both reporting, as it is commonly understood that adolescent PDPH is often underreported, and caretakers€™ ability to recognize symptoms [4-5]. A recent study noted the PDPH rate to be three times higher in teenagers when compared to adults [6]. The purpose of study was to determine the incidence of PDPH after spinal anesthesia for adolescent idiopathic scoliosis surgery, as it is currently not well defined. Our hypothesis was that PDPH incidence would be lower than the currently published rates since the patients are largely in the prone position for the surgery and intrathecal morphine is administered. These two factors may be protective against PDPH.

Methods:

After Institutional Review Board approval from our institution, we retrospectively reviewed all adolescent (ages 13-18) patients that underwent primary posterior spinal fusion with spinal analgesia between January 1, 2018, and December 31, 2021. We utilized EPIC for data retrieval as well as REDcap for data storage and basic analysis. Patients were excluded if no block report was documented at the time of the procedure, had known allergies to morphine, or if the case was aborted before completion of surgery. A diagnosis of PDPH was considered positive in our analysis if there was a formal diagnosis in the record from an anesthesiologist at our institution. Current data was compared to the PDPH rate from a previous investigation on patients who underwent ambulatory lower limb surgery (3.4%) [6]. Due to the low PDPH rates in both groups, Bayesian analysis was utilized. Prior distributions were modelled as non-informative Jeffrey beta priors while PDPHs were modeled as binomial random variables. Thus, the posterior distributions for the PDPHs were also beta-distributed [7]. Posterior PDPH rates and the rate

difference between the two groups were summarized using the posterior median and 95% credible intervals (CIs) where summaries of the rate difference were computed using a Monte-Carlo method with 100000 samples. The R statistical software was employed in this analysis.

Results:

A total of 398 patients were included in analysis. Of these patients, we found that 4 (1%) had PDPH associated with their procedure. The average age of the PDPH group was 14.50 years (compared to 14.29 for the non-PDPH group) and of these 4, 3 (75%) were female, and only 1 patient had a past medical history of migraines. All patients (100%) received conservative treatment (caffeine, fluid, NSAIDs, acetaminophen), 3 (75%) received cosyntropin, and none received a blood patch, occipital nerve blocks, or sphenopalatine blocks. 1 (25%) patient required readmission. The mean length of stay for all patients was 3.81 days (StDev: 1.12, median: 4). Amongst those with PDPH, the mean length of stay was 7.25 days (Median: 7, StDev 2.22). The size of the spinal needle ranged from 18 gauge to 27 gauge (G) with the most common size being 25 G (72.2%, 268/371). Within the PDPH group, 75% (3/4) were with a 25 G needle and 25% (1/4) was with a 22 G needle. Compared to the Delpizzo study, patients in our cohort had a 99.8% lower likelihood of developing PDPH with a rate difference posterior median of -2.3% and rate difference posterior distribution 95% CI of -4.1% to -0.6% (Figure 1).

Conclusions:

PDPH incidence amongst adolescents receiving intrathecal morphine during primary posterior spinal fusion surgeries was about 1%, which is lower than currently reported rates (4.9% in adolescents receiving spinal anesthesia for supine procedures). PDPH incidence was higher in females than males (75%), which is consistent with current literature. All the patients that had PDPH had resolution with conservative management, and none required an epidural blood patch.

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Primary Presenter: Samuel Merrill

Project Title: *Classification and Incidence of Bacterial Infections in Infected Nonunion and Osteomyelitis Patients After Bone Fracture*

Primary Mentor: Jason Stoneback

Thematic Area: Clinical Science

Abstract:

INTRODUCTION: Osteomyelitis is a complex clinical problem with a high recurrence rate that can occur due to a relapse of the original organism or reinfection with a different pathogen. Previous studies suggest that gram positive cocci are the most common cause of bone infections, and have identified possible risk factors for recurrence: repeated operations, post-traumatic osteomyelitis, internal fixation at the first stage bone exposure, and Pseudomonas aeruginosa infection. However, the comprehensiveness of these studies is lacking. The purpose of this study is to investigate the most common bacteria in traumatic osteomyelitis and infected nonunion cases.

METHODS: A retrospective analysis of patients following fracture fixation with a diagnosis of an infected non-union and osteomyelitis was conducted from 2006-2018. We performed a descriptive analysis for both nominal and categorical variables and a multivariate analysis for risk factors for recurrent osteomyelitis, including demographic data, comorbidities, location of osteomyelitis, microbiologic data, and surgical outcome data. Statistical analysis and a neural network were performed using JMPSAS software.

RESULTS: The 141 patients included in our analysis had a mean age of 53.65 ± 14.8 years old with the majority being male. The most common comorbidities identified were tobacco use and hypertension. The most common locations of osteomyelitis were tibia/fibula and spine. The most common type of bacteria isolated in those patients with infected nonunion were Methicillin-sensitive Staphylococcus aureus and Methicillin-resistant Staphylococcus aureus (MRSA). The three most common antibiotics administered were Vancomycin, Doxycycline, and Daptomycin. The top two complications in those patients with infected nonunion were wound healing problems and recurrent infection. Risk factors for recurrent osteomyelitis that were identified in this study include previous malignancy, peripheral vascular disease, number of irrigation and debridement procedures, and a wound healing problem.

DISCUSSION: The most common causal organisms were Methicillin-sensitive Staphylococcus aureus and Methicillin-resistant Staphylococcus aureus (MRSA), with the most common antibiotic regimens employed to treat these infections being Vancomycin, Doxycycline, and Daptomycin. Our results suggest that an age > 54.2 years and an absolute eosinophil count

greater than 1.15 cells/mcL are correlated to wound healing problems that precipitate recurrent osteomyelitis.

Primary Presenter: Ahmed Mohammed

Project Title: *Intravenous Drug Use related infections and treatments: A Review*

Primary Mentor: Sarah Rowan

Thematic Area: Public Health and Epidemiology

Abstract:

Primary Presenter: Rouna Mohran

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

Primary Mentor: Madiha Abdel-Maksoud

Thematic Area: Global Health

Abstract:

Abstract

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

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

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

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

Primary Presenter: Anthony Monzon

Project Title: *Airway Epithelial Paraoxonase-2 in Obese Asthma[image.png] (/users/252847/files/19378899/preview?verifier=posn4Xr2s9YDM46UVYNwmAxpCVQQKHQBnciUDjAT)*

Primary Mentor: Daniel Winnica

Thematic Area: Basic Biomedical Science

Abstract:

Obesity in asthmatics has been associated with higher airway oxidative stress in which dysfunctional mitochondria are a potential contributing source of excess free radicals. Paraoxonase 2 (PON2) plays an important role in reducing mitochondrial-derived oxidative stress and could, therefore, have therapeutic potential in these patients.

Primary Presenter: Nancy Moran

Project Title: *Integrating Family Medicine at the Chanda Center for Health, an Integrative Clinic for Individuals with Spinal Cord Injuries*

Primary Mentor: Brooke Dorsey-Holliman

Thematic Area: Public Health and Epidemiology

Abstract:

ABSTRACT

Background: The standard model of care, a primary care provider with dispersed specialist referrals, often fails to meet the complex needs of individuals with spinal cord injury (SCI). Co-locating family medicine, behavioral health, and integrative medicine provides an innovative solution.

Objective: To examine participant and provider experiences at the Chanda Center for Health (CCFH), which provides integrated primary care and integrative medicine services for individuals with SCI. We compared characteristics and outcomes for people with SCI at CCFH and at non-SCI-specialized medical homes.

Methods: Quantitative analysis was performed on data from patients with SCI seen at Denver Health for traditional primary care services and those seen at CCFH for integrated primary care. Primary outcomes were emergency department visits, opioid prescription counts, and hospitalizations. Secondary outcomes were PHQ-4 scores, psychiatric diagnoses, and primary care visits. We conducted semi-structured qualitative interviews with 12 participants and 5 providers followed by thematic analysis.

Results: The CCFH group was significantly different in race and proportion of English as primary language. The non-CCFH group had significantly more primary care visits, emergency department visits, and hospitalizations. No significant difference was found in the number of opioid prescriptions, psychiatric diagnoses, or PHQ-4 scores. Participants were grateful to access primary care in the same location as integrative services and reported improved quality of life.

Conclusions: This model is an innovative approach to care in a population with unique needs. Integration of a family physician at the CCFH is perceived positively by participants and providers, though increased collaboration is desired.

Primary Presenter: Brissa Mundo-Santacruz

Project Title: *A Mixed-Methods Study on Maternal Perspectives on Postpartum Depression Screening: Beliefs, Concerns and Level of Comfort*

Primary Mentor: Janet Meredith

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Introduction

Postpartum depression (PPD) is a leading cause of morbidity and mortality amongst pregnant women; the Edinburgh Postpartum Depression Scale (EPDS) screens for PPD, however it is unknown how accurate responses reflect the true experience of mothers. Our objective was to assess the maternal perspectives on the purpose of the EPDS, level of honesty while answering, and to identify barriers to completing the questionnaire.

Methods

We conducted a cross-sectional survey and qualitative study design composed of a survey administered in both English and Spanish containing 8 questions about demographics and 16 questions including: yes/no, drop down, check all that apply, and open-ended answers for participants across various hospitals and clinics in the Denver metro area. We evaluated data using thematic and descriptive analysis.

Results

Our participants were white (53%) women who were married (78%) and had completed a college-level education (61%). Most of these women agreed they felt comfortable answering honestly to the EPDS questions (>60%). We found 5 important themes: recognizing symptoms of depression, stigma and guilt surrounding mental health, fear of the unknown, inefficient format, and importance of doctor patient relationship.

Conclusion

Women in the postpartum period are at high risk for experiencing untreated postpartum depression due to fear of not knowing what will happen if they screen positive. There are several barriers to answering truthfully and it is imperative the EPDS becomes more transparent to improve the sensitivity of the screening survey.

Primary Presenter: Derrick Murcia

Project Title: *Investigation of Asleep versus Awake Motor Mapping in Resective Brain Surgery*

Primary Mentor: david Ormond

Thematic Area: Clinical Science

Abstract:

Objective: To develop an asleep motor mapping paradigm for accurate detection of the corticospinal tract during glioma surgery and compare outcomes with awake patients undergoing glioma resection.

Methods: A consecutive cohort of adult patients undergoing craniotomy for suspected diffuse glioma with tumor in a perirolandic location who had awake or asleep cortical and subcortical motor mapping with positive areas of motor stimulation were assessed for postoperative extent of resection (EOR), permanent neurological deficit, and proximity of stimulation to diffusion tensor imaging-based corticospinal tract depiction on preoperative magnetic resonance imaging. Outcome data were compared between asleep and awake groups.

Results: In the asleep group, all 16 patients had improved or no change in motor function at last follow-up (minimum 3 months of follow-up). In the awake group, all 23 patients had improved function or no change at last follow-up. EOR was greater in the asleep group (mean [SD] EOR 88.71% [17.56%]) versus the awake group (mean [SD] EOR 80.62% [24.44%]), although this difference was not statistically significant (P = 0.3802). Linear regression comparing distance from stimulation to corticospinal tract in asleep (n = 14) and awake (n = 4) patients was r = -0.3759, R2 = 0.1413, P = 0.1853, and 95% confidence interval = -0.4453 to 0.09611 and r = 0.7326, R2 = 0.5367, P = 0.2674, and 95% confidence interval = -7.042 to 14.75, respectively.

Conclusion: In this small patient series, asleep motor mapping using commonly available motor evoked potential hardware appears to be safe and efficacious in regard to EOR and functional outcomes.

Primary Presenter: Taylor Neilson

Project Title: *Financial Toxicity of Breast cancer Care: The Patient Perspective Through Surveys and Interviews.*

Primary Mentor: Sarah Tevis

Thematic Area: Clinical Science

Abstract:

Introduction: While the economic burden of cancer care is an emerging concern in the United States, the potential financial toxicity of breast cancer care at the patient level remains poorly understood. This study aims to characterize the scope of the contributors to financial distress on breast cancer patients and the resources utilized to address them.

Methods: Adult female patients diagnosed with invasive breast cancer or ductal carcinoma in situ between 2014 and 2019 at a single institution were retrospectively evaluated. Those who enrolled in copay assistance or indicated financial concerns on an intake distress screen were provided a web-based survey assessing financial changes, resources used, and financial engagement with providers. Semi-structured interviews further explored sources of financial distress and analyzed by two researchers using grounded-theory methodology.

Results: 68 patients completed the online survey, 15 of the 68 also participated in semi-structured phone interviews. On the online survey 74% of participants endorsed a financial distress score ‰¥5 on a scale of 0-10. 74% changed their budget, 72% used their savings, and 60% cut down on spending. However, only 40% used resources such as financial counseling or financial assistance. Interviews revealed three major contributors to financial distress: [1] unexpected medical and non-medical expenses, [2] lost revenue from missed work, and [3] altered budgeting.

Conclusion: Many breast cancer patients experience significant financial distress, and do not have access to the resources they need. This study highlights the need for financial transparency, supportive financial services, and counseling at the time of diagnosis, throughout treatment and beyond.

Primary Presenter: Kylan Nelson

Project Title: *New-onset seizures in adults: Low diagnostic yield of gadolinium contrast in initial brain MRI evaluation*

Primary Mentor: Vincent Timpone

Thematic Area: Clinical Science

Abstract:

Abstract

Background and purpose: The diagnostic utility of contrast MR-imaging in adult new-onset seizures without clinically suspected neoplasia or infection is not well defined in the literature. Imaging guidelines consider both contrast and noncontrast MR-imaging examinations appropriate in this clinical scenario. The purpose of this study was to evaluate the utility of contrast MR-sequences in evaluation of seizure in patients without suspicion for neoplasia or infection.

Methods: Imaging and clinical data were reviewed for 103 consecutive patients admitted for phase-1 seizure monitoring with the following criteria: (1) MRI-brain performed with/without intravenous contrast; (2) no clinical suspicion for central nervous system (CNS) infection; and (3) no history of CNS neoplasia, or suspected metastatic disease. Readers designated cases as lesional or nonlesional. Lesional cases were further categorized as either visualized on noncontrast sequences only, contrast sequences only, or both.

Results: 29/103 (28%) patients had epileptogenic lesions, 74/103 (72%) were nonlesional studies. 29/29 (100%) lesional abnormalities were detected on noncontrast sequences (sensitivity 100% [95 confidence interval (CI): 88-100], specificity 100% [95 CI: 95-100]). 23/29 (79.3%) lesional cases were visualized on both noncontrast and postcontrast sequences. 6/29 (20.7%) were visualized only on noncontrast sequences. No lesional cases were detected exclusively on postcontrast MR sequences. With an observed nonlesional extraneous contrast MR-imaging rate of 72%, estimated excess cost of contrast MR-imaging per 1000 patients using Medicare data was $103,680 USD.

Conclusions: Contrast MR-imaging has limited diagnostic utility in initial screening of adult new-onset seizure patients without clinically suspected neoplasia or infection. More judicious use of contrast MR-imaging in this patient population may reduce unnecessary exposure to gadolinium and lower associated healthcare costs.

Primary Presenter: Eugene Ng

Project Title: *Specialty Care Access Needs Assessment for Aurora, CO*

Primary Mentor: Kari Mader

Thematic Area: Public Health and Epidemiology

Abstract:

Across the country, there exists a large unmet specialty care need for patients on Medicaid or who are uninsured. Previous studies have identified multiple barriers to care unique to this patient population which include providers and health systems that do not accept Medicaid, poverty, complex referral process, incomplete referrals, lack of clinic-hospital affiliations, transport and clinic location factors, and poor communication across primary and specialty care providers. The Colorado Health Institute has identified a major specialty care gap that exists within Colorado€™s residents with Medicaid and who are uninsured. However, the extent of this gap in access has not been defined within the Aurora, CO community. Here, we seek to characterize the unmet specialty care need for individuals covered by Medicaid and who are uninsured, identify key barriers to specialty care access, and identify key strategies to mitigate barriers these patients encounter. We utilized provider surveys and subsequent key informant interviews from primary care physicians accepting Medicaid and uninsured patients to quantify and characterize the unmet specialty care in Aurora, CO. This approach will allow us to identify key barriers to specialty care access and elucidate strategies to mitigate such barriers through in-depth descriptive analysis. We have completed a physician database to include all providers in Aurora, CO who accept Medicaid or uninsured patients, and are completing a survey to be distributed to these providers and key interview follow ups.

Primary Presenter: Linh Nguyen

Project Title: *Attitudes towards deprescribing among adults with heart failure with preserved ejection fraction*

Primary Mentor: Sarah Tietz

Thematic Area: Clinical Science

Abstract:

Background/Objectives: Attitudes toward deprescribing could vary among subpopulations. We sought to understand patient attitudes toward deprescribing among patients with heart failure with preserved ejection fraction (HFpEF), a subpopulation with a chronic debilitating condition where polypharmacy is nearly universal.

Design: Retrospective cohort study

Setting: Academic medical center in New York City

Participants: Consecutive patients with HFpEF seen in July 2018-December 2019 at a program dedicated to providing care to older adults with HFpEF

Measurements: We assessed the prevalence of vulnerabilities outlined in the domain management approach for caring for patients with heart failure, and examined data on attitudes toward deprescribing via the revised Patient Attitudes Toward Deprescribing (rPATD). We examined bivariate associations between patient desire to deprescribe (from the rPATD) and factors such as demographics and vulnerabilities across multiple domains.

Results: Among 134 patients with HFpEF, the median age was 75 (interquartile range 69-82), 60.4% were women, and 35.8% were non-White. All had vulnerabilities in at least one of the 4 domains from the domain management approach for caring for patients with heart failure. Almost all patients had polypharmacy (94.0%) and 56.0% had hyperpolypharmacy; multimorbidity (80.6%) and frailty (78.7%) were also common. Overall, 90.3% were amenable to deprescribing if told it was possible by their doctors; and 26.9% had an active desire to deprescribe. Notably, 91.8% of patients reported that they would like to be involved in decisions about their medicines. In bivariate logistic regression, non-White participants were less likely to have an active desire to deprescribe one of their medications (OR 0.25, 95% CI 0.09-0.62, p-value=0.005).

Conclusions: Patients with HFpEF contend with myriad vulnerabilities that could prompt consideration for deprescribing. Most patients with HFpEF were amenable to deprescribing. Race may be an important factor that impacts patient attitudes toward deprescribing.

Key Words: heart failure, polypharmacy, frailty

Primary Presenter: Sarah Nodine

Project Title: *When to Transfer: Predictors of High Flow Nasal Cannula Failure in Children at a Community Hospital*

Primary Mentor: Mark Brittan

Thematic Area: Clinical Science

Abstract:

Introduction: High flow nasal cannula (HFNC) is commonly used for acute respiratory illness. Children who do not improve, known as HFNC failure, often require escalation to an intensive care unit (ICU). To safely implement HFNC in community hospitals without an ICU, it is important to identify patients at risk for failure, enabling early transfer before deterioration. Prior literature has identified partial pressure of carbon dioxide (pCO2) > 50mmHg as one variable that can predict failure. Less is known about other risk factors of HFNC failure.

Aims: To determine factors associated with HFNC failure among children presenting to a community hospital.

Methods: We performed a retrospective cohort study of patients < 18 years who received HFNC at a community hospital from 7/2018 to 10/2019. We excluded patients with medical complexity. Per protocol, a pC02 was obtained prior to HFNC initiation, patients were transferred to a quaternary-care hospital if pCO2>50mmHg or based on clinical discretion. Our outcome was HFNC failure, defined as need for HFNC greater than the floor limit per age per policy, non-invasive positive pressure, or mechanical ventilation. In bivariable analysis, we compared demographic and clinical factors (e.g. diagnosis, vital signs, pCO2) between those with and without HFNC failure. We included variables in a multivariable model based on clinical and statistical significance ($p<0.2$). We used Poisson regression with robust error variance to calculate the adjusted relative risk (aRR) of HFNC failure for each variable in the model. Receiver operating characteristic (ROC) analysis was performed to compare the predictive power of pCO2 alone vs a full multivariable model (with and without pCO2).

Results: Of 194 patients receiving HFNC, 98 had HFNC failure. In multivariable regression, the risk of failure was higher in those who were younger (aRR 1.84, $p<0.001$), and had asthma (aRR 1.4, $p=0.031$). Patients with an improved respiratory rate (RR) after HFNC initiation were less likely to fail (aRR 0.59, $p=0.002$; Figure 1). In ROC analysis, pCO2 was not an accurate predictor of failure.

Conclusion: Patients who were younger, had asthma, and did not have an improved RR after HFNC initiation were more likely to experience HFNC failure. These factors should be considered when triaging who can be safely receive HFNC in the community setting.

Primary Presenter: Ani Oganesyan

Project Title: *Abnormal pulmonary flow is associated with impaired right ventricular coupling in patients with COPD*

Primary Mentor: Dunbar Ivy

Thematic Area: Clinical Science

Abstract:

Introduction:Cor Pulmonale or right ventricular (RV) dysfunction due to pulmonary disease is an expected complication of COPD resulting from increased afterload mediated by hypoxic pulmonary vasoconstriction as well as the destruction of the pulmonary vascular bed. Early detection of elevated RV afterload has been previously demonstrated by visualization of abnormal flow patterns in the proximal pulmonary arteries. Prior quantitative analysis of helicity in the pulmonary arteries of pulmonary hypertension patients has demonstrated a strong association between helicity and increased RV afterload.

Hypothesis: Patients with COPD will have abnormal pulmonary flow as evaluated by 4D-Flow MRI and associated with RV function and pulmonary arterial stiffness.

Methods: Patients with COPD (n=15) (65yrs ± 6) and controls (n=10) (58yrs ± 9) underwent 4D-Flow MRI to calculate helicity (Figure 1A). The helicity was calculated in 2 segments: 1) the main pulmonary artery (MPA) and 2) along the RV outflow tract (RVOT) - MPA axis. Main pulmonary arterial stiffness was measured using the relative area change (RAC).

Results: COPD patients had decreased helicity relative to healthy controls in the MPA (19.4±7.8 vs 32.8±15.9 s-2, P=0.007) (Figure 1B). Additionally, COPD patients had reduced helicity along the RVOT-MPA axis (33.2±9.0 vs 43.5±8.3 s-2, P=0.010). The helicity measured in the MPA was associated with RV end-systolic volume (R=0.59, P = 0.002), RVEF (R=0.631, P<0.001), RAC (R=-0.61, P=0.001). e combined helicity along the MPA-RVOT axis was associated with RVEF (R=0.74, P<0.001), RVESV (R=-0.57, P=0.004), and RAC (R=0.42, P=0.005).

Conclusion: Patients with COPD show quantitatively abnormal flow hemodynamics, when compared with healthy controls, as assessed by 4D-Flow MRI. A strong association between helicity along the MPA-RV outflow tract axis and RV function suggests that 4D-Flow MRI might be a sensitive tool in evaluating RV - pulmonary arterial coupling in COPD.

Primary Presenter: Elizaveta Orysheva

Project Title: *Tools of the Trade: Assessing for Posterior Cortical Atrophy on the Front lines*

Primary Mentor: Steven Lowenstein

Thematic Area: Clinical Science

Abstract:

Posterior Cortical Atrophy (PCA) is a complex neurocognitive syndrome that typically first presents with visual impairments. The development of targeted treatments has been hindered by a lack of a standardized approach to diagnosis and monitoring of illness progression, an issue that is a common theme in today€™s literature on the topic. Despite the growing volume of literature on PCA, there remains a deficit in information aimed at primary care providers; though specialist intervention is the ultimate goal of care, most patients will initially present to their primary provider. It is therefore imperative that providers are aware of the syndrome so they can direct the appropriate next steps in care. This project aims to accomplish two goals: (1) to create a simplified overview of PCA to help primary care providers identify the syndrome, and (2) to identify the most commonly used diagnostic tools to better inform development of outcome measures in future clinical trials. A PCA battery created from a standard set of measures agreed upon by consensus from specialists in the field would be an effective tool for informing primary care providers and assessing these changes. Methods: Part 1 - Literature Review: A comprehensive literature review was carried out using major online databases. Part 2 - Survey: A 23 question survey was sent out to members of the Alzheimer€™s disease Professional Interest Area. The survey responses were then analyzed to determine which testing modalities were used by 30% or more of the clinicians who participated in the survey. Results. Part 1 - Literature Review: The review yielded 30 unique and relevant publications on the topic. Part 2 - Survey: Of the survey responders, 39 were clinicians. There were 23 €œmost-used€ testing tools for 9 most tested PCA features. Conclusion. This project attempted to organize the existing literature into a more streamlined product aimed at primary care providers. The survey portion of the paper illustrated that, although no clear consensus was identified, there is a preference for some tools over others, providing a starting point to create and distribute comprehensive materials that clinicians around the world can use to standardize their diagnostic screening of patients with suspected PCA.

Primary Presenter: Daniel Owens

Project Title: *Data-driven Learning: Understanding How Students Utilize a Data Dashboard*

Primary Mentor: Tai Lockspeiser

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Research Statement:

The purpose of this study was to explore how medical students utilize a dashboard of their exam performance and determine factors that most support students in utilizing this dashboard to improve their approach to learning.

Background/relevance

Data dashboards are a promising technology that are increasingly accessible in medical education (1-3). However, studies describing the implementation, use, and impact of dashboards are limited. A conceptual framework for analyzing and interpreting learning analytics dashboards has been created outside of medical education (4).

Study Design/Methods:

Using a phenomenological design, student interviews were conducted with second-year medical students who had utilized a dashboard displaying performance on all exam items in core courses during preclinical years (2019-2021). Students in all terciles of exam performance were included. Interviews were semi-structured, conducted by a trained fourth-year medical student, audio-recorded, and transcribed. Data were analyzed using the constant comparative method.

Results/Findings:

Eleven interviews were conducted. Preliminary analysis identified 19 codes in 3 themes. The first theme was €œLooking at the Data€□: students expressed value in seeing their data in a longitudinal view. The second theme was €œMaking Meaning from the Data€□: students described reflecting on and deriving insights from the dashboard. The third theme was €œActing on the Data€□: the biggest change students described was how they allocated their time studying with more emphasis on weaknesses.

Conclusion

The results highlight distinctions between students looking at, making meaning from, and acting on performance data, which aligns well with the previous model (4). The challenge students

faced when the data in the dashboard conflicted with their internal feelings about performance supports the importance of focused training in data literacy and faculty guidance in understanding the data which may ultimately empower students to use data to guide growth throughout their career.

Significance:

Understanding how students use data dashboards to guide learning can help maximize their utility.

Primary Presenter: Vishruti Patel

Project Title: *and Student Identity on Learner Outcomes*

Primary Mentor: Marisha Burden

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Background

Academic medical centers (AMCs) have experienced significant clinical growth and have responded to the increase clinical demand by growing the number of hospital medicine services.[1,2] While this unprecedented growth has occurred, it has often outpaced the growth of housestaff training programs which has led to academic hospitalist teams evolving their clinical and educational models in a variety of ways.[2] We aimed to understand how hospitalist teams have evolved their clinical and educational models and the impact these strategies have had on their teams.

Methods

We conducted semi-structured interviews via virtual video with hospitalist leaders (including Division Head, Section Head, educational leaders) at different AMCs across the nation. Inclusion criteria included AMCs with 200 or greater beds hospital, AMCs with teaching as a central mission area and AMCs experiencing clinical growth. Clinical growth was broadly defined as an increase in total patients, an increase in hospitalist teams, or addition of hospitalist to the group in the last five years. Interviews focused on: (1) impact of clinical growth on educational growth; (2) strategies utilized to mitigate disproportionate clinical growth and increase educational growth; and (3) impact of these strategies. Interviews were audio-recorded, transcribed, and coded. A mixed inductive and deductive method at the semantic level was utilized to identify themes and subthemes.

Results

From September 2021 to January 2022, 17 hospital medicine leaders representing 17 AMCs participated in the interviews. Three key themes were identified. (1) Clinical growth, both defined by volume and acuity, was felt to drive tension between clinical and educational productivity and priorities. This tension was pervasive at all sites, impacted hospitalists in their daily duties and created a mismatch between supply and demand for educational opportunities. (2) There exists a discrepancy between desired job duties/careers and actual job descriptions and expectations. Traditional teaching careers were noted to be popular and more valued choices among young as well as experienced hospitalists. Limited traditional teaching opportunities have created challenges in recruitment, sustaining job satisfaction, and paths to promotion. Academic

hospitalists jobs have increased in their requirements for clinical duties leaving less differences between academic and non-academic jobs. (3) Hospitalist groups have worked creatively to address the supply/demand issue. Hospitalist groups found some success by focusing on growing non-traditional teaching opportunities and thinking about the role and identity of an academic hospitalist beyond the traditional teaching capacity, noting, some of these opportunities are threatened by the increasing drive for higher clinical productivity.

Conclusions

The hospitalist field faces supply and demand problems in both the clinical and educational settings driving a need to rethink educational opportunities. Solving the supply and demand problem presents a challenging problem to solve with no optimal solution.

References

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Primary Presenter: Monica Patten

Project Title:

Circumstances of Suicide Among Lesbian, Gay, Bisexual and Transgender Individuals

Primary Mentor: Catherine Velopulos

Thematic Area: Public Health and Epidemiology

Abstract:

Introduction: Suicide rates for sexual minorities are higher than the heterosexual population. The purpose of this study is to explore circumstances surrounding suicide completion to inform future intervention strategies for suicide among lesbian, gay, bisexual and transgender (LGBT) individuals.

Materials and Methods: We completed a retrospective analysis of data from the National Violent Death Reporting System (NVDRS) from 2013-2017. Victims identified as transgender were considered separately. We stratified analysis by identified sex of the victim for the LGB population.

Results: Of the 16,831 victims whose sexual orientation or transgender status was known: 3886 (23.1%) were identified as female, 12,945 (76.9%) were identified as male. 479 (2.8%) were identified as LGBT; of these, 53 (11%) were transgender. LGBT victims were younger than non-LGBT victims. Male LGB victims were more likely to have a history of prior suicide attempts, past or current mental illness diagnosis, and were less likely to use firearms than male heterosexual victims. Female LGB victims were more likely to have problems in an intimate partner relationship than heterosexual women, while LGB men were more likely to have problems in family or other relationships. Transgender victims were again more likely to have mental health problems and a history of prior attempts, but less likely to have intimate partner problems and more likely to have a history of child abuse.

Conclusions: These results highlight the importance of promoting suicide interventions that recognize the complex intersection between stated gender, sex, and sexuality and the different cultural impacts these identities can have.

Primary Presenter: Matthew Paulson

Project Title: *A descriptive analysis of battlefield first responder and combat lifesaver interventions during the Role 1 phase of care*

Primary Mentor: Vikhyat Bebarta

Thematic Area: Clinical Science

Abstract:

TITLE: A descriptive analysis of battlefield first responder and combat lifesaver interventions during the Role 1 phase of care

AUTHORS

CPT Matthew W. Paulson, BA, USA (1, 2)

John D. Hesling, BS (1, 2)

MAJ (Ret) Jerome T. McKay, PhD, USA (2)

Col Vikhyat S. Bebarta, MD, USAF (2, 3)

Brig Gen Kathleen Flarity, DNP PhD, USAF (2, 4)

COL (Ret) Sean Keenan, MD, USA (2, 5, 12)

LTC Jason F. Naylor, USA (6)

MAJ Andrew D. Fisher, MD, LP, USA (7,8)

MAJ Michael D. April, MD, USA (9)

James Bynum, PhD (11)

MAJ Steven G. Schauer, DO, MS, USA (3, 10, 11, 12)

* University of Colorado School of Medicine, Aurora, Colorado

* CU Anschutz Center for COMBAT Research, Department of Emergency Medicine, University of Colorado School of Medicine, Aurora, Colorado

* 59th Medical Wing, JBSA Lackland, Texas

* Headquarters Air Mobility Command, Command Surgeon, Scott Air Force Base, Illinois

* Joint Trauma System, Defense Health Agency, JBSA Fort Sam Houston, Texas

* Madigan Army Medical Center, Joint Base Lewis McChord, Washington

* Medical Command, Texas Army National Guard, Austin, Texas

* Department of Surgery, University of New Mexico School of Medicine, Albuquerque, New Mexico

* 2nd Stryker Brigade Combat Team, 4th Infantry Division, Fort Carson, Colorado

* Department of Emergency Medicine, Brooke Army Medical Center, Fort Sam Houston, Texas

* United States Army Institute of Surgical Research, JBSA Fort Sam Houston, Texas

* Uniformed Services University of the Health Sciences, Bethesda, Maryland

CORRESPONDING AUTHOR

Matthew W. Paulson

13001 E 17th Place

Aurora, CO 80045

matthew.paulson@cuanschutz.edu

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ETHICS: The U.S. Army Institute of Surgical Research (USAISR) regulatory office reviewed protocol H-19-018 and determined it was exempt from IRB oversight. We obtained only de-identified data. We executed data sharing agreement 19-2186 prior to data transfer.

DISCLAIMER: Opinions or assertions contained herein are the private views of the authors and are not to be construed as of-ficial or as reflecting the views of the Depart-ment of Defense or its Services.

ABSTRACT

Background: Battlefield first responders (BFR) are the first non-medical personnel to render critical lifesaving interventions for combat casualties, especially massive hemorrhage where rapid control will improve survival. Soldiers receive medical instruction during initial entry training (IET) and unit-dependent medical training, and by attending the Combat Lifesaver (CLS) course. We seek to describe the interventions performed by BFRs on casualties with only BFRs listed in their chain of care within the Prehospital Trauma Registry (PHTR).

Methods: This is a secondary analysis of a dataset from the PHTR from 2003-2019. We excluded encounters with a documented medical officer, medic, or unknown prehospital provider at any time in their chain of care during the Role 1 phase to isolate only casualties with BFR medical care. Some patients met inclusion criteria, yet lacked coded interventions based on our query.

Results: Of the 1357 encounters in our initial dataset, we identified 29 casualties that met inclusion criteria. Pressure dressing was the most common intervention (n=12), followed by limb tourniquets (n=4), IV fluids (n=3), hemostatic gauze (n=2), and wound packing (n=2). Bag-valve-masks, chest seals, extremity splints, and nasopharyngeal airways (NPA) were also used (n=1 each). Notably absent were backboards, blizzard blankets, cervical collars, eye shields, pelvic splints, hypothermia kits, chest tubes, supraglottic airways (SGA), intraosseous (I/O) lines, and needle decompression (NDC).

Conclusions: Despite limited training, BFRs employ vital medical skills in the prehospital setting. Our data show that BFRs largely perform medical interventions within the scope of their medical knowledge and training. Better datasets with efficacy and complication data are needed.

Primary Presenter: Binhan Pham

Project Title: *Current Statistical Data on POCUS to Guide Physician Training*

Primary Mentor: Jill Vanwyk

Thematic Area: Clinical Science

Abstract:

Aims: This literature review aims to identify sensitivities and specificities of ultrasound for the diagnosis of various diseases to help direct physician training for point-of-care ultrasound.

Materials and methods: A systematic search was conducted through Pubmed. Sensitivity and specificity were taken from the studied articles and considered given the methodology of the article. Articles associated across diagnosis or specific body parts were reviewed. Positive predictive values and negative predictive values were included as an OR boolean keyword in a subsequent search.

Results: The overall sensitivities and specificities are variable depending on the diagnosis being studied. The compositie sensitivities and specificities of multi-meta-analysis are reviewed across various body systems.

Conclusion: As POCUS becomes more ubiquitous, directing training of future physicians towards high fidelity use cases may aid in diagnostics.

Primary Presenter: Jessica Phan

Project Title: *Improving Hypertension Management in Rheumatology Clinic: A Quality Improvement Initiative Aimed at Improving Care Coordination Between Specialty and Primary Care*

Primary Mentor: Elena Weinstein

Thematic Area: Clinical Science

Abstract:

still working on it

Primary Presenter: Lauren Pitzer

Project Title: *WNT4 Balances Development vs Disease in Gynecologic Tissues and Women's Health*

Primary Mentor: Matthew Sikora

Thematic Area: Basic Biomedical Science

Abstract:

The WNT family of proteins is crucial in numerous developmental pathways and tissue homeostasis. WNT4, in particular, is uniquely implicated in the development of the female phenotype in the fetus, and in the maintenance of mÃ¼llerian and reproductive tissues. WNT4 dysfunction or dysregulation can drive sex-reversal syndromes, highlighting the key role of WNT4 in sex determination. WNT4 is also critical in gynecologic pathologies later in life, including several cancers, uterine fibroids, endometriosis, and infertility. The role of WNT4 in normal decidualization, implantation, and gestation is being increasingly appreciated, while aberrant activation of WNT4 signaling is being linked both to gynecologic and breast cancers. Notably, single-nucleotide polymorphisms (SNPs) at the WNT4 gene locus are strongly associated with these pathologies and may functionally link estrogen and estrogen receptor signaling to upregulation and activation of WNT4 signaling. Importantly, in each of these developmental and disease states, WNT4 gene expression and downstream WNT4 signaling are regulated and executed by myriad tissue-specific pathways. Here, we review the roles of WNT4 in women's health with a focus on sex development, and gynecologic and breast pathologies, and our understanding of how WNT4 signaling is controlled in these contexts. Defining WNT4 functions provides a unique opportunity to link sex-specific signaling pathways to women's health and disease.

Primary Presenter: Elijah Potokar

Project Title: *THE ROLE OF MRI IN PROSTATE cancer MANAGEMENT: AN EVOLVING LANDSCAPE*

Primary Mentor: Granville Lloyd

Thematic Area: Clinical Science

Abstract:

ABSTRACT

Background: Prostate cancer is one of the most prevalent cancers in men and a significant cause of death globally. In recent decades, the therapeutic approach towards prostate cancer has undergone a rapid progression, as has the screening methodologies. The utilization of Magnetic Resonance Imaging (MRI) and MRI-directed biopsy has emerged as a topic of increasing clinical investigation and interest.

Objective: The aim of this paper was to perform a narrative review of the literature pertaining to the utilization of MRI for the diagnosis and management of prostate cancer, its present applications, and to examine its potential as a screening modality.

Methods: By synthesizing data from single-center studies, multi-center studies, nationwide studies, and comprehensive meta-analyses of all pertinent published literature. Evaluation of the utility of MRI as a screening modality for prostate cancer was addressed by using the screening domains: disease/condition, the test/intervention, and the program/system (Table 1).

Findings: MRI has a wide scope of applications in the management of prostate cancer including screening, risk stratification, staging, treatment planning, and surveillance. MRI and MRI-guided biopsy improves the detection of clinically significant prostate cancer, minimizes over-treatment, and is cost-effective.

Primary Presenter: Victor Quach

Project Title: *High healing rate of stable femoral condyle osteochondritis dissecans in young patients placed in a hinged knee brace locked in extension*

Primary Mentor: Jay Albright

Thematic Area: Clinical Science

Abstract:

Treatment for femoral condyle osteochondritis dissecans (OCD) varies widely.

Hypothesis/Purpose We report the rate of stable femoral condyle OCD lesion healing in adolescents using a locked hinged knee brace, activity restriction and physical therapy and assess factors that may influence healing. We hypothesized that less severe and smaller lesions and younger age would be associated with healing.

Study Design Level of Evidence III: Retrospective Cohort Study

Primary Presenter: James Rhodes

Project Title: *Healthcare Barriers Impacting HIV Pre-Exposure Prophylaxis (PrEP) Uptake for Youth in the United States*

Primary Mentor: Rita Lee

Thematic Area: Public Health and Epidemiology

Abstract:

Abstract

Background

HIV disproportionately affects young men who have sex with men. Pre-exposure prophylaxis (PrEP) can prevent HIV acquisition; however, youth access to PrEP is limited by healthcare barriers.

Objective

A systematic review of healthcare barriers impacting PrEP uptake for youth in the United States was conducted. These data can support interventions to increase PrEP uptake in youth and help develop strategies to be implemented in healthcare systems.

Methods

A total of 70 published articles were identified from PubMed that included key words, such as PrEP, provider, youth, United States, barrier, and/or access. A total of 29 articles were included for review that met inclusion criteria. Data about barriers were recorded along with relevant themes regarding healthcare barriers

Results

Many healthcare barriers were identified, including PrEP access, stigma, patient-provider communication, providers€™ knowledge and willingness to prescribe PrEP, along with other provider concerns about adolescents using PrEP.

Conclusions

Pre-exposure prophylaxis (PrEP) is essential for HIV prevention. Providers in any setting should be able identify at-risk youth and prescribe PrEP accordingly. To increase accessibility, it is important for providers to recognize and address the barriers for PrEP utilization, prescribing, and continuity of care that significantly impact youth.

Primary Presenter: Caitlin Ritz

Project Title: *CDK8 maintains stemness and tumorigenicity of MYC-driven medulloblastoma*

Primary Mentor: Rajeev Vibhakar

Thematic Area: Basic Biomedical Science

Abstract:

BACKGROUND

Cyclin-dependent kinase 8 (CDK8) belongs to the transcription-related cyclin dependent protein kinase family. CDK8 and cyclin C associate with the mediator complex to regulate gene transcription. Although CDK8 has been shown to be implicated in the malignancy of several types of cancer, its functional role and mechanism in medulloblastoma remains largely unknown.

METHODS

Crisper-Cas9 screen was used to discover essential genes for MB tumor growth. Microarray and immunohistochemistry on pediatric patient samples were performed to examine the expression of CDK8. The effect of CDK8 inhibitor in vitro was measure by cell viability, colony-forming assays, extreme limiting dilution assay and RNA-Seq. ALDH activity, cell-cycle distribution DNA damage and apoptosis were analyzed by flow cytometry. Medulloblastoma mouse xenografts were generated to explore the effect of CDK8 inhibitor.

CONCLUSIONS

Here, we demonstrate how CDK8 plays an essential role in maintaining stemness and tumorigenicity in medulloblastoma. CDK8 inhibition suppresses stem cell associated signaling in medulloblastoma cells and inhibits tumor cell self-renewal. Additionally, CDK8 has increased expression in MYC-driven medulloblastoma, is positively correlated with c-MYC expression in human medulloblastoma specimens and associates with poor survival in patients. Using a cut&run assay, we found CDK8 associates with MED1 to activate transcription of MYC target genes. CDK8 contributes to MYC-driven transcriptional programs mediating DNA repair. Pharmaceutic inhibitors and genetic depletion result in cessation of tumor growth in xenograft mouse models and increase in apoptosis and DNA damage. Collectively, these findings highlight the importance of the CDK8-c-MYC axis in maintaining stemness and tumorigenicity in medulloblastoma. Our studies establish the selective inhibition of CDK8 inhibition as a viable therapeutic strategy in MYC-driven medulloblastoma.

Primary Presenter: Joshua Romero

Project Title: *Risk Factors of SARS-CoV-2 Antibodies in Arapahoe County First Responders—The COVID-19 Arapahoe SErosurveillance Study (CASES) Project*

Primary Mentor: Shanta Zimmer

Thematic Area: Public Health and Epidemiology

Abstract:

Abstract

Objectives:

Define the seroprevalence and risk factors for SARS-CoV-2 antibodies in Arapahoe County, Colorado first responders (eg, law enforcement, human services, fire departments).

Methods:

Two hundred sixty four first responders were enrolled June to July 2020. SARS-CoV-2 seropositivity was defined as detection of immunoglobulin G (IgG) antibodies to both spike receptor binding domain and nucleocapsid in venous blood by validated enzyme-linked immunosorbent assay. We compared risk factors for being seropositive versus seronegative.

Results:

4% (11/264) were SARS-CoV-2 seropositive. Seropositive participants were significantly more likely to have lung disease (% seropositive, % seronegative; P-value) (36%, 8%; P = 0.01), prior SARS-CoV-2/COVID-19 testing (36%, 8%; P ‰¤ 0.01), a prior positive result (18%, less than 1%), and to believe they previously had COVID-19 (64%, 15%; P < 0.01). Only 15% of those believing they had COVID-19 had anti-SARS-CoV-2 antibodies.

Conclusions:

Human services employees and individuals with lung disease are at SARS-CoV-2 exposure risk. Few individuals believed they had COVID-19 had prior exposure.

Primary Presenter: Lexie Ross

Project Title: *Impact of concussion, playing surface, and sport contact status on time to lower extremity musculoskeletal injury.*

Primary Mentor: Kenneth Hunt

Thematic Area: Clinical Science

Abstract:

Background: Post-concussion neuromuscular control deficits may persist beyond clinically measured recovery and predispose athletes to subsequent musculoskeletal injuries in the months-to-years after returning to sports. Previous investigations have demonstrated a relationship between concussion and risk of subsequent lower extremity musculoskeletal injury (LEMSKI) among diverse athletic populations, but the effect of sport- and patient-specific factors on time to injury after concussion has not been thoroughly described.

Hypothesis/Purpose: To explore the effect of concussion, biologic sex, playing surface, and sport contact status on time to LEMSKI among NCAA Division I student-athletes.

Study Design: Case-control, level of evidence III.

Methods: A 3-year retrospective observational investigation using archival data from the Pac-12 HAP, a deidentified injury database of injuries among Pac-12 NCAA Division I student-athletes, utilizing a mixed linear model analysis with contrasts.

Results: LE injuries accounted for 44.5% (14,873/33,432) of all database injuries. Among 1179 student-athletes included, student-athletes sustained a subsequent LEMSKI on synthetic surfaces a mean of 14.5 days sooner than on constructed surfaces (SE=5.255; $p=0.045$) and 23.5 days sooner than on organic surfaces (SE=4.018; $p<0.001$). On average contact sport student-athletes sustained a subsequent LEMSKI 52.1 days sooner compared to collision sport student-athletes (SE=5.248; $p<0.001$), and limited contact sport student-athletes sustained a subsequent LEMSKI 42.29 days sooner compared to collision sport student-athletes (SE=4.463; $p<0.001$). There was no observed effect of either prior concussion ($F=0.038$; $p=0.846$) or biologic sex ($F=0.602$; $p=0.438$) on time to LEMSKI overall.

Conclusion: LEMSKI was not influenced by history of concussion in this observational study. Student-athletes who compete in contact and limited contact sports or play on synthetic surfaces may be at increased risk of earlier subsequent LEMSKI compared to student-athletes who compete in collision sports or play on other surfaces. Further investigations exploring the factors contributing to any protective effect of sport contact level and playing surface on time to subsequent LEMSKI may further elucidate injury risks, inform injury prevention strategies, and improve student-athlete health.

Primary Presenter: Jessica Saifee

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

Primary Mentor: Steven Lowenstein

Thematic Area: Global Health

Abstract:

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

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

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

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

Primary Presenter: Omar Samara

Project Title: *Proinflammatory Cytokines levels in Sepsis and Healthy volunteers, and Tumor Necrosis Factor-alpha associated sepsis mortality: A systematic review and metaanalysis*

Primary Mentor: Andres Henao Martinez

Thematic Area: Clinical Science

Abstract:

Abstract:

Background: Sepsis is a global health challenge associated with significant morbidity and mortality. Detrimental sepsis effects are attributed to excessive inflammation or a "cytokine storm." However, anti-inflammation therapies have failed to lower sepsis mortality. We aim to characterize levels of key inflammatory cytokines in patients with sepsis and compare levels with those in healthy individuals and relate tumor necrosis factor TNFÎ± levels to patient characteristics and outcomes.

Methods: We performed a systematic review and meta-analysis. Medline, Embase, Cochrane Library, and Web of Science Core Collection databases were searched between 1985 and May 2020. Analysis was restricted to studies in English. We included randomized controlled trials (RCTs), controlled trials, cohort studies, case series, and cross-sectional studies that reported mean levels of cytokines in the circulation thought to be relevant for sepsis pathogenesis. We also evaluated concentrations of these cytokines in healthy individuals. The Quality in Prognosis Studies tool was used to assess the methodological quality of included studies. We extracted summary data from published reports. Data analyses were performed using a random-effects model to estimate pooled odds ratios (OR) with 95% confidence intervals for cytokine levels and mortality. This systematic review is registered in PROSPERO (CRD42020179800).

Findings: We identified 3654 records, and 104 studies were included with a total of 3250 participants. The pooled estimated mean TNFÎ± concentration in sepsis patients was 58.4 pg/ml (95% Confidence Interval or CI 39.8-85.8 pg/ml), and in healthy individuals was 5.5 pg/ml (95% CI 3.8-8.0 pg/ml). Pooled estimate means for IL-1Î² and IFN-Î³ in sepsis patients were 21.8 pg/ml

and 63.3 pg/ml, respectively. Elevated TNFÎ± concentrations associated with increased 28-day

sepsis mortality (p=0.001). In subgroup analyses, we did not detect an association between TNFÎ±

levels and sepsis source, sepsis severity, or sequential organ failure assessment (SOFA) score. A TNF-Î± cutoff level ‰¥ 14.7 pg/mL separated sepsis patients from healthy individuals with a sensitivity of 82.6%, a specificity of 91.7%, and a likelihood ratio of 9.9.

Interpretation: Sepsis mean TNFÎ± concentration is increased approximately 10-fold compared to

mean concentration in healthy individuals, and TNFï□¡ï€ associated with sepsis mortality but not

sepsis severity. The concept that elevated cytokines cause sepsis should be revisited in the context of these data.

Primary Presenter: Bianca Sanchez

Project Title: *A Mixed-Methods Study on Maternal Perspectives on Postpartum Depression Screening: Beliefs, Concerns and Level of Comfort*

Primary Mentor: Janet Meredith

Thematic Area: Public Health and Epidemiology

Abstract:

Abstract

Introduction

Postpartum depression (PPD) is a leading cause of morbidity and mortality amongst pregnant women; the Edinburgh Postpartum Depression Scale (EPDS) screens for PPD, however it is unknown how accurately responses reflect the true experience of mothers. Our objective was to assess the maternal perspectives on the purpose of the EPDS, level of honesty while answering, and to identify barriers to completing the questionnaire.

Methods

We conducted a cross-sectional survey and qualitative study design composed of a survey administered in both English and Spanish containing 8 questions about demographics and 16 questions including: yes/no, drop down, check all that apply, and open-ended answers for participants across various hospitals and clinics in the Denver metro area. We evaluated data using thematic and descriptive analysis.

Results

The demographics of our participants were 53% white, 61% had a college education and 78% were married. Most of these women agreed they felt comfortable answering honestly to the EPDS questions (>60%). We found 5 important themes: recognizing symptoms of depression, stigma and guilt surrounding mental health, fear of the unknown, inefficient format, and importance of doctor patient relationship.

Conclusion

Women in the postpartum period are at high risk for experiencing untreated postpartum depression due to fear of not knowing what will happen if they screen positive. There are several barriers to answering truthfully and it is imperative the EPDS becomes more transparent to improve the sensitivity of the screening survey.

Primary Presenter: Brionna Sandridge

Project Title: *Outcomes of initial conservative treatment in OCD of the Elbow*

Primary Mentor: Jay Albright

Thematic Area: Clinical Science

Abstract:

Background: Osteochondritis dissecans (OCD) is a disorder characterized by the separation of subchondral bone and articular cartilage from underlying bone due to a lack of blood supply. Effective treatment of elbow OCD is still debated. This study aims to compare the characteristics and clinical outcomes of adolescent patients diagnosed with stable OCD of the elbow who either progressed to surgery or did not after initial conservative treatment.

Methods: We performed a retrospective chart review of patients 5-18 years of age who were diagnosed with stable OCD of the elbow and initially underwent conservative treatment at Children€™s Hospital Colorado. Demographic and radiographic variables such as age, sex, skeletal maturity, and lesion size were collected. Clinical outcomes that were collected included time to return to sport and the need for a second surgery. Statistical analysis was performed.

Results: We identified 18 patients to meet inclusion criteria; 11 progressed to surgery and 7 did not. There were no significant differences between groups regarding sex, age, skeletal maturity, or insurance type. Loss of range of motion in the elbow was seen in 64% of patients who progressed to surgery and in 29% of those who did not ($p = 0.34$). While there were no significant differences in radiographic measurements between groups, those who progressed to surgery had greater average lesion sizes than those who did not ($p=0.22$). We did not observe any significant difference in the time from diagnosis to return to sport.

Conclusions: Overall, there were no significant differences between patients who progressed to surgery versus those who did not regarding patient characteristics or clinical outcomes. However, it may be clinically useful to consider the loss of range of motion and size of the lesion when treating these patients. Factors associated with the healing of stable OCD lesions and the benefits of conservative treatment should be further investigated.

Primary Presenter: Michal Schafer

Project Title: *Bromocriptine Improves Central Aortic Stiffness in Adolescents with Type 1 Diabetes: Arterial Health Results from the BCQR-T1D Study*

Primary Mentor: Kristen Nadeau

Thematic Area: Clinical Science

Abstract:

Background: The presence of vascular dysfunction is a well-recognized feature in youth with type 1 diabetes (T1D), accentuating their lifetime risk of cardiovascular events. Therapeutic strategies to mitigate vascular dysfunction are a high clinical priority. In the bromocriptine quick release T1D study (BCQR-T1D), we tested the hypothesis that BCQR would improve vascular health in youth with T1D.

Methods: BCQR-T1D was a placebo-controlled, random-order, double-blinded, cross-over study investigating the cardiovascular and metabolic impact of BCQR in T1D. Adolescents in the BCQR-T1D study were randomized 1:1 to phase-1: 4-weeks of BCQR or placebo after which blood pressure (BP), peripheral vascular stiffness by brachial artery distensibility (BrachD), endothelial function by reactive hyperemic index (RHI), and central aortic stiffness measured by pulse wave velocity (PWV), relative area change (RAC) and distensibility from phase-contrast MRI, were performed. Following a 4-week washout period, phase 2 was performed in identical fashion with the alternate treatment.

Results: Thirty-four adolescents (mean age 15.9±2.6 years, HbA1c 8.6±1.1%, BMI %ile 71.4±26.1, medianT1D duration 5.8 years) with T1D were enrolled and had MRI data available. Compared to placebo, BCQR therapy decreased systolic [ˆ† = -5 mmHg, (95%CI: -3, -7), p<0.001) and diastolic BP (ˆ† = -2 mmHg, (95%CI: -4, 0), p=0.039). BCQR reduced ascending aortic PWV (ˆ† = -0.4 m/s, p=0.018), and increased RAC (ˆ† = -2.6%, p=0.083) and distensibility (ˆ† = 0.08 %/mmHg, p=0.017). In the thoraco-abdominal aorta, BCQR decreased PWV (ˆ† = -0.2 m/s, p=0.007) and increased distensibility (ˆ† = 0.05 %/mmHg, p=0.013). BCQR also decreased BrachD in normal-weight participants (ˆ† = 0.56 %/mmHg, p=0.023).

Conclusions: BCQR improved BP and central and peripheral aortic stiffness and pressure hemodynamics in adolescents with T1D over 4 weeks vs. placebo. However, BCQR decreased peripheral RHI. BCQR may improve aortic stiffness in youth with T1D, supporting future longer-term studies.

Primary Presenter: Laura Schubert

Project Title: *ERBB family fusions are recurrent and actionable oncogenic targets across cancer types*

Primary Mentor: Robert Doebele

Thematic Area: Basic Biomedical Science

Abstract:

Purpose: Gene fusions involving receptor tyrosine kinases (RTKs) define an important class of genomic alterations with many successful targeted therapies now approved for ALK, ROS1, RET and NTRK gene fusions. Fusions involving the ERBB family of RTKs have been sporadically reported, but their frequency has not yet been comprehensively analyzed and functional characterization is lacking on many types of ERBB fusions.

Materials and Methods: We analyzed tumor samples submitted to Caris Life Sciences (n=64,354), as well as the TCGA (n=10,967), MSK IMPACT (n=10,945) and AACR GENIE (n=96,324) databases for evidence of EGFR, ERBB2 and ERBB4 gene fusions. We also expressed several novel fusions in cancer cell lines and analyzed their response to EGFR and HER2 tyrosine kinase inhibitors (TKIs).

Results: In total, we identified 1,251 ERBB family fusions, representing an incidence of approximately 0.7% across all cancer types. EGFR, ERBB2, and ERBB4 fusions were most frequently found in glioblastoma, breast cancer and ovarian cancer, respectively. We modeled two novel types of EGFR and ERBB2 fusions, one with a tethered kinase domain and the other with a tethered adapter protein. Specifically, we expressed EGFR-ERBB4, EGFR-SHC1, ERBB2-GRB7 and ERBB2-SHC1, in cancer cell lines and demonstrated that they are oncogenic, regulate downstream signaling and are sensitive to small molecule inhibition with EGFR and HER2 TKIs.

Conclusions: We found that ERBB fusions are recurrent mutations that occur across multiple cancer types. We also establish that adapter-tethered and kinase-tethered fusions are oncogenic and can be inhibited with EGFR or HER2 inhibitors. We further propose a nomenclature system to categorize these fusions into several functional classes.

Purpose: Gene fusions involving receptor tyrosine kinases (RTKs) define an important class of genomic alterations with many successful targeted therapies now approved for ALK, ROS1, RET and NTRK gene fusions. Fusions involving the ERBB family of RTKs have been sporadically reported, but their frequency has not yet been comprehensively analyzed and functional characterization is lacking on many types of ERBB fusions.

Materials and Methods: We analyzed tumor samples submitted to Caris Life Sciences (n=64,354), as well as the TCGA (n=10,967), MSK IMPACT (n=10,945) and AACR GENIE (n=96,324) databases for evidence of EGFR, ERBB2 and ERBB4 gene fusions. We also expressed several novel fusions in cancer cell lines and analyzed their response to EGFR and HER2 tyrosine kinase inhibitors (TKIs).

Results: In total, we identified 1,251 ERBB family fusions, representing an incidence of approximately 0.7% across all cancer types. EGFR, ERBB2, and ERBB4 fusions were most frequently found in glioblastoma, breast cancer and ovarian cancer, respectively. We modeled two novel types of EGFR and ERBB2 fusions, one with a tethered kinase domain and the other with a tethered adapter protein. Specifically, we expressed EGFR-ERBB4, EGFR-SHC1, ERBB2-GRB7 and ERBB2-SHC1, in cancer cell lines and demonstrated that they are oncogenic, regulate downstream signaling and are sensitive to small molecule inhibition with EGFR and HER2 TKIs.

Conclusions: We found that ERBB fusions are recurrent mutations that occur across multiple cancer types. We also establish that adapter-tethered and kinase-tethered fusions are oncogenic and can be inhibited with EGFR or HER2 inhibitors. We further propose a nomenclature system to categorize these fusions into several functional classes.

Primary Presenter: Violette Simon

Project Title: *Validation of Orthopedic Hip Fracture Data from the National Surgical Quality Improvement Program (NSQIP) Database.*

Primary Mentor: Joshua Parry

Thematic Area: Clinical Science

Abstract:

Purpose: Internal validation studies of National Surgical Quality Improvement Program (NSQIP) registry data have reported potential inaccuracies. The purpose of this study was to determine the accuracy of hip fracture CPT codes and complications entered into NSQIP for a single participating center.

Methods: A retrospective study identified patients with a hip fracture CPT code from NSQIP data at a single institution over a two-year period. CPT codes included 27235 (percutaneous fixation of femoral neck fracture (Perc FNFX)), 27236 (open treatment of femoral neck fracture, internal fixation/prosthetic replacement (Open FNFX)), 27244 (open treatment of inter/peri/subtrochanteric femoral fracture with plate (Plate ITFX)), 27245 (treatment of inter/peri/subtrochanteric femoral fracture, with intramedullary implant (IMN ITFX)), and 27125 (hemiarthroplasty (HA)). The institutional medical record was reviewed to determine the accuracy of CPT code and 30-day complication data entered into the registry.

Result: 12.8% (n = 20/156) of patients had an inaccurate CPT code. The proportion of inaccurate CPT codes varied significantly by procedure: Plate ITFX (76.9%), Open FNFX (13.8%), IMN ITFX (7.0%), and HA (0%) ($p < 0.0001$). A total of 82 complications were identified in 66 patients via the medical record. 43.9% (n = 36/82) of these complications were not documented in the NSQIP data. The proportion of missing complications varied significantly by type: renal (100%), UTI (53.8%), infection (50%), bleeding (30%), death (25%), respiratory (25%), cardiac (0%), stroke (0%), and VTE (0%) ($p < 0.0001$).

Conclusion: Hip fracture CPT codes and 30-day complication data entered into the NSQIP registry were frequently inaccurate. Studies incorporating NSQIP data should acknowledge these potential limitations of the registry, and future research to validate NSQIP orthopedic data across procedures and institutions is necessary.

Level of evidence: LEVEL III: Diagnostic study.

Primary Presenter: John-David Slaugh

Project Title: *Integration of Diagnostic Lung Ultrasound into Clinical Practice by Hospitalists in an Academic Medical Center*

Primary Mentor: Anna Maw

Thematic Area: Clinical Science

Abstract:

Background: Point of care lung ultrasound (LUS), ultrasound of lung that is performed at the bedside by a clinician, is an imaging modality that is equal to or more accurate than chest radiography for multiple common causes of dyspnea. In spite of its many advantages, few hospitalists use LUS. The purpose of this study was to understand the process of LUS adoption and the impact of LUS on real world hospitalist practice.

Methods: A retrospective chart review was conducted of patients who received a LUS while hospitalized at a quaternary care academic medical center in Aurora, CO between July 2020 through June 2022. Data was extracted from the electronic health record (EHR) into a standardized REDcap form. Cases were defined as patients who had received LUS that 1) had images archived and accessible to viewing through the electronic medical record (EHR) and 2) had an imaging report documented in the EHR. All ultrasounds were performed with handheld devices.

Results: Of the 831 LUSs reviewed, 302 were performed to evaluate for appropriateness of thoracentesis, 271 for diagnosing or monitoring pneumonia, 172 for volume status assessment, 137 for worsening respiratory status, 115 for monitoring pleural effusions, and 12 for monitoring of diuresis. Documentation was sufficient to determine clinical decision making for LUS. 87.9% were considered to be diagnostically useful and 39.2% changed management.

Conclusions: These data suggest that LUS was most often a diagnostically useful test and the results routinely changed management, but that the rates of LUS use remaining relatively low. This work also demonstrated high rates of documentation sufficient to evaluate clinical decision-making allowing for robust analysis of real-world clinical decision-making using LUS, which is an important gap in both the education and health services research literature. Using this research infrastructure, we plan for future work to focus on monitoring multiple implementation and health outcomes including equity of implementation as well as common cognitive errors seen within LUS to inform improvements in hospitalist training.

Primary Presenter: Stephen Smiley

Project Title: *Torsed Ectopic Intra-Abdominal Liver Rest within an Adolescent Female*

Primary Mentor: erica mandell

Thematic Area: Clinical Science

Abstract:

Extrahepatic liver (EL) rests are rare with a reported annual incidence of 0.24-0.47. While reports often note EL incidentally found on pathologic specimens of aberrant tissue, there has been a case report of hepatocellular carcinoma arising from one of these rests, highlighting the importance of surgical resection. EL has been reported to cause symptoms such as abdominal pain, intraperitoneal bleeding, and compression of adjacent organs. Most commonly, it has been identified in the gallbladder, likely due to proximity of the gallbladder to the native liver. The paucity of diagnostic tests makes the preoperative diagnosis challenging. We present a case of a 12-year-old female presenting with severe epigastric pain secondary to incapsulated EL tissue attached to the stomach via a narrow stalk. By describing this case, we hope to improve diagnosis and management of abdominal masses with unclear etiology.

Primary Presenter: Bektu Solomon

Project Title: *Establishing a Basis for Implementation of a Patient Centered Intervention for Improvement of Gestational Diabetes Follow-Up at University of Colorado Hospital*

Primary Mentor: Diane Christopher

Thematic Area: Public Health and Epidemiology

Abstract:

Individuals diagnosed with gestational diabetes in pregnancy are several times more likely to develop type 2 diabetes following delivery than those that did not have gestational diabetes. There is evidence of very poor compliance with the recommended postpartum glycemic testing at institutions across the United States and a variety of patient barriers have been identified. We performed a retrospective chart review and administered a patient survey to evaluate compliance and assess patient barriers at the University of Colorado. We found that the rate of postpartum glycemic testing was extremely poor at 20% and patients were not receiving information regarding long term risks associated with gestational diabetes or the recommendations for glycemic testing after pregnancy.

Primary Presenter: Daniel Soria Jimenez

Project Title: *SURGICAL MANAGEMENT OF SACROCOLPOPEXY MESH COMPLICATIONS*

Primary Mentor: Brian Flynn

Thematic Area: Clinical Science

Abstract:

BACKGROUND: Abdominal sacrocolpopexy (SC) with polypropylene mesh is a reliable and effective approach to treating pelvic organ prolapse. Risks of mesh complications range from 0% to 5%,1 including mesh erosion at 2.7%. Some complications can be managed conservatively with estrogen and antibiotics. Erosions and mesh perforations, however, require mesh removal. Experienced surgeons thus should perform this procedure to resolve any post- and intraoperative complications.

OBJECTIVES: To highlight our experience and demonstrate our technique for robotic-assisted laparoscopic (RAL) surgery for the treatment of complex mesh complications through a retrospective review of 15 cases of patients who underwent this procedure at our institution.

METHODS: Retrospective review from a single surgeon was conducted for 15 cases of RAL SC mesh removal at a tertiary surgical center between December 2013 and April 2019. Cases were included if SC mesh perforation was imminent or found to have perforated nearby structures. Results are presented as median (range) for continuous variables and n (%) for categorical variables.

Key segments of the procedure are demonstrated in photographs taken from the procedure€™s video: Patient 1, a 52-year-old woman with a history of SC for pelvic organ prolapse 3 years prior. SC mesh removal and repeat SC with cadaveric fascia are performed.

RESULTS: Fifteen cases were completed using RAL approach without the need for conversion to an open procedure. Median patient age was 51 years and median follow up was 1.4 years. Preoperative symptoms are shown in Table 1. The most common sites of mesh perforation involved the posterior bladder wall (40 %), vaginal apex (33 %), and sigmoid colon (6 %). Three patients had concomitant vesicovaginal fistulas. Operative details are found in Table 2. Repeat SC was performed using cadaveric fascia in 85% of cases. Three patients developed postoperative complications requiring additional surgery: a colovesical fistula, a vesicovaginal fistula, and a mesh exposure. At final follow up, 64% of patients were completely continent (0 pads per day). No patients developed pelvic organ prolapse postoperatively.

CONCLUSIONS: Mesh complications following abdominal SC are rare but can have devastating consequences. This article highlights an efficacious RAL technique in the removal of polypropylene mesh as well as our single institution experience and outcomes.

Primary Presenter: Hayley Specht

Project Title: *Helicopter Versus Ground Emergency Medical Services: A Scoping Review*

Primary Mentor: Mark Deutchman

Thematic Area: Public Health and Epidemiology

Abstract:

Objectives: Efforts to identify which patients benefit most from Helicopter Emergency Services (HEMS) activation can help guide clinical decisions around employing this costly and often risky resource. This scoping review seeks to identify trends in survival outcomes data comparing helicopter and ground emergency services (GEMS) transports directly from trauma scenes to definitive care, critically assess the quality of existing data, and generate questions for further directed study. Methods: Pubmed was the primary database used for this review. Database search was conducted by a matrix approach utilizing MeSH search terms as well as general keyword search criteria. Included studies were published in 2010 or later and directly compared survival in HEMS and GEMS trauma transports from scene. Studies were evaluated by 3 independent reviewers to ensure inclusion criteria were met. Results: Forty-one retrospective cohort studies were included for review. HEMS and GEMS survival outcomes were compared overall or based on patient physiologic criteria, injury type, injury severity, and patient age. HEMS activation was associated with improved survival overall in both nation-wide and single-institution studies. When comparing HEMS and GEMS survival based on type of injury, results were mixed with the exception of traumatic brain injury which benefited from HEMS activation across several studies. When patient characteristics were compared, those with unstable vital signs at the trauma scene appeared to benefit from HEMS activation. Patient age (pediatrics patients or those >55 years) was not consistently associated with mortality benefit. Conclusions: After controlling for injury severity and patient characteristics, HEMS is associated with improved survival in patients transported from trauma scenes. Several studies reported that patients with unstable vital signs on scene and those with traumatic brain injuries benefit most from HEMS activation. The quality of the existing evidence is poor, in large part due to methodological limitations and confounding variables that cannot be controlled for on a trauma scene. Further study is needed to elucidate specific factors that lead to the possible survival benefit of HEMS.

COI: All authors declare they have no conflicts of interest.

Primary Presenter: Breanna Stafford

Project Title: *How Mobile Health May Improve Addiction Treatment for Patients and Providers*

Primary Mentor: Steven Lowenstein

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

How Mobile Health Technology May Improve Addiction Treatment for Patients and Providers is a literature review exploring substance use disorder (SUD) in the context of mobile health (mHealth) apps. There is an immense cost tied to substance use disorders which has steadily increased over the last several years. While individuals seeking treatment may initially have success, the chronicity and relapsing nature of the disease adds to the expense and makes it particularly difficult to treat from a provider perspective. This prompted the need to look into creative methods of treatment that may give the necessary support to patients while alleviating the burden for healthcare workers and maintaining healthcare resources. As most people have access to smartphones with the advent of smartphone apps, the objective of our literature review was to investigate how smartphone apps can be a complement to the treatment of substance use disorder. We focused on barriers that exist in treatment of SUD, including both personal characteristics as well as structural barriers. We then looked into the current design of smartphone apps used for SUD treatment. Through our review, we found that smartphone apps have the potential to complement the treatment of SUD by giving continual support to patients and keeping them in treatment longer, ease the stress of administering treatment for providers, and decrease healthcare costs due to SUD. Through our search we also recognized that while there are benefits, there are also limitations to relying on smartphone apps such as the lack of benefit for individuals who do not have access to a smartphone or are not familiar with how to use one. In addition, there are very few evidence-based apps on the market, and for the ones that do exist, there are language barriers faced by minority populations. We also recognize that this is a new area of research and further work, such as performing qualitative interviews with individuals who have used these apps, needs to be done.

Primary Presenter: Jacob Steins

Project Title: *The Utility of Fertility Awareness Based Methods in Primary Care:*

A Narrative Literature Review

Primary Mentor: Thomas Jensen

Thematic Area: Public Health and Epidemiology

Abstract:

This narrative literature review aims to provide an overview of literature regarding different types of Fertility Awareness Based Methods (FABMs) and their effectiveness, the implementation of FABMs in medical education, and their utility as a uniquely natural form of family planning.

Primary Presenter: Sarah Stroup

Project Title: *A Review of Adolescent Contraceptive Counseling- Patient Autonomy or Provider LARC Bias?*

Primary Mentor: Janet Meredith

Thematic Area: Public Health and Epidemiology

Abstract:

Abstract

Though there have been significant reductions in the adolescent pregnancy rate in the United States in recent years, it is still the highest in the developed world and most of these pregnancies are considered unintended. Recent policy changes and removal of barriers to access have encouraged provider enthusiasm and advocacy for long-acting reversible contraception (LARC) use in their adolescent patient populations. However, as the unintended pregnancy rate stigmatizes a poorer and minority adolescent population at higher rates, more research is needed to understand these €œat-risk€□ adolescents€™ experiences and attitudes towards LARC and family planning counseling to ensure reproductive justice and autonomy is prioritized above promotion of the most effective method of contraception.

This review seeks to investigate available literature with a focus on but not limited to adolescents€™ and young adults€™ perspectives of LARC use and knowledge, experiences with provider bias, and general attitudes about reproductive counseling. Specifically, we hope to learn more about adolescents of color experiences with family planning counseling and if they feel their care was patient-driven.

A comprehensive literature search has been completed using the MeSH terms €œAdolescents€□, €œCoercion€□ €œLong Acting-Reversible Contraception€□, €œContraceptive Choice€□, €œChoice Behavior€□ €œRacial Bias€□, and €œAutonomy€□. The literature search identified common themes about this topic. One, that LARC was considered a first line recommendation for contraception use in adolescents and many reviews stressed that providers have potentially promoted LARCs above other methods and towards certain populations. Second, that given this country€™s dark history with reproductive injustices and violations of patient autonomy towards women of color, cultural consciousness and patient-centered language should be used when counseling these populations in family planning methods, especially in a vulnerable population like developing adolescents. Though much of the literature stated the possibility of these issues, there exists a gap in the literature when it comes to studying the adolescent opinions and experiences with contraceptive counseling.

Primary Presenter: Malcolm Su

Project Title: *Longitudinal Risk Management for Patients with Increased Risk for Breast cancer*

Primary Mentor: Sarah Tevis

Thematic Area: Clinical Science

Abstract:

Introduction

This study aims to characterize longitudinal care management and evaluate the relationship between various patient factors and the likelihood of choosing risk-reducing behaviors in women with increased risk of developing breast cancer.

Methods

A retrospective study was conducted to evaluate all adult female patients who had at least one clinic visit with a surgical provider for discussion of breast cancer risk assessment between January, 2017 to July, 2020 at an academic center. Patients with prior history of breast cancer were excluded. Patient details and strategies pursued at clinic visits were recorded. A time-to-event analysis was performed, and hazard ratios were determined to characterize associations between patient characteristics and time to pursuing risk-reducing care management.

Results

There were 283 participants with at least one follow-up visit and 48 (17.0%) ultimately changed their initial strategy to either chemoprevention or prophylactic mastectomy. Patients with gene mutations were 6 times more likely to engage in risk-reducing management compared to those without (hazard ratio (HR) 5.99, $P < 0.001$). Those with histories of high-risk proliferative changes (HR 7.62, $P < 0.001$) and hysterectomy (HR 2.99, $P = 0.019$) were also more likely to engage in risk-reducing management. Age, race, and increased predicted risk of developing breast cancer (estimated by various calculators) were not associated with increased likelihood of engaging in risk-reducing strategies.

Conclusion

Known gene mutations, history of high-risk proliferative changes, and prior hysterectomy were factors associated with women who were more likely to engage in risk-reducing strategies. These findings, when paired with patient reported outcome measures, may help guide shared decision-making

Primary Presenter: Sophia Sugar

Project Title: *Keep Your Pin Up: Students Combating Opioid Use Disorder Stigma with Lapel Pins*

Primary Mentor: Tyler Coyle

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Drug overdose death rates continue to rise €“ more Americans and Coloradans are dying of drug overdoses than ever before. Despite efforts to shift the narrative, our society continues to struggle to acknowledge substance use disorders as medical conditions worthy of medical care. Rural settings are no exception. In this piece, a University of Colorado medical student describes her experience working to fight stigma surrounding opioid use disorder in both lay and healthcare professional populations. By designing and employing the use of lapel pins, students are leading a grassroots campaign to combat opioid use disorder stigma among healthcare professionals at the outset of their careers. Using real experiences from a rural clinic, the authors explore barriers to addiction care, including how stigma can perpetuate sub-optimal care for treatable medical conditions.

Primary Presenter: Quy Tat

Project Title: *Preemptive Analgesic E ect of Intrathecal Applications of Neuroactive Steroids in a Rodent Model of Post-Surgical Pain: Evidence for the Role of T-Type Calcium Channels*

Primary Mentor: Vesna Jevtovic-Todorovic

Thematic Area: Basic Biomedical Science

Abstract:

Preemptive management of post-incisional pain remains challenging. Here, we examined the role of preemptive use of neuroactive steroids with activity on low-voltage activated T-type Ca2+ channels (T-channels) and y-aminobutyric acid A (GABAA) receptors in the development and maintenance of post-incisional pain. We use neuroactive steroids with distinct effects on GABAA receptors and/or T-channels: Alphaxalone (combined GABAergic agent and T-channel inhibitor), ECN (T-channel inhibitor), CDNC24 (GABAergic agent), and compared them with an established analgesic, morphine (an opioid agonist without known effect on either T-channels or GABAA receptors). Adult female rats sustained the skin and muscle incision on the plantar surface of the right paw. We injected the agents of choice intrathecally either before or after the development of post-incisional pain. The pain development was monitored by studying mechanical hypersensitivity. Alphaxalone and ECN, but not morphine, are effective in alleviating mechanical hyperalgesia when administered preemptively whereas morphine provides dose-dependent pain relief only when administered once the pain had developed. CDNC24 on the other hand did not offer any analgesic

benefit. Neuroactive steroids that inhibit T-currents€”Alphaxalone and ECN€”unlike morphine, are effective preemptive analgesics that may offer a promising therapeutic approach to the treatment of post-incisional pain, especially mechanical hypersensitivity.

Primary Presenter: Brooke Terkovich

Project Title: *Rural Community Attitudes and Perceptions on Opioid Overdose and Access to Naloxone*

Primary Mentor: Mark Deutchman

Thematic Area: Public Health and Epidemiology

Abstract:

Prior to COVID-19, Opioid Use Disorder (OUD) and opioid-related overdoses were a major public health concern. Naloxone is an opioid overdose reversal medication that has played a significant role in reducing opioid overdose deaths, however the availability of naloxone within the community has not increased to match overdose rates. This study aims to gain a better understanding of community attitudes towards naloxone access and willingness to use naloxone.

This study utilized a quantitative survey of laypersons within the rural community regarding their perceptions of the current opioid epidemic and their attitudes towards naloxone compared to individuals who identified as working within healthcare. A total of 17 individuals responded to the survey. 12 respondents identified as working in healthcare and 5 respondents identified as working within other fields. The results of Likert scale questions were analyzed using a Whitney Mann analysis. No statistical significance was found between respondents who identified as working in healthcare compared to other fields. Compared to healthcare workers, laypersons were somewhat less open to the idea of naloxone being available in community spaces and were less confident and willing to administer naloxone even with proper training. However, attitudes of laypersons in rural communities was generally positive regarding having naloxone available in local community spaces to be administered by individuals with training in case of an opioid overdose.

Primary Presenter: Michaela Thurston

Project Title: *A Comparison of the Learning Environment and Student Wellness in Longitudinal Integrated Clerkships and Traditional Block Rotations*

Primary Mentor: George Olsen

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Background: Medical students report elevated prevalence of stress, anxiety, and depression. Mental health worsens in medical school, especially during clerkships, suggesting that learning environment may negatively impact wellness. There is limited literature describing wellness and learning environment in Longitudinal Integrated Clerkships (LICs) compared to traditional block rotations (TBRs). This study aimed to determine if there are differences in wellbeing and learning environment between students in LIC and TBR curricula at a single medical school.

Methods: Students at the University of Colorado responded to surveys before and after clerkships (82 LIC, 71 TBR). Learning environment was evaluated through specific survey questions. The Dyrbye Medical Student Well-Being Index (MSWBI) was used to assess wellness. Results were compared using paired and independent t-tests, chi-square, and Fisher exact tests.

Results: There were significant differences in learning environment after clerkships. LIC students more often felt there were faculty they could confide in ($p<0.001$) and that faculty/administration gave personal help to students ($p<0.01$). LIC students also reported less intense competition for grades (Ï‡2 = 3.97, $p=0.046$). There was no difference in MSWBI score between LIC and TBR students before or after clerkships. While TBR students€™ MSWBI score significantly increased pre- to post-clerkship, indicating decreased wellness (0.53, $p<0.01$), the change for LIC students was not significant (0.37, $p=0.07$).

Conclusions: Students in LICs perceive greater support from faculty and administration, and experience tempering in the intensity of grading competition. Wellness overall is similar between TBR and LIC students, though students in the LIC model may experience less of the negative impacts well-described to occur during clerkships.

Primary Presenter: Lillian Toaspern

Project Title: *ADMINISTRATION OF ISAS IN SECOND TRIMESTER SURGICAL ABORTION PROCEDURES*

Primary Mentor: Jeanelle Sheeder

Thematic Area: Clinical Science

Abstract:

The measurement of patient satisfaction is an evolving concept in providing high-quality, patient-centered care. From August 2016 to March 2017, we performed a clinical trial to assess the behavior of the Iowa Satisfaction with Anesthesia Scale (ISAS) in measuring patient satisfaction with monitored anesthesia care (MAC) during early second trimester abortion, hypothesizing that the ISAS would adequately report patient pain while also providing novel satisfaction information. This hypothesis was the secondary endpoint in a multi-site, double-blinded, randomized, non-inferiority study that explored nitrous oxide as an alternative to IV sedation in early second trimester abortion. The ISAS is a self-administered measure of patient satisfaction with monitored anesthesia care. It was administered 30 minutes after surgical abortion procedure. Patients responded to eleven statements by placing a mark along a six-choice vertical response column (e.g., €œDisagree moderately€□) below each statement. Each answer score can range from -3 to +3, which correspond to €œdisagree very much€□ and €œagree very much€□, respectively. The mean of the total responses gives a single number, which is a quantitative measure of patient satisfaction with MAC. The Visual Analog Scale (VAS) was administered both pre-operatively and post-operatively according to standard-of-care guidelines. The pending results demonstrate that the ISAS adequately captures pain measurements as compared to the gold-standard VAS (r2 value: 0.681). The individual questions regarding patient satisfaction demonstrate that patients who experienced high levels of pain also reported a high level of satisfaction. This finding is contrary to the common belief that higher pain control results in higher patient satisfaction. This is novel information regarding patient satisfaction. The results suggest that the ISAS is a reliable tool to measure patient pain and satisfaction in gynecological procedures.

Primary Presenter: Wesley Tran

Project Title: *Retrospective Analysis of Bladder Perforation Risks in Patients after Augmentation Cystoplasty using an Extraperitoneal Approach*

Primary Mentor: Kyle Rove

Thematic Area: Clinical Science

Abstract:

Background: Initial management of pediatric patients with neurogenic bladder is focused on clean intermittent catheterization and medical therapies. Those with more hostile or small capacity bladders require surgical intervention including bladder augmentation that can result in significant clinical sequelae. This study examines a rarely described approach wherein the bladder reconstruction is extraperitonealized by bringing bowel segments through a peritoneal window and then closed.

Objective: The aim of this study was to determine if the rate of bladder rupture and subsequent morbidity differed between patients who have undergone an intraperitoneal versus extraperitoneal bladder augmentation. We hypothesized that an extraperitoneal approach reduced the risk of intraperitoneal bladder perforation, downstream Intensive Care Unit (ICU) admission, small bowel obstruction (SBO) requiring exploratory laparotomy, and ventriculoperitoneal (VP) shunt-related difficulties as compared to the standard intraperitoneal technique.

Methods: A retrospective chart review was conducted to assess surgical approach and outcomes in patients who underwent bladder augmentation performed between January 2009 and June 2021. Patients were identified through an existing database and manual chart review was conducted to extract data through imaging studies, operative notes, and clinical documentation. The primary outcome was bladder perforation. Secondary outcomes were ICU admission, exploratory laparotomy, and VP shunt externalization, infection, or revision for any cause. Nonparametric statistical analyses were performed.

Results: A total of 111 patients underwent bladder augmentation with 37 intraperitoneal and 74 extraperitoneal procedures. Median follow up was 5.8 years [IQR 3.0€“8.6 years] and did not vary between groups (p=0.67). Only one patient was found to have a bladder perforation in the intraperitoneal group (log-rank p=0.154). There were no significant differences in time to post-augmentation ICU admission, exploratory laparotomy, or VP shunt events between the two groups (log-rank p=0.294, log-rank p=0.832, and log-rank p=0.237, respectively). Furthermore, a Kaplan-Meier analysis assessing time to composite complication demonstrated no significant difference between the two techniques (log-rank p=0.236).

Discussion: This study provides important data comparing the rate of bladder perforation and subsequent morbidity between intraperitoneal and extraperitoneal bladder augmentation. As expected, with a complex procedure, both groups suffered complications, but these data showed no difference between the two procedures. Rates of prior (abdominal) surgery may influence the decision to perform this procedure extraperitoneal.

Conclusions: Outcomes related to bladder perforation and secondary consequences do not differ significantly between patients who had bladder augmentation performed with an intraperitoneal versus extraperitoneal approach. Given the low number of adverse events in this study, larger studies are warranted.

Primary Presenter: Richard Tran

Project Title: *Ascorbic acid attenuates hydrogen peroxide induced oxidative stress and osteoblasts demonstrate antioxidant recycling potential*

Primary Mentor: Jeffrey Olson

Thematic Area: Basic Biomedical Science

Abstract:

Purpose of Study

Oxidative stress is strongly implicated in disease progression of age-related macular degeneration. Oral supplements, including ascorbic acid (AA), target this oxidative etiology, yet efficacy is limited due to insufficient ocular distribution. One possible avenue is restoring the antioxidant potential of the vitreous by improving recycling of the inactive oxidized form of AA, dehydroascorbic acid (DHA), back to its active reduced form. Here, we demonstrate the antioxidant potential of AA to improve common retinal pigment epithelium (ARPE-19) cell viability in the setting of H2O2 induced oxidative stress and evaluate osteoblasts as a potential source of antioxidant recycling.

Methods Used

In vitro evaluation was performed by incubating ARPE-19 in culture media containing .2mM H2O2 with and without 100uM AA. MTT assay was performed to assess for cell viability. Osteoblast antioxidant recycling potential was tested by exposing MG-63 osteosarcoma cells to culture media containing100uM DHA. At each time point from 0 to 80 minutes, media was collected and concentrations of DHA and AA were assessed using HPLC. Statistical comparisons were performed using a student€™s t-test.

Summary of Results

AA successfully attenuated the toxic effects of H2O2, with 88% of ARPE-19 cells remaining viable after exposure to both H2O2and AA, compared to 61% viable after incubation with H2O2 alone ($P < .001$). Osteoblast antioxidant recycling of DHA was observed with an increase of AA concentration and a concomitant decrease in DHA levels over time. At 80 minutes, the concentration of AA had a 2-fold increase with a paired 2-fold decrease in DHA levels.

Conclusions

These experiments demonstrate the antioxidant potential of AAto attenuate the effects of oxidative stress and its physiologic importance in managing cellular exposure to reactive oxygen species. Osteoblasts exhibited the potential for antioxidant regeneration of AA outside their biological niche. While preliminary, these results demonstrate the promise of an implantable device that continuously recycles antioxidant, eliminating the need for constant injections.

Primary Presenter: Tara Trujillo

Project Title: *Testing multiple outcomes across mental health treatment options: an example using antidepressants*

Primary Mentor: Joel Stoddard

Thematic Area: Clinical Science

Abstract:

Mental health providers must balance the risks and benefits of treatment decisions by assessing prior evidence. It is now possible to compare the strength of evidence for multiple treatments and outcomes formally through PALM analysis, which stands for PAtient-centered treatment ranking via Large-scale Multivariate network meta-analysis. By way of example, consider a comparative analysis of both efficacy and acceptability of antidepressants following Cipriani et al. (2018). In the original analyses performed by Cipriani et al., the two outcomes were modeled separately; therefore, joint inference on a weighted function of both the treatment efficacy and the acceptability is not available. We applied PALM to the dataset of the antidepressant treatment network. The PALM analysis also allows for the visualization of treatment comparisons based on more than two outcomes where each treatment is presented by an origami star. This type of analysis also allows for the ability to look at relative safety and efficacy based on a joint consideration of multiple outcomes, and rank treatments through a personalized utility function relevant to a particular patient. This type of analysis will allow, for the first time, for personalized clinical decision-making when it comes to choosing mental health treatment.

Primary Presenter: John-Paul Tsai

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

Primary Mentor: Madiha Abdel-Maksoud

Thematic Area: Public Health and Epidemiology

Abstract:

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

Primary Presenter: Shilpa Tummala

Project Title: *The financial relationship between the medical industry and obstetrics and gynecology and urology residency leadership*

Primary Mentor: Tyler Muffly

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Objective: To examine the magnitude of industry payments to obstetrics and gynecology (OBGYN) and urology residency directors and department chairs between 2013 and 2020.

Methods: For this cross-sectional study, non-research payments between August 1, 2013, and December 31, 2020, from drug or device manufacturers to program directors and department chairs of OBGYN and urology residencies were compiled from the Centers for Medicare and Medicaid Services Open Payments Database. This data was cross-referenced with the Accreditation Council of Graduate Medical Education. Department chairs were identified by internet search or direct program contact. Data was analyzed using nonparametric and multiple linear regression models.

Results: A total of 28,764 payments were accepted by 599 physicians, summing $8,467,051. Urologists averaged more payments and higher amounts per engagement than OBGYNs ($p<0.01$ for both). Similarly, department chairs received a higher number of payments and greater compensation per engagement than program directors ($p<0.01$ for both). California accounted for the highest sum amongst the states at $1,676,221. Male gender, regardless of specialty, was another significant variable for higher average payment compared to female counterparts ($p<0.01$). The association between non- research payments and department chairs remained significant after adjusting for covariates (unstandardized $Î²=171.5$; 95% CI 63, 279; $p<0.01$).

Conclusion: Four variables were predictive of the magnitude of industry payments received: male gender, department chair, urology, and practicing in California. Non- research payments to leadership positions in OBGYN and urology residency programs can impact trainees and should be disclosed.

Primary Presenter: Caroline Vance

Project Title: *Evidence-Based Business Plan for Expansion of the CU Street Medicine Team*

Primary Mentor: Scott Harpin

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

EVIDENCE-BASED BUSINESS PLAN FOR EXPANSION OF THE CU STREET MEDICINE TEAM. CE Vance, (BS, SOM), SB Harpin, Department of Community & Behavioral Health, University of Colorado College of Nursing, Aurora, CO.

Purpose: On any given night in the Denver Metro area, approximately 6,900 individuals experience homelessness. This population experiences a high burden of communicable and chronic disease, along with unique challenges in accessing necessary health care for preventative and acute needs. While health care services designed specifically for persons experiencing homelessness (PEH) do exist in the Denver Metro area, individuals staying outside of Downtown Denver or rough sleeping do not have readily available access to care. CU Street Medicine was formed to provide an innovative solution for this gap in care in the communities surrounding our institution. This project builds an evidence-based plan for expansion of the team.

Methods: Available literature on Street Medicine, disease burden in PEH, health care access/costs for PEH, and PEH-centered health professional student education was queried on PubMed. Street Medicine Institute best practices guidelines and data from the Denver Point in Time Survey were reviewed. Structured interviews were conducted with leaders of the University of Southern California Street Medicine and University of Pittsburgh Medical Center Street Medicine teams. Expert opinion for business plan structure was provided by faculty mentor Dr. Scott Harpin.

Results: Evidence-driven expansion recommendations were divided into following frameworks: administrative structure; staffing, volunteers, and daily operations; educational sites; community partnerships; and data management and program evaluation. Recommendations include CU Street Medicine remaining a campus group working in partnership with independent 501(c)(3) YHC Free Clinic for clinical operations. Additionally primary recommendations include emphasis on student and clinician volunteer recruitment and retention, employment of a Street Medicine nurse, improved data management, and increased emphasis on programmatic evaluation.

Conclusions: A significant need for innovative approaches to health care for PEH exists in the Denver community, particularly in the neighborhoods surrounding the University of Colorado

Anschutz Medical Campus. CU Street Medicine has established the programmatic structure, community partnerships, and framework for expansion necessary to become a sustainable source of care for PEH in this community.

Primary Presenter: Ivana Vasic

Project Title: *Efficacy of Short Course Cognitive Behavioral Therapy on Stress Reduction Among First Year Surgical Residents*

Primary Mentor: Kshama Jaiswal

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Introduction: Burnout among surgical residents ranges from emotional exhaustion to severe mood disturbance. Burnout is seen as early as intern year and has profound effect on work performance and interpersonal relationships. Mitigation of burnout requires both individual and institutional interventions. Cognitive Behavioral Therapy (CBT) is an individual-level intervention used in treating patients with depression and anxiety. In this study, we have examined the novel application of CBT as a skill-based therapeutic intervention to increase mental wellness and fortitude. We hypothesized that interns who participated in CBT would have lower burnout, stress, anxiety, and depression and higher flourishing ratios than those that did not.

Methods: 25 surgical interns were randomly assigned to three sequential CBT sessions either early, during the first semester of internship, or late, during the second semester of internship. All study participants completed a baseline survey and attended at least one CBT session. The baseline scores for burnout, anxiety, depression, and stress were obtained using The Maslach Burnout Inventory (MBI), GAD-7, PHQ-9, and Perceived stress scale (PSS), respectively. Emotions were assessed using PANAS scale (POS-positive; NEG-negative). Flourishing positivity index, a ratio between positive and negative emotions, was used to evaluate participants feelings and functioning in the areas of life that matter to them (ratio > 2.9 flourishing; 1-2.9 languishing; <1 perishing).

Independent variables were compared by the Fisher Exact Test, Wilcoxon Rank-Sum Test, and t-test. Statistical significance was set at $p<0.05$.

Results: Ethnic minorities were significantly more likely to present with high stress (PSS >17) than their white non-Latinx counterparts upon baseline ($p=0.03$). The late group showed a significant downward trend in MBI score ($p=0.03$). PANAS-POS trended downward for early group ($p=0.03$). Both groups showed significant reduction in their PHQ-9 score over time: mean difference -3.51 ($p=0.03$) for early group and -3.36 ($p=0.01$) for late group. GAD score did not significantly decrease in either group. Flourishing ratio did not significantly change in either group, with most residents remaining in the languishing category.

Conclusion: In this study, short course CBT was associated with changes in wellness surveys. Further studies may focus on the operationalization of therapy in this unique cohort.

Primary Presenter: Frances Vernon

Project Title: *Income Inequality Is Associated With Low Cumulative Antiretroviral Adherence in Persons With Human Immunodeficiency Virus*

Primary Mentor: Jose Castillo-Mancilla

Thematic Area: Public Health and Epidemiology

Abstract:

Income Inequality Is Associated With Low Cumulative Antiretroviral Adherence in Persons With Human Immunodeficiency Virus

Frances Vernon, Mary Morrow, Samantha MaWhinney, Ryan Coyle, Stacey Coleman, Lucas Ellison, Jia-Hua Zheng, Lane Bushman, Jennifer Kiser, Omar GalÃ¡rraga*, Peter Anderson, Jose Castillo-Mancilla

University of Colorado Anschutz Medical Campus, Aurora, CO.

*Brown University, School of Public Health, Providence, RI.

Background: Tenofovir diphosphate (TFV-DP) in dried blood spots (DBS) is associated with viral suppression and predicts future viremia. However, its association with the social determinants of health (SDoH) in people living with HIV (PLWH) has not been evaluated.

Methods: DBS for TFV-DP were prospectively collected from a clinical cohort of PLWH receiving tenofovir disoproxil fumarate (TDF)-based therapy (up to 3 visits over 48-weeks between 2014 and 2017). Zip code was collected at enrollment and matched with the relevant SDoH data from 2016 obtained from AIDSVu (aidsvu.org). SDoH data included household income, percent living in poverty, education level and income inequality (the latter was quantified using the Gini coefficient, where 0 and 1 represent absolute income equality and inequality, respectively). Log-transformed TFV-DP concentrations were analyzed using a mixed-effects model. Baseline statistics are presented as median (interquartile range). Model results are percent change [95% confidence interval] in TFV-DP for every significant change in the SDoH. All results are reported with no adjustment for multiple comparisons.

Results: A total of 950 person-visits from 430 participants were analyzed, encompassing zip codes within the following Colorado counties: Denver, Arapahoe, Jefferson, Adams and Douglas. Baseline household income, Gini and TFV-DP concentration were $56,227 ($46,763, $70,369), 0.418 (0.391, 0.487) and 1721 (1181, 2441) fmol/punch, respectively. After adjusting for age, sex, race, estimated glomerular filtration rate, body mass index, hematocrit, CD4+ T-cell count, antiretroviral drug class and 3-month self-reported adherence, Gini was inversely associated with TFV-DP in DBS. For every 0.1 increase in Gini, TFV-DP concentration

decreased by 9.2% [0.5, 17.1%; P=0.039]. Gini remained significant after adjusting for HIV viral suppression with the same 0.1 increase estimating a decrease of 8.7% [0.3 17.9%; P=0.042] in TFV-DP concentrations. No statistically significant associations were identified between TFV-DP concentration and the other SDoH (Table).

Conclusions: Greater income inequality was associated with lower TFV-DP concentrations in PLWH on TDF, suggesting that adherence may be influenced by population level characteristics that exist in the presence of income inequality and impact individual level health outcomes. Future studies on the utility of this adherence biomarker to improve clinical care and adherence in marginalized PLWH are needed.

Primary Presenter: Vall Vinaithirthan

Project Title: *Hepatitis C Viremia Among Patients Presenting to an Urban Emergency Department in 2019 - 2021*

Primary Mentor: Sarah Rowan

Thematic Area: Public Health and Epidemiology

Abstract:

Primary Presenter: Kristen Vossler

Project Title: *Postoperative Outcomes After Staged vs. Coordinated Mastectomy and Bilateral Salpingo-oophorectomy*

Primary Mentor: Sarah Tevis

Thematic Area: Clinical Science

Abstract:

Background/Objective: Individuals with high-risk gene mutations for breast and ovarian cancer or a breast cancer diagnosis are often given the option to undergo prophylactic bilateral salpingo-oophorectomy (BSO) in addition to mastectomy. The objective of this study was to compare postoperative complication rates as well as total healthcare costs between patients who underwent coordinated versus staged breast surgery and BSO.

Methods: Billing data from the MarketScan® database were used to identify adult female patients who underwent both mastectomy and BSO between 2010 and 2015 in the United States. Patients were placed in the coordinated group if a breast operation and BSO were performed simultaneously and were placed in the staged group if both operations were performed separately. The primary outcomes were (1) incidence of postoperative complications within 90 days of each operation and (2) aggregate healthcare charges over the 2-year period from the date of the first surgery. Univariate analyses by chi-squared and Wilcoxon Rank-Sum tests were performed along with multivariable logistic and negative binomial regressions to adjust for risk.

Results: A total of 2,736 patients in the database underwent both mastectomy and BSO in the study period, 400 (14.6%) in the coordinated group and 2336 (85.4%) in the staged group. Incidence of postoperative complications was higher in the staged group (27.2% vs. 22.3%; p=0.04). Risk-adjusted odds of postoperative complications were higher in the staged group (OR 1.35 [95% CI 1.04-1.76; p=0.02]). Median healthcare charges over 2 years were higher in the staged group ($109,055 vs. $92,003; p<0.01). After risk-adjustment, charges remained higher in the staged group (Beta=0.14; 95% CI 0.05-0.23; p<0.01).

Conclusions: Coordinating breast surgery with BSO is both safe and cost-effective when compared to performing these operations separately.

Primary Presenter: Megan Wade

Project Title: *A Qualitative Study of Postpartum Contraception Decision Making Among Adolescents*

Primary Mentor: Hana Smith

Thematic Area: Clinical Science

Abstract:

Background

Adolescent mothers are more likely to experience short-interval repeat pregnancies than their non-adolescent counterparts, placing them at risk for both pregnancy-related morbidity and adverse socioeconomic outcomes. A previous study in our dyadic adolescent-mother baby medical home showed an association between long-acting contraception (LARC) use and decreased repeat pregnancy, but the reasons that adolescent mothers choose their subsequent contraceptive methods is not well elucidated.

Objective

The purpose of this study is to better understand postpartum contraceptive choice decision-making for adolescent mothers and how this may vary by demographic factors.

Design/Methods

In order to gather broad information on contraceptive decision making, we conducted qualitative phone interviews with twenty-one adolescent mothers after their child€™s 6 month well child visit (WCV) at the Young Mother€™s Clinic (YMC). The data that was collected in these interviews was then analyzed using rapid qualitative analysis. The results of this analysis were used to create a discrete list of reasons for contraceptive choice or refusal. This list will then be used to gather a larger set of data from all adolescent mothers presenting to their child€™s 6 month WCV. This larger data set will be analyzed with the goal of improving understanding of postpartum adolescent contraception decision making, and determine any variance based on race/ethnicity.

Results

Twenty-one patient interviews were completed. Each interview was independently coded by two reviewers. All interview transcripts were used to create a matrix outlining common themes related to contraceptive choice. Nearly all participants cited an inability to remember to take a daily pill as the reason they did not choose OCPs as their birth control method. Those who did not choose an IUD or implant cited invasiveness as reason for refusal. Participants chose methods other than Depo because they felt that frequent appointments were inconvenient. Conversely, participants who chose the IUD/Implant cited its efficacy, convenience, and menses suppression as reasons for their decision. Those who chose Depo favored its ease of use and menses suppression as well. These themes and concepts will serve as the basis for our discrete reasoning surveys moving forward.

Conclusions

The data provided by this study highlights factors that influence adolescent mothers€™ contraception decisions. This insight can be used to inform patient-centered contraception counseling specific to this population.

Primary Presenter: Amber Walters

Project Title: *Motherhood and Medicine*

Primary Mentor: Therese Jones

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Female physicians have a long history of overcoming unique barriers in their quest to a profession. Gender discrimination, one such barrier, is manifested in pay gaps, glass ceilings, lack of mentors, and outright sexism in the workplace 1,2. These factors, gratefully, are receiving more attention in the form of research, publicity, and institutional adjustments. However, despite our best efforts, female physicians are still dropping out of medicine at significantly higher rates than men and reporting unique concerns regarding home-life/work-life conflict3 including maternity-based discrimination4-6. Interestingly, this barrier has been relatively under-investigated with the majority of our information coming from impersonal survey statistics7. This project takes a humanities approach to exploring the unique struggles and experiences of female physicians who also identify as mothers. Interviews were obtained from a variety of physician mothers and incorporated into a narrative€”narrative medicine being an increasingly popular method of research and a way to share compelling stories. Ultimately, this narrative not only explores intimate details from the lives and careers of physician mothers, it also brings to light how, despite the inequities, physician mothers are essential contributors to compassionate, innovative and humanistic medicine.

Primary Presenter: Mary Wang

Project Title: *Upstanding and Interrupting Biases: Understanding the Impact of Different Curriculum Delivery Models*

Primary Mentor: Anna Neumeier

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Introduction: Within clinical learning environments, medical students are uniquely faced with power differentials that make acts of racism, discrimination, and microaggressions (RDM) challenging to address. Experiences of microaggressions and mistreatment are correlated with higher rates of positive depression screening and lower satisfaction with medical training. This current study expands upon this curriculum and examines its efficacy among two different medical student class cohorts. It also compares outcomes of two different modes of curriculum delivery €“ virtual vs in-person. We additionally examine if there are differences in the educational impact of the curriculum between students within the same cohort who self-identified as under-represented in medicine (URM) compared to those who do not identify as URM.

Methods: A case-based curriculum was previously developed to practice communication responses to address RDM using an adapted 6Ds approach as described in our previous work. Cases were collected through volunteer submission and revised to maintain anonymity. Faculty and senior medical students cofacilitated the small-group sessions. During the sessions, students reviewed the communication framework, explored their natural response strategies, and practiced all response strategies.

Results: Cohort B (in-person) showed a significant difference in incoming knowledge about different strategies to deal with RDMs aimed at other members of the medical team (3.26 vs 3.56, $p < 0.05$) and aimed at myself ($p < 0.01$) compared to cohort A (virtual). There were no significant differences in post-session outcomes between cohorts. Among those who completed both pre- and post-session surveys in cohort A,

Discussion: Although cohorts differed in baseline levels of knowledge of strategies to deal with RDMs before the session, both cohorts had similar outcomes after the session. There was not difference in outcomes regardless of delivery method. Students reported feeling empowered and gaining valuable skills from this session.

Primary Presenter: Gregory Watson

Project Title: *Postoperative Opioid Use Following Elective Endonasal Skull Base Surgery: A Retrospective Analysis*

Primary Mentor: Anne Getz

Thematic Area: Clinical Science

Abstract:

Abstract:

Background: Following Endonasal Skull Base Surgery (ESBS), clear postoperative analgesic protocols do not exist. We sought to define opioid prescription patterns at our tertiary institution and identify demographic factors, comorbidities, and surgical complications associated with increased opioid prescribing patterns following ESBS.

Methods: A retrospective review of 500 patients who underwent ESBS between October 2015 and November 2020 was conducted. Demographics, comorbidities, and intraoperative complications were analyzed. Oral Morphine Milligram Equivalents (MMEs) and postoperative opioid refill rates were calculated from Electronic Medical Record data. Odds Ratio and Chi-Squared analyses were performed to identify patient characteristics associated with increased postoperative opioid prescription rates.

Results: Data from 500 patients was analyzed. Current smoking status demonstrated the greatest risk for refilling an opioid prescription (OR 2.18, 95% CI 1.08-4.42). Mood disorders (OR 1.99, 95% CI 1.01-3.89), chronic headache or migraine (OR 1.67, 95% CI 1.05-2.69), and intraoperative CSF leak (OR 1.93, 95% 1.22-3.05) were also associated with increased risk for opioid prescription refill, while age was inversely correlated. No significant association was found with sex, surgical approach, pathology, history of chronic pain, or Cushing€™ disease.

Conclusion: Smoking status, intraoperative CSF leak, age less than 50, history of mood disorders, and chronic headache or migraine were all associated with increased rates of opioid prescription refills in patients undergoing ESBS. Understanding these patient factors may help inform patient counseling on postoperative pain expectations and improve analgesic protocols to reduce opioid diversion and misuse.

Primary Presenter: Rachael Weesner

Project Title: *A Novel Vertebral Numbering System Using EOS Imaging*

Primary Mentor: Christopher Kleck

Thematic Area: Clinical Science

Abstract:

Background

Disagreement exists on how to best report anomalous vertebra and which imaging modality is most consistent, creating discrepancies between radiologists and surgeons. Errors in vertebral numbering can have devastating implications for patients. With no consensus on a vertebral counting method that accounts for transitional anatomy of the spine, a simple and accurate vertebral numbering system that can be applied to routine imaging is needed.

Questions/Purposes

* How common are congenital rib and vertebral anomalies and in what patterns do they most often occur in EOS (Alphatec Holdings, Inc, Carlsbad, CA, USA) full-length spine imaging?

* What vertebral counting method best accounts for transitional anatomy of the spine and can provide the lowest error when utilizing limited imaging of the spine?

Methods

A retrospective study analyzing full-length spine x-rays in 3147 patients was performed at the University of Colorado with the aim of describing a novel and more simplified vertebral numbering system. The number of pre-sacral mobile segments were identified and recorded along with number of ribs, congenital fusions, and other anomalous findings. Results were reviewed by a committee of musculoskeletal radiologists, neurosurgeons, and orthopedic spine surgeons and verified by interobserver analysis.

Results

91.1% (2868/3147) demonstrated the conventional 24 pre-sacral mobile segments. Transitional anatomy, as defined by identifying fewer or more than 24 pre-sacral segments, was noted in 8.8% (279) of patients. Within our cohort, 5.5% (174) had 25 pre-sacral mobile segments, 3.3% (104) had 23, and 0.03% (1) had 26. The majority (94.6%; 2976) had 12 ribs (including hypoplastic ribs), 4.5% (143) had 11 ribs, 0.88% (28) had 13 ribs. Presence of both transitional anatomy and abnormal number of ribs was least prevalent, 1.8% (56). Considering the first non-ribbed vertebrae as the first lumbar vertebrae yielded the lowest probability of a numbering error.

Conclusion

Our data suggests there is a lower prevalence of ribbed vertebral body anatomic variations as compared to the prevalence of transitional lumbosacral anatomy. Given this, our institution has

adopted a numbering system counting in a cranial to caudal direction, with the first ribbed vertebra labeled as thoracic (T1) and the first non-ribbed vertebra in the lumbar spine labeled as lumbar (L1). This method will improve consistency between radiologists and surgeons and decrease the risk of wrong level surgery in the setting of transitional anatomy.

Level of Evidence

IV

Primary Presenter: Derek Wengryn

Project Title: *Association of a Video Patient Decision Aid with Shared Decision-Making in Undescended Testicle Consults: A Randomized Control Study*

Primary Mentor: Vijaya Vemulakonda

Thematic Area: Clinical Science

Abstract:

Introduction: Undescended testicle (UDT) is one of the most common pediatric urologic problems, however, is often a source of confusion for parents when deciding when to treat, when to observe, and when nothing needs to be done. Shared decision-making (SDM) has been identified as a key component to improving patient care and outcomes. While patient decision aids have been shown to improve SDM, their use in pediatric urology has not been well-studied. This study measures parents€™ perceptions about the SDM process and evaluates whether an educational video can improve the SDM process in the setting of initial consultation for UDT.

Study Design: Randomized control study of patients aged 0-18 years old and their parents presenting to the urology clinic at a single institution with a referral diagnosis of UDT. Parental perception of SDM during the visit was measured through the shared decision-making questionnaire (SDMQ9). Mean SDMQ9 scores were examined between the intervention group in which parents viewed an educational video on UDT prior to consultation with the urology provider and a control group in which parents received standard care.

Results: 258 patients presenting between February 2019 and April 2022 were included in the study; 144 were randomly assigned to the control group and 114 were assigned to the intervention group. Mean scores on the SDMQ9 were not statistically different between the intervention and control groups (91.9 vs 85.6, p=0.077). Responses were significantly improved in one individual question: €œMy doctor and I thoroughly weighed the different treatment options€ (p=0.041).

Conclusion: In parents of children referred for UDT, use of an educational video prior to discussions with a provider did not increase overall perception of the shared decision-making process, but did improve perception in a single aspect of the process. Our findings suggest that decision aids, such as educational videos, can aid in improving the SDM process in this setting, although further research is needed to optimize these interventions.

Primary Presenter: Dana Yabroudi

Project Title: *EFFECT OF ONE MONTH EXPOSURE TO COMPONENTS OF THE REPROMETABOLIC SYNDROME ON PHYSICAL ACTIVITY AND BODY COMPOSITION IN LEAN WOMEN*

Primary Mentor: Nanette Santoro

Thematic Area: Clinical Science

Abstract:

Abstract:

Background: Subfertility in obese women is associated with chronic pituitary suppression, reduced sensitivity to GnRH and decreased sex steroid production. We have found evidence for a combined effect of hyperinsulinemia and high circulating fatty acids to acutely (4h infusion) suppress pituitary gonadotropin secretion and are currently investigating the effects of one-month exposure to a eucaloric high-fat diet (HFD) on gonadotropin levels in lean women. The aim of this study is to examine the effect of the one-month HFD on physical activity and body composition.

Methods: 18 normal weight (BMI < 25 kg/m2), normally cycling female participants of reproductive age were given a one-month eucaloric HFD, from the onset of menses in one cycle through the next, with 48% calories from fat. A Fitbit was provided to monitor changes in daily activity and sleep throughout the study. Measurement of gonadotropin pulsatility and reproductive hormones were done using frequent blood sampling and daily urine excretion, respectively. These measurements were obtained for a total of 4 menstrual cycles: 1 pre-diet cycle, the HFD cycle, and 2 post-diet cycles. DEXA body composition was measured at baseline and at the end of the 2nd post diet cycle. Pre and post diet comparisons were done using linear mixed model testing and reported as estimated means ± standard error.

Results: Mean number of daily steps were (8,518 ± 2,891) pre diet, (8,681 ± 2,519) during the diet and (7,699 ± 3,474) post diet with a P value of 0.16. Daily active calories were ((1,982 ± 267) pre diet, (2,001 ± 244) during the diet and (1,919 ± 283) post diet with a P value of .09. Means in the HFD cycle did not differ from the pre-diet cycle. Daily sleeping minutes pre diet were pre diet were (420 ± 63), (425 ± 56) during the diet and (402 ± 62) post diet, with no statistical difference between the 3 time points at a P value of .08. WASO incidents pre diet were (2.56 ± 4.04), (2.07 ± 3.31) during the diet and (2.00± 3.53) post diet, with a P value of .02. This significance was attributed to participant variation where one participant had 18 WASO incidents as well as unsatisfactory data collection and specificity from the participants not wearing the fitbit at night as well as the low specificity of detection from the fitbit model that was used. BMI did not significantly differ between pre-diet (21.52 ± 1.90) and post-diet (21.52 ± 1.73) with a P value of 0.97. DEXA body composition measurements indicated a statistically significant decrease in total fat percentage, (31.3 ± 5.6) pre diet and (29.9 ± 5.6) post diet with a P value of <.01, which does not appear clinically significant as the difference of less than 1% falls within the anticipated measurement error of the method. Visceral fat volume (cm3) differed significantly between pre diet (308 ± 123) and post diet (287 ± 121) with a P value of .03. Total

fat mass showed a significant pre diet (18,486 ± 4,391), and post diet (17,710± 4,478) with a P value of <.01. Trunk fat also showed a significant difference between pre diet (7,569 ± 2,569), and post diet (7,122± 2,638) with a P value of <.01.

Conclusions: A one month HFD intervention does not significantly change daily steps, calories burned or sleeping minutes in healthy normal weight women of childbearing age. Our study does show a change in wake after sleep onset incidences although more data collection is needed with higher specificity of detection in better sleep tracking models. If accurate, this significance is thought to be attributed to the timing of food ingestion as well as the types of fat consumed (mono vs polyunsaturated fats) although further studies are needed to draw an association. Our study showed an interesting significant decrease in in total percent fat, total fat mass, visceral fat volume as we as trunk fat with no changes in BMI. This was thought to be due to fat redistribution as well as other external factors including the timing of the intervention. Several previous studies have shown an association between increased fat intake and a decrease in body fat composition although our study aims to focus on the results of this body re-composition on reprometabolic hormones and its effects on fertility. Our study shows that a one month HFD intervention might have an effect on sleep/wake cycles with a decrease in body fat composition. Longer intervention time is needed to make a correlation between these fat intake and body fat percentage and long term consequences on reproductive hormones is to be elucidated in future studies.

Primary Presenter: Madeleine Yemc

Project Title: *Hydroxychloroquine and the Risk of Sudden Cardiac Death*

Primary Mentor: Elizabeth Wallace

Thematic Area: Clinical Science

Abstract:

Hydroxychloroquine and the Risk of Sudden Cardiac Death

Background and Objectives:

Hydroxychloroquine is an antimalarial drug that is widely utilized in dermatology to treat autoimmune disorders and connective tissue diseases. With the experimental trial and failure of hydroxychloroquine as a treatment for patients with COVID-19, many concerns have emerged regarding the medication€™s negative impact on cardiac function including its known ability to induce QT interval prolongation. The aim of this retrospective cohort study is to investigate whether there is a meaningful association between hydroxychloroquine and sudden cardiac death when the medication is used to treat dermatologic conditions.

Methods:

The data for this study was collected from UCHealth Department of Dermatology electronic medical records from January 1, 2000 to January 21, 2021 with assistance from Health Data Compass. The primary study population consisted of all UCHealth patients from January 1, 2000 until January 21, 2021 with a diagnosis of lichen planopilaris (LPP), granuloma annulare (GA), or frontal fibrosing alopecia (FFA) who were prescribed hydroxychloroquine by a dermatologist at a UCHealth outpatient dermatology clinic and meet the inclusion criteria. These individuals will be matched to a control population of individuals meeting the same inclusion criteria, but who were prescribed topical and/or systemic therapies excluding hydroxychloroquine by a dermatologist. We will perform a retrospective cohort analysis comparing the relative

risk of sudden cardiac death among individuals taking hydroxychloroquine to that of a matched control population of non-hydroxychloroquine user. We will stratify the relative risk according to hydroxychloroquine dosage if there is sufficient data.

Results:

We are currently in the processing of collecting our control group data with the assistance of Health Data Compass, thus data analysis has not begun, and the results of this study are still pending.

Conclusions:

The results of this study will help elucidate the relationship, if any, between hydroxychloroquine and sudden cardiac death, when used to treat dermatologic conditions. These findings may help guide future dermatology practices surrounding cardiac disease screening and/or monitoring for persons taking hydroxychloroquine.

Primary Presenter: Stephanie Yu

Project Title: *Current Gaps in Medical Education as Illustrated by the COVID-19 Pandemic: Interviews with Physicians Across Various Medical Specialties*

Primary Mentor: Aimee Pugh-Bernard

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

ABSTRACT

Introduction:

The COVID-19 pandemic brought unprecedented uncertainty and drastic changes that illuminated some of the existing flaws in our healthcare system. We sought to explore these challenges as opportunities to guide transformational improvements in medical education curriculum.

Methods:

Physicians across Colorado from various medical specialties were interviewed regarding the impact of the pandemic. Audio files of the interviews were transcribed, analyzed, and tallied according to a list of systematically established themes. The final data was reviewed to identify common themes that represented opportunities to create a positive transformation to medical education.

Results:

Thirty-one physicians across 20 different medical specialties and sub-specialties were interviewed within the month of April 2020. Analysis of the interviews identified several common themes including significant mental health impact, a lack of data to drive clinical decisions, challenges in communication with patients and families, and a disproportionate impact of the pandemic on underserved communities. A follow-up survey of proposed innovative medical education solutions was administered in January 2022 with most respondents agreeing with the proposed solutions. These included ways to encourage more critical thinking and to incorporate more formal education on public health policy and economics.

Conclusions:

The identified themes are universal in the field of medicine and highlight gaps in our healthcare system that were already present but not readily apparent. We believe that the best way to effect change is to incorporate these topics into medical education to help future physicians be able to make complex decisions, lead in the face of uncertainty, be adept at various modes of patient communication, and be well-versed in public health topics to address inequity in medicine.

Primary Presenter: Caterina Zagona-Prizio

Project Title: *Cadaveric emergency cricothyrotomy training for non-surgeons using a bronchoscopy-enhanced curriculum*

Primary Mentor: James Maloney

Thematic Area: Bioethics, Humanities, Arts, and Education

Abstract:

Abstract

Background: Emergency cricothyrotomy training for non-surgeons is important as rare €œcannot intubate or oxygenate events€ may occur multiple times in a provider€™s career when surgical expertise is not immediately available. However, such training is highly variable and often infrequent, therefore, enhancing these experiences is important.

Research Question: Is bronchoscopy-enhanced cricothyrotomy training in cadavers feasible, and what are the potential benefits provided by this innovation for trainees?

Methods: This study was performed after implementing a program to train non-surgeon providers on cadaveric donors. Standard training with an instructional video and live coaching was enhanced by bronchoscopic visualization of the trachea allowing participants to review their technique after performing scalpel and Seldinger-technique procedures, and to review their colleagues€™ technique on live video. Feasibility was measured through assessing helpfulness for trainees, cost, setup time, quality of images, and operator needs. Footage from the bronchoscopy recordings was analyzed to assess puncture-to-tube time and errors. Participants submitted pre- and post-session surveys assessing their levels of experience and gauging their confidence and anxiety with cricothyrotomies.

Results: The training program met feasibility criteria for low costs (<200 USD/donor), setup time (<30 minutes/donor), and operator needs (1/donor). Furthermore, all participants rated the cadaveric session as helpful. Participants demonstrated efficient technique, with a median puncture-to-tube time of 48.5 seconds. Bronchoscopy recordings from 24 analyzed videos revealed eight instances of sharp instruments puncturing the posterior tracheal wall (33% rate), and two instances of improper tube placement (8% rate). Sharp instruments reached potentially dangerous insertion depths beyond the midpoint of the anterior-posterior diameter of the trachea in 58.3% of videos. Bronchoscopic enhancement was rated as quite or extremely helpful for visualizing the trachea (83.3%) and to assess depth of instrumentation (91.7%). There was a significant average increase in confidence (64.4%, $P<0.001$) and average decrease in performance anxiety (-11.6%, $P=0.0328$) after the session.

Interpretation: Supplementing cadaveric emergent cricothyrotomy training programs with tracheal bronchoscopy is feasible, helpful to trainees, and meets prior documented times for efficient technique. Furthermore, it was successful in detecting technical errors that would have been missed in a standard training program. Bronchoscopic enhancement is a valuable addition to cricothyrotomy cadaveric training programs and may help avoid real-life complications.