

UNIVERSITY OF COLORADO  
DENVER  
ANSCHUTZ MEDICAL CAMPUS

ANNUAL STUDENT MSA CAPSTONE PRESENTATIONS

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UNIVERSITY OF COLORADO DENVER  
ANSCHUTZ MEDICAL CAMPUS  
MSA CAPSTONE PRESENTATIONS

Thursday, March 3, 2016

**Poster Sessions**

Session A: 1:00 pm – 2:00 pm

Session B: 2:15 pm – 3:15 pm

Session C: 3:30 pm – 4:30 pm

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

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

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**Poster Session Judges**

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

Muhammad Aftab, MD, MBBS

Rebecca Allyn, MD

Mel Anderson, MD

Marsha Anderson, MD

Tyler Anstett, DO

Andrew Bradford, Ph.D.

Kimberley Bruce, Ph.D.

Joseph Brzezinski, Ph.D.

Colleen Dingmann, R.N, Ph.D.

Michele Doucette, Ph.D.

Tom Finger, Ph.D.

Jonathan Flug, MD/MBA

Maria Frank, MD

Jeffrey Galinkin, MD

Jackie Glover, Ph.D.

Maria Gove, MD

Adam Green, MD

Barbara Helfrich, MSc

Bethany Kwan, Ph.D., MSPH

Leana MayDO, MPH

Jose Mayordomo, Ph.D.

Brian Moore, MD

Niklaus Mueller, Ph.D.

Sopheap Na, MD

Allison Nitsch, MD

Tatiana Oliveira, MD

David Orlicky, Ph.D.

Linda Overholser, MD, MPH

Megan Petrik, Ph.D.

Todd Pitts, Ph.D.

Sridharan Raghavan, MD, Ph.D.

Nayanjot Rai, MPH

Mona Rizeq, MBChB

Randy Ross, MD

Isabel Schlaepfer, Ph.D.

Hilary Serracino, MD

Deb Seymour, PsyD

Yvonne Skoretz, Ed.D.

Amy Starosta, Ph.D.

John Tentler, Ph.D.

Tamara Terzian, Ph.D.

Linda van Dyk, Ph.D.

Catherine Velopulos, MD, MHS

Zhiying You, MD, Ph.D.

Rui Zhao, Ph.D.

Hongjin Zheng, Ph.D.

**Primary Presenter: Gilbert Acevedo**

**Project Title:** *Novel Small Molecule Inhibitors of the Gas6/TAM Signaling Pathway Inhibit Platelet Aggregation in vitro and Protect Mice from Arterial and Venous Thrombosis in vivo*

**Abstract:**

Background: Growth Arrest Specific gene 6 (Gas6) is a ligand for the Tyro3/Axl/Mer (TAM) family of receptor tyrosine kinases found on the surface of platelets. Previous studies have shown that stimulation of these receptors results in amplification of platelet activation and thrombus stabilization via activation of phosphatidylinositol-3-kinase (PI3K) and Akt, leading to phosphorylation of the  $\alpha$ IIb $\beta$ 3 integrin. Previous work (from our lab and others) demonstrated that inhibition of the Gas6/TAM pathway results in impaired platelet aggregation, reduced aggregate stability, and decreased platelet spreading. Additionally, knockout mice deficient in the receptor or ligand are protected from venous and arterial thrombosis, but retain normal tail bleeding times. Here, we describe development and characterization of novel Mer-selective small molecule inhibitors (SMIs) for thrombosis applications.

Objectives: To determine if Mer-selective SMIs can inhibit platelet aggregation and protect mice from thrombosis, using in vitro and in vivo models

Methods: We used aggregometry and in vivo murine models of arterial and venous thrombosis to compare two Mer-selective SMIs (UNC Mer TKI1 and UNC Mer TKI2) and determine the most effective inhibitor of platelet aggregation and thrombus formation. The inhibitory effect of two doses (1  $\mu$ M and 5  $\mu$ M) of the compounds were determined using standard light-transmission aggregometry after a 30 minute incubation with washed human platelets at 37  $^{\circ}$ C and compared to platelets treated with vehicle control or with a TKI control (UNC TKI Null), a SMI with similar structure but minimal anti-TAM activity. Both collagen/epinephrine-induced systemic venous thrombosis and FeCl<sub>3</sub>-induced carotid artery injury models were used to determine effects on thrombosis mediated by UNC TKIs. Wild type C57Bl/6 mice were treated with one of the two inhibitors and compared to mice treated with vehicle control. Mean values  $\pm$  SEM are shown and statistical significance ( $p < 0.05$ ) was determined using the student's paired t-test.

Results: UNC Mer TKI1 exhibited more potent inhibition of platelet aggregation in vitro relative to UNC Mer TKI2, although both compounds mediated dose-dependent effects. At a concentration of 1  $\mu$ M, the maximum percent aggregation in UNC Mer TKI1-treated samples (n=7) was significantly greater than samples treated with UNC TKI Null (n=7), 20% DMSO vehicle (n=7), or UNC TKI2 (n=7), with mean values of 69  $\pm$  2.2%, 76.7  $\pm$  1.8% ( $p < 0.01$ ), 76.9  $\pm$  2.1% ( $p = 0.001$ ), and 77  $\pm$  1.8% ( $p < 0.001$ ), respectively. At a concentration of 5  $\mu$ M, UNC Mer TKI1-treated samples (n=7) exhibited a mean maximum percent aggregation of 23.7  $\pm$  2.4% compared to 50.4  $\pm$  4.8% for samples treated with UNC Mer TKI2 (n=7,  $p < 0.001$ ).

UNC Mer TKIs also mediated protection from thrombus formation in mice. Following FeCl<sub>3</sub> injury to the carotid artery, vehicle-treated mice (n=11) developed stable vessel occlusions with a mean time of 6.77  $\pm$  0.25 min. In contrast, stable occlusion occurred at a mean time of 46.6  $\pm$  7.72 min (n=9,  $p = 0.001$ ) for UNC Mer TKI1-treated mice. Survival times following venous injection of collagen and epinephrine were also significantly increased in mice treated with either UNC Mer TKI relative to the UNC TKI Null or vehicle controls. Mice pre-treated with UNC Mer TKI1 (n=9,  $p = 0.04$  compared to vehicle alone) or UNC Mer TKI2 (n=9,  $p = 0.03$  compared to vehicle alone) survived for 19.84  $\pm$  4.4 and 21.25  $\pm$  4.65 minutes, respectively. In contrast, mice given UNC TKI Null (n=3) or vehicle (n=21), only survived for 3.21  $\pm$  2.4 min and 3.09  $\pm$  0.22 minutes, respectively.

Conclusion: UNC Mer TKIs mediate dose-dependent inhibition of platelet aggregation and protect mice from arterial and venous thrombosis. Their pronounced activity compared to an inactive scaffold protein with minimal anti-TAM activity suggest that Gas6/TAM pathway inhibition is the mechanism of action for these novel compounds. UNC Mer TKI1 has more potent anti-thrombotic properties than UNC Mer TKI2.

Primary Presenter: **Joseph Adewumi**

Project Title: *The Transcription Factor Prdm16 Marks a Single Retinal Ganglion Cell Subtype in the Mouse Retina*

Abstract:

\* **PURPOSE:** Retinal ganglion cells (RGC) can be categorized into roughly morphologically distinct subtypes. How these subtypes develop is poorly understood, in part because few unique subtype markers have been characterized. We tested whether the Prdm16 transcription factor is expressed by RGCs as a class or within particular ganglion cell subtypes.

\* **METHODS:** Embryonic and mature retinal sections and flatmount preparations were examined by immunohistochemistry for Prdm16 and several other cell type-specific markers. To visualize the morphology of Prdm16+ cells, we utilized Thy1-YFP-H transgenic mice, where a small random population of RGCs expresses yellow fluorescent protein (YFP) throughout the cytoplasm. **RESULTS:** Prdm16 was expressed in the retina starting late in embryogenesis. Prdm16+ cells co-expressed the RGC marker Brn3a. These cells were arranged in an evenly spaced pattern and accounted for 2% of all ganglion cells. Prdm16+ cells co-expressed parvalbumin, but not calretinin, melanopsin, Smi32, or CART. This combination of marker expression and the morphology data from Thy1-YFP-H mice suggested that Prdm16+ cells represented a single ganglion cell subtype. Prdm16 also marked vascular endothelial cells and mural cells of retinal arterioles.

\* **CONCLUSIONS:** We have identified Prdm16 as a marker of a single subtype of ganglion cell; the G9 ganglion cell described by Várnagy and colleagues in 2009. Prdm16 appears to be the first transcription factor that uniquely marks a single type of ganglion cell. Future work is needed to test whether Prdm16 is necessary or sufficient for G9 subtype and arterial vessel development.

**Primary Presenter: Ibukun Akinboyewa**

**Project Title:** *Association of Fellowship Training With Otolaryngology Training Examination Scores.*

**Abstract:**

**Importance:**

No prior studies have evaluated whether residents who pursue fellowship achieve higher performance on the Otolaryngology Training Examination. We hypothesize that residents pursuing a specific fellowship will demonstrate a correlation between their fellowship choice and the corresponding specialty specific Otolaryngology Training Examination score.

**Objectives**

Determine whether residents pursuing fellowship achieve higher performance on the Otolaryngology Training Examination. Determine whether fellowship choice is correlated with higher scores on the related subspecialty section of the examination.

**Design**

Retrospective analysis

**Setting**

Academic Otolaryngology Residency Program

**Participants**

Thirty-five residents training in a university based otolaryngology residency program during 2003 to 2014.

**Exposure**

Residents were divided by whether they pursued fellowship and by type of fellowship pursued.

**Main Outcomes and Measures**

Otolaryngology training exam scores for postgraduate years 2 through 5 and type of fellowship were collected for all residents meeting inclusion criteria. Outcome measures included comparison of scores between residents who either pursued or did not pursue fellowship training, as well as comparison of subspecialty examination scores between residents who pursued the corresponding fellowship and those who did not.

**Results**

Seventeen of 35 residents (48.5%) pursued fellowship training. The three most common fellowship choices were facial plastics (23.5%), pediatric otolaryngology (23.5%), and rhinology (23.5%). For all residents, mean scores on the otolaryngology training examination improved each subsequent training year, but this was only significant between the second and third postgraduate years ( $p < 0.0001$ ). Residents who pursued fellowships did not perform better in any postgraduate year than those who did not attend fellowship ( $p = 0.36, 0.34, 0.72, 0.2$ ). Among residents who pursued the most common fellowships, there was no correlation between postgraduate year 5 scores on the related subspecialty section when compared to the rest of the study group (facial plastics,  $p = 0.76$ ), (pediatrics,  $p = 0.69$ ) and (rhinology,  $p = 0.58$ ).

**Conclusions and Relevance**

Residents pursuing fellowship training did not achieve higher scores on the otolaryngology training examination in any exam year than residents who did not pursue fellowship, and did not achieve higher scores within their chosen subspecialty section in their last year of training. Fellowship choice does not appear to influence Otolaryngology Training Examination scores among residents.

Primary Presenter: **Oluwatoyin Akintujoye**

Project Title: *Tackling Racism and White Supremacy through the Lens of Medical Education*

Abstract:

**Backgrounds and Objectives:** Diversity curricula in medical school education are important in shaping peer-to-peer interactions amongst medical students, and ultimately physician-patient relationships. We examine the current state of multicultural education, with its most pervasive iterations being cultural competence and an understanding of implicit bias. We then establish an alternative model focusing on the examination of white supremacy and an understanding of racism beyond individual interactions to a systemic scope. Lastly, we will outline specific curricular strategies that will be effective for meeting these objectives. **Methodology:** A literature review was conducted from October 15, 2015 through January 15, 2015. Databases searched included PubMed, ERIC, CINAHL, and GoogleScholar. **Results:** A combination of the terms racism and medical school education yielded 72 articles. Searching the term white supremacy yielded 14 articles. Searching the combination of terms racism or prejudice or cultural competence and teaching methods yielded 17 articles. Of the articles found, 50 were relevant. Gaps in the literature include specific writings on the implementation of critical pedagogy in the medical school setting. **Conclusions:** The literature suggests critical multiculturalism and critical pedagogy are effective methods for anti-racism teachings. Supportive settings include opportunities for reflection and emotional safety. Future efforts should include the evaluation and standardization of curriculum based on critical multiculturalism and critical pedagogy.

Primary Presenter: **Sarah Allexan**

Project Title: *Suicide Education in the University of Colorado Medical School Curriculum*

Abstract:

**Background & Objectives:** Suicide remains a leading cause of death with nearly half of all individuals who die having an encounter with a physician within a month of their death. However, little is known about suicide prevention education for physician trainees. We aimed to evaluate the University of Colorado School of Medicine (CUSOM) suicide curriculum in undergraduate medical education, including student exclusion from patient care, perception of suicide risk assessment ability, and satisfaction with training.

**Methods:** CUSOM students (n=665) were surveyed about didactic and clinical exposure, training tools, comfort, training satisfaction, future responsibility and inhibition from patient care.

**Results:** 328 (49%) students participated, reporting varying training, satisfaction, and comfort with suicide assessment. Preclinically, most students received 2-3 didactic sessions but only 0-1 experiential learning sessions. On clerkships, students reported one didactic episode. Few (2%) students believed themselves exempt from future suicide assessment and 5% were excluded from suicidal patient care. Over 1/3 had no training in suicide/depression screening tools. Few students were "every comfortable" with suicide assessment.

**Conclusion:** Gaps exist in medical student education and their comfort with suicide assessment. If future physicians are to impact suicide rates, their education and comfort in this area needs to improve.



**Primary Presenter: Tyler Anderson**

Project Title: *Prevalence of Substance Use among Moroccan Adolescents and Association with Academic Achievement*

Abstract:

AIM: To investigate rates of drug and alcohol use and their association with academic performance in Moroccan youth.

METHODS: An adapted version of the European School Project on Alcohol and Other Drugs (ESPAD) survey was administered to 2139 10th-12th graders in 36 Moroccan public high schools. Two multiple logistic regressions were completed, one for male and one for female subjects. Grade average was used as a two-part outcome variable, and drug use was used as a four-level categorical independent variable. Parents'™ education levels and socioeconomic status were included as covariates.

RESULTS: Of the subjects, 181 girls (16%) and 390 boys (40%) reported ever having used alcohol, hashish, or psychotropic drugs. Girls who had used any of those substances in the past 30 days demonstrated an adjusted odds ratio (AOR) of 2.62 (95% CI 1.31-5.22) of having average or below-average grades, and those with any lifetime use showed an AOR of 1.72 (1.07-2.77). Among the boys, use in the past 30 days was associated with an AOR of 2.08 (1.33-3.24) of average or below average grades, and use in the last 12 months with an AOR of 1.74 (1.00-3.05). Any lifetime use among male and previous 12 month use among female subjects were not significantly associated with academic achievement.

CONCLUSION: Among Moroccan adolescents, drug use is substantially different between boys and girls. In both genders, lower academic achievement was associated with alcohol, hashish, or psychotropic drug use in the last 30 days.

Primary Presenter: **Meredith Aragon**

Project Title: *Evaluation of the “Ask-Advise-Refer” Tobacco Cessation Intervention in the Women’s Care Clinic at Denver Health Medical Center*

Abstract:

**Introduction:** An Ask-Advise-Refer (AAR) tobacco cessation intervention was introduced at Denver Health Women’s Care Clinic in fall 2014. We developed an evaluation to assess Ask, Advise, and Refer rates over the course of the intervention, and patient and provider attitudes regarding AAR.

**Methods:** We developed a process evaluation using both qualitative and quantitative methods. Providers and patients were interviewed or surveyed to assess their awareness of and satisfaction with the program. Clinical processes were observed by the evaluation team. Electronic medical record data were utilized to identify trends in rates of use of AAR.

**Results:** Key informant interviews revealed all medical assistants felt using AAR was important and the process was easy to electronically document. Provider surveys showed the majority were aware of the initiative and knew how to refer patients. Trends in the data for rates of AAR showed consistently high levels of patients Asked about tobacco use (mean=95.1%), but low average percentages of patients Advised and Referred, 42.3% and 17.0%, respectively.

**Conclusions:** Medical assistants were confident in their ability to use AAR, and clinic data revealed that nearly all patients were Asked about tobacco use. However, clinic data showed low percentages of patients received tobacco cessation Advice and Referrals. A misunderstanding of the computer system Advise field led to low documented Advise rates, and erroneous use of Colorado QuitLine referral forms led to an underestimation of Refer rates. Our evaluation discovered roadblocks in the implementation of AAR, which will lead to positive changes for this intervention’s future.

**Primary Presenter: Lydia Archuleta**

Project Title: *Identifying Emergency Department Diagnostic Errors and Adverse Events in 9-day ED Return Visits*

Abstract:

Identifying Emergency Department Diagnostic Errors and Adverse Events in 9-day ED Return Visits.

Roberta Capp, MD, MHS; Christopher McStay, MD; Kristen Nordenholz; Sheridan Hodkins, BSN; Lydia Archuleta, BA; Jennifer Wiler, MD, MBA.

**Background:** The Institute of Medicine created a landmark report on the state of health care delivery in the US in *To Err is Human* in 1999, which created awareness about the presence of medical errors and their effect on patient safety. There currently exists little data about the occurrence of adverse events that happen in the emergency department setting, an inherently chaotic work environment, due to diagnostic errors.

**Purpose:** To identify emergency department bounce-back visits within nine days of initial presentation, and determine whether the patient experienced an adverse event due to a diagnostic error made during the index visit.

**Methods/Scope:** This is a retrospective study of all adult patients (age >18 years) who were seen and discharged home from the ED and returned for a second visit within 9 days from Sep. 1st-Dec. 31st 2014. Chart review was the main methodology used to evaluate for diagnostic errors that resulted in adverse events, as defined by the NCC MERP Index. The study was IRB approved and was conducted in a tertiary care emergency setting that treats about 100,000 patients per year.

**Results:** The data for this study have been collected but have not yet been analyzed. Based on similar studies, we would expect that our methods are able to assess all of the bounce-back visits that occurred during the study period and are able to accurately identify adverse events due to diagnostic errors.

**Recommendations:** The next steps towards the completion of this study would be an analysis of the data collected with special attention to adverse events experienced by patients based on the NCC MERP scale. The results should be evaluated with respect to patient demographics, types of conditions commonly misdiagnosed, severity of the adverse event, and follow with a discussion of the implications for current emergency medicine practice.

Primary Presenter: Ali Azadegan

Project Title: *Creation and Maintenance of Semi-automated Patient Database for the UCH Surgical ICU*

Abstract:

This database will enhance the Unit's continuous quality improvement efforts by establishing a framework for ongoing statistical process control charting, and will facilitate process improvement initiatives using plan-do-study-act cycles. As a secondary benefit, creation of this proposed database will lay a foundation for future comparative effectiveness and outcomes research using de-identified datasets. Phase I of this project has involved a formal, multi-disciplinary process designed to identify an initial set of high-priority quality metrics to be monitored as well as the creation and implementation of a computerized patient database for all patients admitted to the SICU service. In Phase II, statistical process control charting will be established. In Phase III, one or more care-bundle-based quality initiatives will be introduced and refined using plan-do-act-study cycles.

Primary Presenter: **Brittany Badesch**

Project Title: *The effectiveness of an experiential learning approach in promoting positive attitudes of health professions students toward individuals with intellectual disabilities.*

Abstract:

**Background:** Deficiencies in health professions educational programs to teach concepts of disability have been identified as a contributing factor to health disparities among individuals with disabilities. There is a need for an effective model to educate medical students in this field.

**Specific Aims:** The objective of this research project is to design and implement a program which will give health professional students the opportunity to gain experience interacting with individuals who have intellectual disabilities and assess how the program affects the perceptions of participating students toward adults with intellectual disabilities.

**Method:** Health professions students at the Anschutz Medical Campus were administered a nine-question survey and the Community Living Attitudes Scale-Mental Retardation (1996) to measure their attitudes towards individuals with intellectual disabilities with regards to sheltering, exclusion, similarity, and empowerment. Linear regression models assessed differences of perceptions between program participants and non-participants, and between those with previous experience working with this population and those without.

**Findings:** 198 students responded, with 26 participating in the experiential learning program, and 172 not. Although not significant, program participants' sub-scores reflect more positive attitudes towards individuals with intellectual disabilities in the similarity ( $p$ -value=0.728) and empowerment ( $p$ -value=0.732) categories. Scores of students who reported previous experience also reflect non-significant more positive attitudes in three of four sub-score categories, sheltering ( $p$ -value=0.517), similarity ( $p$ -value=0.229), and empowerment ( $p$ -value=0.473).

**Discussion:** Although not significant, more positive attitudes were found in multiple of the sub-score categories for both students who participated in the experiential learning program and students who had previous experience working with individuals with intellectual disabilities. Reasons for a lack of significant findings could include brevity of experience provided by the experiential learning program and variability in the amount of previous experience reported, demonstrating a need to investigate programs that provide more experience working with individuals with intellectual disabilities in the future.

Primary Presenter: Tyler Barr

Project Title: Music Therapy in Medical Student Education

Abstract:

**Objective:** To determine Colorado medical students' readiness to inform patients about Music Therapy (MT) as a treatment modality based on exposure in medical school.

**Method:** Students at the University of Colorado School of Medicine and Rocky Vista School of Medicine were recruited via email to complete an online researcher-developed survey titled Music Therapy Survey. Quantitative data were collected and analyzed to determine student knowledge, interest, and likeliness to recommend MT based on exposure in medical school.

**Results:** Only 11.3% of medical students reported exposure to MT by formal instruction or incidental clinical exposure. Respondents most frequently indicated minimal or zero knowledge (R=97.2%-99.2%) of MT as a treatment modality. Medical student knowledge of MT did not vary based on year in school. Students with prior exposure to MT had statistically significant ( $p < 0.01$ ) better understandings of the training of music therapists, the evidence for MT, which patients would be likely to benefit, and resources for interested patients. Additionally, study findings indicated statistically significant differences in the mean scores ( $p < .01$ ) for interest in learning more about MT based on exposure to MT. However, 91% of all students reported that they were somewhat or very interested in learning more about MT.

**Conclusions:** While interest in learning more about MT was high for medical students, instruction in and exposure to MT in medical school was minimal. Students have very little understanding of how Music Therapists are trained, what evidence exists for the use of MT as a treatment modality, and for which patients MT is most beneficial. Additionally, if a patient is interested in MT, medical students have little knowledge of resources for these patients. Furthermore, although students are unprepared to speak with patients about MT, those with some exposure were significantly better prepared to do so.

**Primary Presenter: Cameron Barton**

**Project Title:** *Risk factors for rod fracture after posterior correction of adult spinal deformity with osteotomy: a retrospective case-series*

**Abstract:**

**Background**

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Osteotomies including pedicle subtraction (PSO) and/or Smith-Peterson (SPO) are used to facilitate surgical correction of adult spinal deformity (ASD), but are associated with complications including instrumentation failure and rod fracture (RF). The purpose of this study was to determine incidence and risk factors for RF, including a clinically significant subset (CSRF), after osteotomy for ASD.

**Methods**

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A retrospective review of clinical records was conducted on consecutive ASD patients treated with posterolateral instrumented fusion and osteotomy. Seventy-five patients (50 female; average age, 59) met strict inclusion/exclusion criteria and follow-up of  $\geq 1$  year. Data was extracted pertaining to the following variables: patient demographics; details of surgical intervention; instrumentation; and postoperative outcomes. Patients were divided into two subgroups: 1) rod fracture (RF) and 2) non-RF. The RF subgroup was further divided into CSRF and non-CSRF. Odds ratios (OR) were calculated to evaluate the association between risk factors and RF. The  $\chi^2$ -test was used to define P-values for categorical variables, and T-test was applied for continuous variables, P-values  $\leq 0.05$  were considered significant.

**Results**

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Incidence rates of RF were: for entire population, 9.3 % (95 % CI: 2.7 %; 15.9 %); for PSO, 16.2 % (95 % CI: 4.3; 28.1); and for SPO, 2.6 % (95 % CI: 0 %; 7.7 %); the OR of PSO versus SPO was 7.2 (95 % CI: 0.8; 62.7,  $P = 0.1$ ). CSRF incidence was 5.3 % (95 % CI: 0.2 %; 10.4 %). Significant risk of RF was revealed for following factors: fusion construct crossing both thoracolumbar and lumbosacral junctions (OR = 9.1,  $P = 0.05$ ), sagittal rod contour  $> 60^\circ$  (OR = 10.0,  $P = 0.04$ ); the presence of dominos and/or parallel connectors at date of rod fracture (OR = 10.0,  $P = 0.01$ ); and pseudarthrosis at  $\geq 1$  year follow-up (OR = 28.9,  $P < 0.001$ ). Statistically significant risk of CSRF was revealed for fusion to pelvis ( $P = 0.05$ ) and pseudarthrosis at  $\geq 1$  year follow-up (OR = 50.3, CI: 4.2; 598.8,  $P < 0.01$ ).

**Conclusions**

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The risk of RF after posterolateral instrumented correction of ASD with osteotomy had statistically significant association with the following factors: pseudarthrosis at  $\geq 1$  year follow-up; sagittal rod contour  $> 60^\circ$ ; presence of dominos and/or parallel connectors at date of fracture; and fusion construct crossing both thoracolumbar and lumbosacral junctions. Statistically significant risk for the CSRF subset was fusion to the pelvis and pseudarthrosis at  $\geq 1$  year follow-up.

Primary Presenter: **Kristen Beck**

Project Title: *Progression to inflammatory arthritis in a health-fair based cohort selected based on elevations of antibodies to citrullinated protein antigens*

Abstract:

Antibodies to citrullinated protein antigens (ACPA) can be elevated prior to the onset of inflammatory arthritis (IA), and are highly predictive for the future onset of rheumatoid arthritis (RA). We hypothesized that one could identify individuals with elevations of ACPA in absence of IA in a community-based health-fair ACPA, and identify factors that would be associated with development of IA/RA.



Primary Presenter: Paige Bennett

Project Title: Working to End Teen Obesity

Abstract:

Engaging Teenagers in Positive Conversations about Body Weight in the Clinic Setting: A Qualitative Study

Authors: Paige Bennett and Alexandra Ly

Background:

Childhood obesity in Aurora and select Denver neighborhoods is increasing at a disproportionate rate compared to state and national levels. To address the issue of teen obesity, we sought to understand teenager perspectives on how health care providers (HCPs) can best engage teenagers in conversations about body weight and body image (BW/BI) to provide effective counseling.

Methods:

Community-based participatory research was performed in collaboration with a teenager advisory board (TAB). The TAB provided insight into the key issues through descriptions of their experiences discussing weight with providers and then co-developed the focus group questions. Teenagers participating in this study were recruited from local high schools with the help of high school guidance counselors. Focus groups were voice recorded, transcribed, and analyzed with open qualitative coding by three coders. Descriptive statistics were used. Participants of the focus groups as well as the TAB were compensated with \$25.00 gift cards. The protocol was IRB exempt: 13-1670.

Results:

Two 2-hour focus groups were conducted consisting of 9 Latina girls and 8 Latino boys ages 15-18 from Aurora, CO. Sixteen reported having a conversation with a health care provider (HCP) about BW/BI; all respondents believed it was important for HCPs to know how to initiate conversations about BW/BI. Five main

themes emerged: open the conversation by getting to know the teenager and make them feel comfortable; elicit patient-centered goals and motivation around health; identify concrete weight management suggestions specific to the teenager's culture, family income, and access to food and exercise; provide information about weight loss expectations; and encourage them by verbal

affirmations of support. In the second arm of this study, two 2-hour focus groups were conducted consisting of 8 boys and 8 girls of mixed races. Analysis for this set of focus groups is ongoing at this time.

Conclusion:

Teenagers feel that the conversation they have with their HCPs regarding BW/BI can be improved. Teenagers express that the most effective way for HCPs to discuss BW/BI is to build trust, elicit information to develop personalized recommendations, and encourage them to feel positive and motivated about BW/BI goals.

Primary Presenter: **Matt Bezzant**

Project Title: *The Histone Methyltransferases MLL1 and DOT1L Cooperate with Meningioma-1 to Induce AML*

Abstract:

Meningioma-1 (MN1) overexpression in acute myeloid leukemia (AML) predicts a poor prognosis. Forced expression of MN1 in murine hematopoietic progenitors induces an aggressive myeloid leukemia. This leukemia is strictly dependent on a defined gene expression program in the cell of origin, which includes as key components the homeobox genes HoxA9 and Meis1. We show that this program is controlled by two histone methyltransferases, Mll1 and Dot1l. Deletion of either Mll1 or Dot1l abrogates the cell of origin-derived gene expression program, including the expression of HoxA cluster genes. In vivo, MN1-driven murine leukemias were found to be dependent on both Mll1 and Dot1l. HOXA9 and MEIS1 are co-expressed with MN1 in a subset of clinical MN1<sup>high</sup> leukemia, and human MN1<sup>high</sup>/HOXA9<sup>high</sup> leukemias were sensitive to pharmacologic inhibition of DOT1L. These data point to DOT1L as a potential therapeutic target in MN1<sup>high</sup> AML. In addition, our findings suggest that epigenetic modulation of the interplay between an oncogenic lesion and its cooperating developmental program has therapeutic potential in AML.

**Primary Presenter: Luke Bidikov**

**Project Title:** *Treatment of Dry Eye Syndrome with Human Milk*

**Abstract:**

**Objective:** Dry eye syndrome (DES) affects millions of people. There are a number of treatments targeting its multifactorial pathophysiology; however, many of these treatments provide incomplete relief or have deleterious side effects. The purpose of this study was to evaluate the efficacy of two homeopathic remedies “human milk and nopal cactus (prickly pear)” as therapeutics for DES.

**Methods:** We used a previously described benzalkonium chloride (BAK) dry-eye mouse model to study the efficacy of human milk and nopal cactus (prickly pear). BAK was applied at a concentration of 0.2% to the mouse ocular surface for 4 days. We measured tear volume, punctate score, and corneal thickness to verify that the animals had dry eye. After induction of dry eye animals were treated for 7 days with human milk (whole and fat-reduced), nopal extract derivatives, cyclosporine, and physiological saline applied as drops twice daily for 7 days. At the end of the 11-day study, corneal thickness was measured in all groups.

**Results:** The mean corneal thickness at day 11 in the BAK-induced dry eye was  $29.33 \pm 0.38 \mu\text{m}$ . Mean corneal thickness after 7 days of treatment for saline vehicle control was  $36.05 \pm 0.06 \mu\text{m}$ , whole milk was  $34.64 \pm 0.14 \mu\text{m}$ , fat-reduced milk was  $35.04 \pm 0.48 \mu\text{m}$ , nopal was  $24.76 \pm 5.62 \mu\text{m}$ , nopal (filtered) was  $27.99 \pm 6.14 \mu\text{m}$ , ethyl acetate was  $26.53 \pm 3.25 \mu\text{m}$ , methanol was  $21.59 \pm 13.12 \mu\text{m}$ , cyclosporine was  $37.44 \pm 1.19 \mu\text{m}$ , where  $\pm$  SEM and N=9.

**Conclusion:** Treatment with cyclosporine, human milk, and fat-reduced milk for 7 days restored corneal thickness that had been reduced by BAK in our mouse model. Further studies are required to determine if human milk may be safely used to treat dry eye in patients.

Primary Presenter: **Peter Boulos**

Project Title: *CORTICAL THINNING IN ADOLESCENT FEMALES WITH SUBSTANCE AND CONDUCT PROBLEMS.*

Abstract:

**Aims:** Some individuals have onset of substance use disorders early in adolescence, develop multiple substance use disorder diagnoses, and have severe persistent courses. Although such youths exhibit more impulsivity, risk-taking, and problems of inhibition, relatively little is known about brain differences seen in such youths. This is especially true of adolescent females. The aim of this study was to investigate potential brain differences in cortical thickness.

**Methods:** We recruited 22 patients from a university-based treatment program for youths with serious substance and conduct problems and 21 community controls, all female and aged 14-19 years. We obtained T1 structural brain images using a 3T MRI scanner and assessed for group differences in cortical thickness across the entire brain using FreeSurfer's QDEC program and for 3 regions-of-interest (ROI) bilaterally (6 comparisons). These regions of interest were defined by the Desikan's atlas, chosen based on a priori predictions from the literature, and included: 1) medial orbitofrontal cortex; 2) rostral anterior cingulate cortex; 3) middle frontal gyrus. Age and IQ were entered as nuisance factors for all analyses.

**Results:** Using a vertex-level threshold of  $p=0.005$  and Monte Carlo Simulation-determined cluster threshold (250mm<sup>2</sup>) we demonstrated on whole-brain analyses that one region, including the left pregenual rostral anterior cingulate cortex extending into the left medial orbitofrontal region (356 mm<sup>2</sup> in size) was significantly thinner in patients. ROI analyses yielded no group differences.

**Conclusions:** Adolescent females with serious substance and conduct problems may have reduced cortical thickness in pregenual regions of the left rostral anterior cingulate and medial orbitofrontal cortex. These regions have been associated with poor behavioral control in past studies.

**Primary Presenter: Claire Bovet**

Project Title: *Quality of life, unmet needs, and iatrogenic injuries in rehabilitation of patients with Ehlers-Danlos Syndrome/Joint Hypermobility Syndrome*

Abstract:

Introduction: Ehlers-Danlos Syndrome (EDS) and the joint hypermobility syndrome (JHS) are connective tissue disorders that form an overlapping clinical syndrome. EDS/JHS-associated pain correlates with poor quality of life. While physical therapy is the recommended treatment for EDS/JHS, little is known about therapy-related patient experiences and iatrogenic injuries.

Methods: We studied 38 EDS/JHS patients, eliciting health-related quality of life (HRQoL) from 27 patients through the RAND SF-36 questionnaire. We also explored physical therapy experiences through focus groups with 13 patients.

Results: Our patients displayed poor HRQoL, with 71% reporting worse health over the past year. SF-36 scores were significantly lower than the scores of the average American population ( $p < 0.001$  for 8 of 10 categories assessed), but were comparable to EDS/JHS populations in Belgium, the Netherlands, Sweden, and Italy. Focus groups identified factors associated with: negative past physical therapy experiences, iatrogenic joint injuries, positive physical therapy experiences, and unmet needs in joint rehabilitation.

Conclusions: This group of EDS/JHS patients has significant decrements in HRQoL and many unmet needs in treatment, as well as a risk for iatrogenic injuries. We identify several factors that may help meet patients' physical therapy needs, and offer suggestions for improving joint rehabilitation in patients with EDS/JHS.

Primary Presenter: **William Brandenburg**

Project Title: *Medical Knowledge and Preparedness of Climbers on Colorado's 14,000 Foot Peaks*

Abstract:

**Objective:** To assess the medical knowledge and preparedness of mountain climbers on Colorado's 14,000 foot peaks. Additionally to compare differences in knowledge and preparedness based on demographics, training, and difficulty of the climb.

**Methods:** Mountain climbers from 11 Colorado 14,000 foot peaks were surveyed at the time of summiting. These peaks represented every major mountain range and class of difficulty in Colorado. Marijuana use and demographic information including age, gender, state of residence, and income level was collected in the survey. In addition, participants were scored on medical knowledge and preparedness using a novel assessment tool. Scores were then compared and statistically analyzed.

**Results:** Mountain climbers scored  $2.84 \pm 1.25$  and  $3.92 \pm 1.20$  out of 6.00 on medical knowledge and preparedness respectively. Medical training was shown to be the only significant predictor of medical knowledge while age, race, income, and group status were all shown to be significant predictors of preparedness. 9.4% of participants were using marijuana. Only 25 % of individuals climbing class 3 mountains elected to wear helmets.

**Conclusions:** Most mountain climbers had no formal wilderness medicine training and did worse on the medical knowledge assessment than those who have had training. Consistent with previous studies, participants performed poorly on the medical knowledge assessment. As such, ways to improve wilderness medical knowledge among outdoor recreationalists should be sought. The low rate of helmet use on Colorado's technical peaks represents an important area for education and injury prevention.

Primary Presenter: **Brooke Bredbeck**

Project Title: *COMMON DENOMINATORS IN GLOBAL HEALTH:*

*A comparison of 3 Rapid Health Need Assessments from across the globe*

Abstract:

Common Denominators Within Global Health: A Comparison of Three Rapid Needs Assessments From Across The Globe

Purpose

Rapid Health Needs Assessments were conducted in Guatemala, Pakistan, and Peru to inform the implementation of child health interventions. Results were compared to explore differences between cultures and resources, and to highlight shared vulnerabilities.

Methods

Convenience samples were used in Pakistan (N= 200); Peru (N=551); and Guatemala (N=287). The written surveys, in English or Spanish, were similar (67 or 87 questions) and identified a sample of mothers with young children. Chi-square, t-tests & ANOVA were used for the statistical analysis. Additionally, odds ratios from logistic regression models, adjusted for maternal variables, were calculated.

Results

The mean age of mothers was 29.1 years (SD= ±8) with a mean number of 3.2 children (SD=±2). The literacy rate across all regions was 81%. Approximately 60% of women reported skipping meals in the past 3 months, and ~40% had a child <5 years old who had diarrhea. Water source was associated with childhood diarrhea in Peru (OR 1.62, p 0.02) and Pakistan (OR 2.29, p 0.03), and high parity was associated with diarrhea in Guatemala (OR 1.24, p 0.001). Use of oral rehydration (ORS) in Guatemala, Peru, and Pakistan was 26.65%, 10.86%, and 1%, respectively.

Conclusion

Childhood diarrhea and food insecurity were both very prevalent, and were related to factors that tend to define marginalized, low-income populations worldwide. A striking difference between regions is the lack of ORS use in Pakistan. From this information, interventions can be targeted to focus around family planning and IMCI education, especially the use of ORS.

Primary Presenter: **Quan Bui**

Project Title: *The Psychiatric and Medical Management of Acute Marijuana Intoxication in the Emergency Room*

Abstract:

We use a case report to describe the acute psychiatric and medical management of marijuana intoxication in the emergency setting. A 34-year-old woman presented with erratic, disruptive behavior and psychotic symptoms after recreational ingestion of edible cannabis. She was also found to have mild hypokalemia and QT interval prolongation. Psychiatric management of cannabis psychosis involves symptomatic treatment and maintenance of safety during detoxification. Acute medical complications of marijuana use are primarily cardiovascular and respiratory in nature; electrolyte and electrocardiogram monitoring is indicated. This patient's psychosis, hypokalemia and prolonged QTc interval resolved over two days with supportive treatment and minimal intervention in the emergency department. Patients with cannabis psychosis are at risk for further psychotic sequelae. Emergency providers may reduce this risk through appropriate diagnosis, acute treatment, and referral for outpatient care.



**Primary Presenter: Allison Reid Burks**

**Project Title:** *Understanding Pregnant Women's Beliefs and Attitudes about Marijuana in Colorado*

**Abstract:**

Understanding Pregnant Women's Beliefs and Attitudes about Marijuana in Colorado

**Introduction:** Marijuana is currently legal in several U.S. states with more considering legalization. Though little is known about how marijuana affects the developing fetus, a significant number of women use during pregnancy; in a companion study at our site, 9.4% of women tested positive for tetrahydrocannabinol (THC) at their first prenatal visit. We examine women's perceptions of benefits and consequences of use while pregnant.

**Methods:** Anonymous surveys were distributed at three University-based Obstetric clinics to pregnant patients. Surveys included questions about marijuana use and perceived benefits and consequences of use during pregnancy and breastfeeding.

**Results:** 102 surveys were completed; median age 30 (range 18-43 years), 63% White, 53% had a college or graduate degree. Many agreed that marijuana helps with stress (54%), anxiety (40%), headaches (48%), aches/pains (58%), and is healthier than cigarettes (41%). Less than half thought it could reach the baby through the placenta (49%) or expose the baby to chemicals (45%). Women were unsure if marijuana could alleviate morning sickness (60%), affect a baby's brain (50.5%) and development (46.5%), or if it had been proven to be dangerous to use in pregnancy (57%). Only half (55%) disagreed that marijuana was ok to use in pregnancy.

**Conclusion:** Women have mixed and uncertain beliefs about marijuana, especially in pregnancy. Respondents felt marijuana was useful for common ailments but were unsure of the consequences of use while pregnant. Clearly there is a need for continuing investigation into marijuana's effects in pregnancy and on fetal outcomes to provide accurate education to patients.

**Authors:** Allison Reid Burks, Hayley Crossman, Sarah Black, Jane Limmer, Mary Kohn, Jeanelle Sheeder

**Primary Presenter: Natasha Cabrera**

**Project Title:** *Unscheduled 72-Hour Return Visits to Pediatric Emergency Departments and Urgent Cares: A Caregiver Perspective*

**Abstract:**

**OBJECTIVE:** To characterize caregiver reasons for 72-hour emergency department (ED) returns.

**METHODS:** A convenience sample of caregivers returning within 72 hours of initial visit to a pediatric ED or affiliated Urgent Care (UC) site were prospectively surveyed from 11/14-6/15; patients evaluated at outside EDs or UCs, scheduled for return, or non-English/Spanish speaking were excluded. Caregiver surveys underwent item generation, validation, and pilot testing.

**RESULTS:** Caregiver surveys were analyzable for 495 of 500 children with a 72-hour return ED visit. Mean age of caregivers was 33 years, 62% completed college. Children were 2 years of age (47%), male (52%), Caucasian (55%), and publically insured (64%). Most frequent discharge (DC) diagnoses on initial ED visit were infectious (41%), respiratory (20%), and gastrointestinal (20%). Though 96% had a primary care provider, only 14% had been evaluated prior to ED return. Reported reasons for ED return included belief that their child's illness had not resolved (51%) or worsened (41%). Most caregivers (58%) did not have complete understanding of all components of DC instructions (diagnosis, duration of illness, home care, return precautions). Though 93% stated they knew their child's DC diagnosis, provider-documented diagnoses were discordant for 22%. Complete understanding of DC instructions was associated with ED satisfaction (OR 5.7 CI 3.8- 8.5).

**CONCLUSION:** Among caregivers of children returning for an unscheduled ED visit, most lack complete understanding of DC instructions from the initial visit. Improving delivery of key components of DC instructions has the potential to increase ED satisfaction and reduce unscheduled 72-hour returns.

Primary Presenter: Ryan Caldwell

Project Title: Subcapital Phalangeal Fractures: A Retrospective Study

Abstract:

Background: Phalangeal neck fractures represent a special subset of pediatric hand injuries which pose unique challenges to the treating physician. Also termed “subcapital” fractures, many advocate the prompt reduction and stabilization of these fractures given their propensity for instability and avascularity. Most agree that restoring anatomic alignment, providing bony stability, and preserving vascularity are essential to good functional outcomes. The aim of this study was to look retrospectively at our experience with both nonoperative and operative treatment of subcapital phalangeal fractures in a pediatric population over a 5-year period.

Methods: A retrospective chart review was performed on pediatric patients who received treatment for a subcapital phalangeal neck fracture of the middle or proximal phalanx between 2009 and 2014. Outcome measures were compared between nonoperative and operative treatments, including: mechanism of injury, radiographic parameters, delays in treatment, time to union, and rate of complications.

Results: 157 patients met eligibility criteria for the review. The degree of sagittal plane translation and sagittal angulation were predictive factors for surgical treatment. No significant difference in time to surgery was found between CRPP and ORIF subgroups. 9% (14/157) of patients were delayed in treatment, with 36% (5/14) of these requiring surgery. A delay in treatment with subsequent surgery was predictive of a need for ORIF over CRPP ( $p=0.036$ ). Time to union was significantly higher in the operative group ( $p=0.001$ ).

Conclusions: This study demonstrates that a strong correlation between initial sagittal plane displacement and a need for surgery. Though time to surgery was not different between the CRPP and the ORIF groups, a delay of treatment has a higher risk of requiring an open reduction. A nearly 3-fold longer time to union may be expected in patients requiring operative intervention, likely due to the higher degree of displacement and vascular insult from open reduction.

Primary Presenter: Tom Califf

Project Title: *Taking Aim At Disparate Bystander CPR Provision: Targeted Hands-only CPR Training Where It Is Needed*

Abstract:

Taking Aim At Disparate Bystander CPR Provision: Targeted Hands-only CPR Training Where It Is Needed

Background: Out-of-hospital cardiac arrest remains a significant cause of morbidity and mortality, disproportionately affecting low-income and black populations in neighborhoods where bystander CPR is rarely provided. The Denver HANDDS Program was developed to identify these "high-risk" neighborhoods, ascertain barriers to bystander intervention and implement a community intervention to address these disparities.

Aim: To implement and evaluate a community-based, culturally-sensitive, train-the-trainer hands-only CPR program in targeted neighborhoods.

Methods: Community liaisons recruited participants to CPR education sessions. These participants then used low-cost, reusable manikins to train friends and family. All trainees were offered a survey immediately before and after training. Participants returned data on friend and family trainees up to 4 weeks later.

Conclusions: The Denver HANDDS Program effectively recruited subjects from identified neighborhoods and increased both knowledge of and comfort with performing hands-only CPR. 344 primary trainees completed training, and they educated 886 secondary trainees. Per-topic survey performance improved for primary and secondary trainees, and total score increased significantly. 664 of 832 respondents felt comfortable with performing CPR after the intervention. 55 primary trainees and 103 secondary trainees lived within 1 mile of target neighborhoods.

**Primary Presenter: Julian Cameron**

Project Title: *Quantifying mediastinal anatomy using magnetic resonance and computed tomography to differentiate vascular ring types*

Abstract:

Quantifying mediastinal anatomy using magnetic resonance and computed tomography to differentiate vascular ring types

Background: Differentiating between double aortic arch (DAA) with left arch atresia and right aortic arch (RAA) with left ligamentum has been difficult due to an inability to identify atretic vascular structures on preoperative imaging. Yet, no study has attempted to quantify aortic arch anatomy to differentiate between these two groups of vascular rings.

Materials and Methods: Retrospective, single-center study of all pediatric patients who were diagnosed by MRI or CT prior to surgical correction of a vascular ring between 2002 and 2015. All imaging diagnoses were compared to their surgical diagnosis. For patients with DAA or RAA, several quantitative measurements of mediastinal vascular anatomy were taken, including the distance between the left common carotid (LCC) and left subclavian artery (LSCA), and the distance between the corresponding right arch branching.

Results:

After excluding cases with additional mediastinal anomalies distorting the aortic arch, a total of 87 cases were analyzed. Ring types include: DAA with atresia distal to the LSCA (n=24), RAA with mirror image branching (n=4), DAA with balanced arches (n=6), DAA with right dominant arches (n=15), and RAA with aberrant LSCA (n=38). No DAA with complete atresia between LCC and LSCA were identified €" thus, DAA with right dominant arches were used as a proxy. We found that the ratio of the distance between LCC and LSCA to the distance between RCC and RSCA were statistically significant when comparing RAA with mirror image to DAA with distal atresia ( $p < 0.01$ ; 95% CI: -0.335 -- -0.187) and RAA with aberrant LSCA to DAA with right dominant arches ( $p < 0.01$ ; 95% CI: 0.365 €" 0.725).

Conclusions:

Quantifying left and right sided aortic branching patterns of suspected DAA with left arch atresia or RAA with left ligamentum may be useful in definitively differentiating these groups of vascular rings prior to surgical correction.

Primary Presenter: Maureen Canellas

Project Title: *The Flipped Classroom: Addressing the Ultrasound Curriculum Gap*

Abstract:

Introduction: Point-of-care ultrasound has been shown to improve patient outcomes in a wide array of medical specialties. With this in mind, medical school graduates are expected to proficiently use ultrasound during residency. In response, many medical schools have integrated ultrasound into their standard curriculum. However, this is not the case at CU. Thus, our medical students are vulnerable to being underprepared for the ultrasound proficiency expected of them in residency. My project aims to correct this gap in our students' curriculum by implementing a pilot ultrasound course using the flipped classroom method.

Methods: 179 first year medical students were given access to online ultrasound resources and instructed to review them prior to 5 hands-on scanning sessions. After the 5-session course concluded, student perception of the flipped classroom design was obtained.

Results: On average, 84% of students reviewed the material prior to each session. Student satisfaction with this curriculum design was entirely positive, with the highest reported scores recorded when replying to, "This activity was preferable to the traditional lecture format."

Discussion: Our study demonstrates that the flipped classroom model is an effective and preferable way to expand undergraduate medical education to include ultrasound without adding to an already full lecture burden.

Primary Presenter: Melanie Carter

Project Title: Identifying a gap in early medical education of pediatric patients with congenital heart disease

Abstract:

ABSTRACT

Objective

Recently, increasing emphasis is being placed on adult congenital heart disease (ACHD) programs as patients are living longer and require more extensive adult-specific cardiac care. These programs are based on specific guidelines and, while pediatric providers are encouraged to educate their congenital heart disease (CHD) patients as early as age 12, most of the emphasis of these programs is on the adult care. Very few transition programs focusing on the pediatric side are in place to educate and facilitate a patient's move from pediatric to adult care. This study aims to explore a gap in the knowledge of pediatric patients with CHD. Specifically, we analyzed how well pediatric patients age 12 to 18 understand their heart disease and, from this data, propose that there likely is an educational gap where pediatric physicians have overlooked an opportunity to teach their young patients, setting them up for later medical success. It has previously been shown that young patients do not have a solid understanding of their disease, which is essential for them to transition to adult care and self-management. Our hypothesis is that this lack of understanding results from a gap in medical education that likely occurs at a much younger age than has previously been identified. We hope that by identifying this gap in educational care, we will increase awareness and improve care provided by pediatric cardiologists.

Methods

A total of 110 surveys were collected from the Children's Hospital Colorado's Pediatric Cardiology Clinic between 2011 and 2014. These surveys were filled out by patients ages 12 – 18 who had a documented CHD lesion. Answers on the survey were compared to documentation in the electronic medical record (EMR) by chart review. Data were analyzed with Statistical Analysis Software, version 9.4, using Student's t- and Chi-square testing.

Results

71 patients of the 110 surveyed were able to correctly identify their heart lesion. 39 patients (35.4%) incorrectly defined or did not have an answer for the name of their lesion. The majority of patients (57.9%) had CHD lesions of moderate complexity and of these 35.5% could not identify their lesion. 30.8% of patients had lesions of simple complexity and of these 30.3% were unable to identify their lesion. Of the 11.2% of patients with severe lesions, 58.3% could not identify their disease. Age had no effect on the patient's ability to correctly identify their lesion.

Conclusions

Based on these data and other supporting research, we conclude that pediatric patients with CHD would benefit from earlier education by their pediatric provider, with a similar emphasis as is currently placed on adult care and education. The provider's investment in the patient from a very early age will not only develop rapport and confidence within that relationship, but will also promote a better health outcome for the patient with their increased disease and treatment comprehension. Ultimately, such educational reform can reduce the financial burden on the healthcare system and improve health outcomes for CHD pediatric and adult patients.

Primary Presenter: **Sarah Cebron**

Project Title: *Maternal beliefs and restrictive practices regarding bedtime TV viewing in families of Mexican Descent*

Abstract:

Maternal beliefs and restrictive practices regarding bedtime TV viewing in families of Mexican Descent

Background: Bedtime television (TV) viewing may impact a child's sleep and increase a child's obesity risk. Little is known about maternal beliefs, self-efficacy, and restrictive practices concerning bedtime TV viewing, especially in mothers of low-income Latino preschoolers.

Objective: To evaluate relationships between maternal beliefs, self-efficacy, and restrictive practices regarding child bedtime TV viewing and how these variables relate to child bedtime TV viewing.

Methods: A cross sectional study was conducted in 3 safety-net clinics. Phone interviews (English/Spanish) were conducted with female caregivers of Mexican descent with a child 3-5 years old. Maternal beliefs were assessed via level of agreement (strongly agree to strongly disagree) with various statements. Self-efficacy was measured by asking How sure are you that you can limit your child from watching TV before going to bed (not at all sure to very sure). Participants reported the frequency of restricting child bedtime TV viewing (never to always). TV before bedtime was created using data collected from a weeklong TV diary. Path analyses were carried out using maximum likelihood (ML) and were adjusted for covariates including maternal age and education, child age, and presence of a bedroom TV.

Results: The majority (52%) of the 321 participants strongly disagreed that bedtime TV viewing helps children sleep better. 74% reported high self-efficacy for limiting bedtime TV, though 59.8% reported actually limiting their child's bedtime TV viewing often, very often, or always. Stronger maternal beliefs that bedtime TV did not benefit sleep were associated with higher maternal self-efficacy ( $p < 0.001$ ) and restrictive behavior ( $p < 0.001$ ). Increased maternal restrictive behavior was significantly associated with decreased odds of heavy child bedtime TV viewing (OR=0.42,  $p < 0.001$ ).

Conclusion: Maternal restrictive practices around child bedtime TV viewing are influenced by maternal beliefs and subsequently affect child bedtime TV viewing. Maternal beliefs provide a modifiable target for interventions seeking to improve sleep and prevent obesity in low-income preschoolers of Mexican descent.



**Primary Presenter: Nathan Coffman**

Project Title: *An analysis of the co-localization of HCN4 and a novel HCN4-interacting protein, LRMP/HINT1, in CHO, HEK, and mouse sinoatrial cells*

Abstract:

The intrinsic decline in maximum heart rate with age is a well-known but poorly understood phenomenon, and seems to occur independent of lifestyle variables such as diet or exercise. This decline in maximal heart rate is paralleled by a decline in intrinsic heart rate, or the rate at which the heart beats absent any autonomic stimuli, which is caused by a decreased action potential firing rate by the specialized myocytes of the sinoatrial node. The ability of the sinoatrial myocytes (SAMs) to produce spontaneous action potentials is due to the "funny current,"  $I_f$ , which is produced by ion flux through the hyperpolarization-activated cyclic nucleotide gated channel 4 (HCN4). The mid-point activation ( $V_{1/2}$ ) becomes more hyperpolarized with age, but this effect can be reversed by the application of saturating concentrations of cyclic adenosine monophosphate (cAMP) and the firing rate and activation kinetics of SAMs from old mice restored to the same levels as those from young mice. However, cAMP failed to normalize the kinetics of  $I_f$  in transfected Chinese hamster ovary (CHO) cells, indicating another effector was present. Co-immunoprecipitation of HCN4 from CHO cells revealed a novel HCN4 interacting protein, LRMP/HINT1. This protein was transfected into HEK and CHO cell lineages and expressed alongside HCN4. Here, we utilize ICC to demonstrate that HCN4 and LRMP are significantly co-localized in SAMs and co-expressing CHO and HEK cells.

Primary Presenter: Jack Conner

Project Title: *Transjugular vs Percutaneous Liver Biopsy: A comparison of tissue adequacy*

Abstract:

**PURPOSE:** To measure, objectively, the quality of Tranjugular Liver Biopsy (TJLB) versus that of percutaneous liver biopsy (PLB) in terms of adequacy for staging fibrosis.

**BACKGROUND:** Liver fibrosis and subsequent cirrhosis is one of the top ten leading causes of death in the United States and is diagnosed via pathological examination of biopsy specimens. TJLB and PLB are two of the most commonly used methods of obtaining these samples. Though often considered the inferior method in the past, recent advances in TJLB have dramatically improved sample quality. This study aims to demonstrate that using objective measures of sample adequacy, specifically 11 or more complete portal triads (CPTs), TJLB samples are no longer inferior to those obtained via PLB.

**MATERIALS AND METHODS:** A retrospective review of consecutive patients who underwent non-targeted liver biopsy during the 10 month study period identified 212 patients. These patients were stratified into biopsies performed percutaneously by hepatology (n=63), percutaneously by interventional radiology (IR) (n=57), and transjular performed by IR (n=92). Procedural metrics, including needle gauge, number of passes, number of substantial samples, reason for biopsy, and indication for TJLB will be analyzed. Early (24 hours) and late complications (30 days) are a secondary outcome measured. Biopsy samples were obtained and re-read by trained pathologist. Sample metrics, including, sample length, total length, sample CPTs, total CPTs, fragmentation, and subjective tissue adequacy will be analyzed.

**RESULTS:** The following results represent only preliminary analysis of raw data. No differences in demographic characteristics were found between the three groups. Needle gauge for hepatology PLB was 16, for both TJLB and PLB in IR it was generally 18. Rate of fragmentation was 30.4 % of hepatology PLB, 84.8 % for IR PLB, and 73.6 % for TJLB. Mean total CPTs were 12.5 for hepatology PLB, 25.7 for IR PLB, and 22.2 for TJLB. Objective inadequacy (< 11 CPTS) occurred 31.1 % for hepatology PLB, 0.0 % for IR PLB, and 12.5 % for TJLB. Subjective inadequacy as determined by the pathologist occurred at a rate of 4.5 % for hepatology PLB, 0.0 % for IR PLB, and 17.9 % for TJLB. Early complications occurred at a rate of 4.8 % for hepatology PLB, 5.3 % for IR PLB, and 11 % for TJLB. Late complications appeared to occur at the same rate for all three groups at a relative rate of 4%.

**CONCLUSION:** The results of this study demonstrate that samples obtained via TJLB are in fact not inferior, if not superior, to those obtained via PLB using 11 CPTs as a measure of objective adequacy. Interestingly Subjective adequacy as determined by pathologist opinion demonstrated that PLB are in fact superior. Reasons for this discrepancy are unclear at this time but may suggest that using the number of CPTs as a measure of adequacy may not be representative of what the pathologist looks for when staging fibrosis.

Primary Presenter: **Catherine Cooper**

Project Title: *Developing Education Materials for an Early Childhood Health and Development Program in Southwest Guatemala*

Abstract:

Developing Education Materials for an Early Childhood Development Program in Southwest Guatemala

**Purpose:** International organizations have recognized the importance of the first two years of life for children's physical and mental growth. Many deficits arise from problems with malnutrition, hygiene, and development in these early years. The purpose of our research was to pilot test education materials for mothers in the Trifinio region of Guatemala regarding child development topics like nutrition, health, hygiene, development, and injury prevention.

**Methods:** Two 30-page interactive flipchart talks were created for 0-6 month olds and 6-12 month olds. Guatemalan community health workers presented the information to groups of 5-10 mothers. The talks provided an interactive education environment via the use of games, activities, and open-ended questions. We gave learning assessments to the mothers before the intervention, immediately after the intervention and 1-2 weeks after the intervention. After the presentation, we conducted focus groups (13 total) with the mothers to elicit qualitative feedback about the flipcharts.

**Results:** We piloted the educational materials with 76 women in the community (38 women in both flipchart groups). Scores improved for the 0-6 month flipchart from 77% to 87% ( $p < .0001$ ), and then to 90% ( $p = 0.01$ ) for the pre-, immediate post-, and 1-2 week post-assessments, respectively. Likewise, scores for the 6-12 month flipchart improved from 78% to 89% ( $p < .0001$ ), and then to 92% ( $p = 0.03$ ) for the pre-, immediate post-, and 1-2 week post-assessments, respectively.

**Conclusion:** Mothers significantly increased their knowledge about health and development topics following this intervention. Their knowledge continued to increase 1-2 weeks after the intervention without re-exposure to the materials, presumably by informal reinforcement with other mothers. Employing an interactive education intervention may be an effective way to educate mothers on child health and development and may, in turn, positively influence the health of their children.

Primary Presenter: **Brittany Cowfer**

Project Title: *Fourth Year Planning: An Exploration of Specialty-Specific Recommendations and Course-Taking Patterns*

Abstract:

Title: Fourth Year Planning: An Exploration of Specialty-Specific Recommendations and Course-Taking Patterns

Background and Objectives: Though residency preparation is a primary purpose of the fourth year, few studies describe the optimal courses to prepare for each specialty. This study compares the course-taking patterns of fourth year students to the recommendations of local specialty advisors and national professional associations with the goal of creating a specialty-specific guide for use in fourth year planning.

Methods: Interviews with advisors in the nine specialties most frequently matched at our institution were conducted regarding fourth year advising. A search of the webpages and papers of national professional organizations and specialty societies (AAOS, ACP) was also performed. Course-taking patterns of fourth year students graduating from our institution in 2014 and 2015 were analyzed by specialty.

Results/Conclusion: While student course-taking matched specialty recommendations in some areas, there was considerable variation within a given specialty and, at times, course-taking deviated from recommendations. The few specific recommendations, such as away rotations for orthopedic surgery, were evident in course-taking data. Advisors described advising as necessarily student-specific, which may account for some variation. With many courses taken by a single student per specialty, it is likely that additional factors drive course selection.

Primary Presenter: **Brian Davis**

Project Title: *Revitalization of bone allograft with mesenchymal progenitors derived from human induced pluripotent stem cells*

Abstract:

AIM: To determine whether mesenchymal progenitors derived from human induced pluripotent stem cells (iPSCs) can adhere, remain viable, and undergo osteogenic differentiation on human bone allografts.

MATERIALS & METHODS: Human fibroblasts were reprogrammed to iPSCs, differentiated towards mesenchymal progenitors (iPSC-MPs), seeded onto bone allografts, and stimulated in complete culture medium (CCM) or osteogenic stimulatory medium (OSM). iPSC-MPs were assessed for attachment and viability using the LIVE/DEAD assay, and osteogenesis was evaluated with alkaline phosphatase (ALP) activity and osteocalcin staining.

RESULTS: iPSC-MPs adhered and remained viable on bone allografts for 28 days. ALP activity and osteocalcin-positive tissue were evident on iPSC-MP-seeded allografts, particularly in OSM.

CONCLUSION: Human iPSC-MPs are a novel candidate cell source to revitalize bone allografts and promote osteogenesis.

Primary Presenter: **Jose Diego**

Project Title: *Treatment of Dry Eye Syndrome with Human Milk*

Abstract:

TITLE: TREATMENT OF DRY EYE WITH HUMAN MILK

AUTHORS: Jose Luis Diego, Luke Bidikov, Michelle Pedler, Jeffery

Kennedy, Mark Petrash, Emily McCourt

### Purpose

Human milk has been used as a natural therapy for many ailments throughout history but very few studies have been conducted to show efficacy. We designed a study to test if human milk is therapeutic for dry eye in a mouse model.

### Methods

Benzalkonium chloride (BAK), an agent known to induce dry eye, was applied at a concentration of 0.2% to the mouse ocular surface for 4 days. We measured tear volume, fluorescein staining, and corneal epithelial thickness to verify that the animals had dry eye. In addition to continuing BAK treatment, some animals were additionally treated with whole human milk, fat-reduced human milk, cyclosporine, or physiological saline applied as drops twice daily for 7 days. At the end of the 11-day study, we measured corneal thicknesses in all treatment groups as a metric to compare their efficacy against dry eye.

### Results

The mean corneal thickness at day 11 in the BAK-induced dry eye was  $29.33\hat{\mu}\text{m}\pm 0.38$ . Mean corneal thickness after 7 days of treatment for saline vehicle control was  $36.05\hat{\mu}\text{m}\pm 0.06$ , human milk was  $34.64\hat{\mu}\text{m}\pm 0.14$ , fat reduced milk was  $35.04\hat{\mu}\text{m}\pm 0.48$ , and cyclosporine  $37.44\hat{\mu}\text{m}\pm 1.19$ , where  $\pm$  SEM and  $N=9$ .

### Conclusion

Treatment with cyclosporine, human milk, and fat-reduced milk for 7 days restored corneal thickness that had been reduced by BAK in our mouse model. Further studies are required to determine if human milk may be safely used to treat dry eye in patients.

Primary Presenter: Jessica Dill

Project Title: *Health Action Completion by Demographic Characteristic: Values-Based Insurance Design at Work in the Colorado Health-OP (\*working title\*)*

Abstract:

Values-based insurance design (VBID) is an increasingly popular concept of structuring insurance benefits to make low-cost, high-value health services available to customers at a free or reduced rate, while increasing cost sharing for services considered to be of higher cost and lower-value (8). The ultimate goal in these designs is to improve consumer health while reducing health care costs incurred from the use of unnecessary health services. Unfortunately, current studies report relatively low rates of customer participation in these types of wellness and preventive programs (Huskam et al reported a completion rate of 20%, 13).

The Colorado HealthOp was a health insurance cooperative formed under the ACA that sought to use VBID as part of their mission of promoting wellness and consumer engagement. Their health plans included an enhanced benefit that customers earned by completing specific high-value actions (completing a health risk appraisal, wellness visit, and biometric screening). This study aimed to identify the demographic factors that predicted increased completion of these health actions in order to identify populations that might benefit from more personalized engagement efforts. Claims data from 2015 showed that females ( $p < 0.01$ , OR 1.48, 95%CI 1.43-1.54), urban dwellers ( $p < 0.01$ , OR 1.18, 95%CI 1.12-1.24) and customers purchasing the health plans with the enhanced benefit ( $p < 0.01$ , OR 2.85, 95%CI 2.74-2.97) were significantly more likely to complete their health actions. The health risk appraisal (HRA), which is an independent predictor of improved health was also associated with higher completion rates in these groups: females ( $p < 0.01$ , OR 1.52, 95%CI 1.46-1.57), urban dwellers ( $p < 0.01$ , OR 1.27, 95%CI 1.21-1.34) and enhanced benefit plans ( $p < 0.01$ , OR 2.85, 95%CI 2.75-2.96). The greatest increase in completion was seen in the customers purchasing the enhanced benefit plans, suggesting that VBID can be successful in improving customer engagement in high-value health actions.

However, the overall completion rate remained low (20% and 23% for health action and HRA respectively), suggesting the need for additional measures to improve completion rates. Using the data provided by this study, the CO HealthOp had planned to initiate targeted interventions aimed at groups with lower completion rates, such as 90-day post-enrollment phone messaging, group mailings and focus groups. Unfortunately, the company was forced to close its doors at the end of 2015 after the federal government chose to withhold promised funds, and the Colorado Bureau of Insurance, citing concerns about their financial solvency, ordered them to shut down. This represents a significant loss of momentum in the world of VBID and consumer-driven health insurance.

Primary Presenter: Ryan D'souza

Project Title: *Clinical and Genetic Characterization of Adult Patients Presenting with Non-Syndromic Vascular Aneurysms and Dissections*

Abstract:

Background and Aims: Genetic disorders affecting the arterial tree in the form of aneurysms and dissections are highly morbid conditions that strike younger persons leading to bleeding, infarction, or even death. Although clinically recognizable syndromes, notably Marfan, Ehlers Danlos, and Loeys-Dietz syndromes encompass the principal diagnosable phenotypes along the genetic vascular disorder spectrum, a substantial subset of patients cannot be adequately classified under a known diagnosis through clinical or molecular diagnostic methods. Here we describe patients presenting with multiple-aneurysms and/or pseudoaneurysm syndromes (MAPS), and clinically characterize this novel phenotype, present data on natural history and prognosis, and propose management guidelines.

Methods: 33 patients with MAPS were identified from February 2006 to October 2015 through the University of Colorado Adult Medical Genetics Clinic. A subset of patients underwent clinical genetic testing utilizing the Marfan/TAAD/Related disorders panel, and another subset was enrolled for research-based exome-sequencing.

Results: 33 patients (11 men, 22 women) were classified as MAPS patients with an average age of first symptom at 37.8 (+/- 13.3) and 35.4 (+/-12.8) years, respectively. Symptom presentation and progression are presented based on vascular territory, notably of the heart, head, and neck, which could manifest with fatal complications. Secondary arterial events occurred at an average of 6.4±5.7 years after the initial MAPS episode. Genetic analysis revealed 10 gene variants that are likely pathogenic and implicated in MAPS.

Conclusion: These data more broadly illuminate a phenotype of aneurysms, dissections, and/or pseudo-aneurysms that don't classify under a recognizable genetic vascular diagnosis. Our data should provide useful clinical information for providers managing patients with MAPS.



Primary Presenter: **Daniel Enriquez**

Project Title: *Qualitative outcomes and operative experience in patients with total shoulder arthroplasty: Comparison to total hip and knee arthroplasty.*

Abstract:

**BACKGROUND:** Joint replacement is an accepted and well-proven treatment for osteoarthritis (OA) of the shoulder, hip and knee joints. The success of these treatments has been reported in terms of quantitative data, and recently, qualitative studies have explored patient experiences with knee and hip replacements. This information has provided patients and physicians with another tool for decision-making. Fewer studies have explored patient experiences with shoulder replacement, and no study has compared patients' experiences with shoulder replacement to knee or hip replacement. A secondary aim is to understand the trajectory of a patient's recovery after completing treatment for upper and lower extremity replacement.

**METHODS:** We will conduct semi-structured interviews with patients who have underwent a total shoulder and a total knee or total hip replacement. Topics we will explore include: patients' experience with the disease process, decision-making process, the post-op period, recovery, rehabilitation, long-term follow up and differences between the surgeries that the patients recall. Interviews will be transcribed and with a thematic analysis method, analyzed for themes. Coding will be performed using Atlas.ti. We analyzed objective outcomes relative to completion of the surgeries individually and completion of all surgeries.

**RESULTS:** No data to report at this time.

**NEXT STEPS:** We need to complete data collection and data analysis.

Primary Presenter: **Christopher Frederick**

Project Title: *Role of Mer Tyrosine Kinase in the Tumor Microenvironment*

Abstract:

Title: Role of Mer Tyrosine Kinase in the tumor microenvironment

Background and Objectives: MerTK is a receptor tyrosine kinase expressed in myeloid lineage cells which has been shown to play a role in tumor progression. Particularly, absence of MerTK has been shown to slow tumor progression. Given the known expression in myeloid cells, it is thought that tumor cells may interact with and alter the tumor microenvironment via the MerTK signaling pathway. The objective of this study is to characterize the role of MerTK and MerTK inhibition in tumor progression and the tumor microenvironment as it relates to tumor-associated macrophages (TAMs). We hypothesize that MerTK inhibition will lead to a decrease in tumor permissive M2 macrophages in the tumor microenvironment.

Methodology: Using a mouse model and a novel MerTK inhibitor, UNC2025, we examine the effect of MerTK inhibition on tumor progression. We then examine in vitro and ex vivo TAM characteristics isolated from wild type and MerTK<sup>-/-</sup> mice as well as those treated with UNC2025.

Conclusions: We show that MerTK inhibition results in decreased tumor burden by volume. However, contrary to our hypothesis, MerTK inhibition showed an increase in tumor permissive M2 macrophages in the tumor microenvironment. This suggests a different mechanism for tumor suppression, perhaps involving a change in the cytokine profile of the tumor microenvironment, or interaction with CD8<sup>+</sup> cells.

**Primary Presenter: Alexander Ghincea**

Project Title: *IL-19 and its cognate receptor: sexually divergent expression in cardiac myocytes and role in heart failure*

Abstract:

Title €“ IL-19 and its cognate receptor: sexually divergent expression in cardiac myocytes and role in heart failure.

Background and objectives €“ Cardiovascular disease is a significant cause of morbidity and mortality in the United States and disproportionately affects women in terms of morbidity and mortality despite being more prevalent in men. Cytokines, their receptors, and their signaling pathways have been implicated in the pathogenesis of heart failure. Interleukin-19 (IL-19) and its receptors Interleukin-20 Receptor alpha and beta (IL-20Ra and IL-20Rb) have been associated with cardiovascular disease. We sought to determine whether IL-19 and its receptors are expressed in cardiac tissue, to explore its role in heart failure, to establish whether there was any sex-related difference in expression, and elucidate its downstream signaling effects.

Hypothesis €“ We hypothesized that IL-19 is cardioprotective, and that sexual divergence in levels of IL-19 or receptor expression can, in part, explain the observed differences in heart failure morbidity and mortality between men and women.

Methods €“ Heart tissue was obtained from thirty-six de-identified human left ventricular biopsies as well as Non-transgenic control (NTG), Dominant-negative CREB (dnCREB), IL-19 Knockout (KO), and double-transgenic (DTG) dnCREB/IL-19KO mouse left ventricles (LV). Samples were tested for expression of IL-19, its receptors, and Signaling Transducer and Activator of Transcription 1 and 3 (STAT 1 and STAT 3) activation using RT-PCR and western blot analysis.

Results €“ IL-19, IL-20Ra, and IL-20Rb were found to be expressed at the transcript level in the mouse LV. Expression of IL-20Rb was significantly upregulated in male animals; no other differences in expression between sex or genotype were noted. We were unable to detect IL-19 at the protein level in mouse hearts. When treated with recombinant IL-19, cardiac fibroblasts preliminarily show STAT3 activation, but no STAT1 activation. Removal of the IL-19 gene in double transgenic animals increased heart failure mortality in male animals. No difference in IL-19 expression was observed in human LV when comparing disease states. Diseased human hearts had lower expression of IL-20Ra than control, however, no differences between sex were observed. No differences between sex or disease were noted with IL-20Rb expression. Analysis of downstream Human IL-19 protein expression was not detectable by western blot. IL-19 signaling indicated that STAT1 and STAT3 were not activated in any of our conditions.

Conclusions €“ We have shown that IL-19 and its receptors are expressed in cardiac tissue, and we have demonstrated that loss of IL-19 significantly impacts cardiac failure.

**Primary Presenter: Christian Ghincea**

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Conclusions €“ We have shown that IL-19 and its receptors are expressed in cardiac tissue, and we have demonstrated that loss of IL-19 significantly impacts cardiac failure.

Primary Presenter: **Danielle Gonzales**

Project Title: *Factors that increase diagnostic yield of surgical lung biopsy in pediatric oncology patients*

Abstract:

**Purpose:** Recent data demonstrate that surgical lung biopsy in immunocompromised children, including oncology patients, alters therapy in only 50% of cases. We hypothesized that there are factors identifiable preoperatively which can predict the patients who will or will not benefit from surgical biopsy.

**Methods:** We reviewed the medical records of all children with malignancy who underwent surgical lung biopsy between 2004 and 2013 at a single institution, excluding those children who had previously undergone a solid organ or bone marrow transplant.

**Results:** Eighty lung wedge biopsies were performed (median age 13 years, IQR 5.25–16; 63% male, n=50) 53 (66%) of which led to a change in patient management. The majority of biopsies were performed to diagnose a new mass or differentiate infection from metastases (mass group) (n = 68, 85%), and 12 biopsies (15%) were performed to diagnose a known infection for antibiotic guidance (infection group). Children in the infection group were more likely to be febrile preoperatively, were more likely to be an inpatient preoperatively, and had a lower absolute neutrophil count at the time of biopsy. Patients in the infection group had higher postoperative mortality rates and higher rates of major complications.

**Conclusion:** In pediatric oncology patients, surgical lung biopsy has a lower diagnostic yield and higher complication rate when performed for antibiotic guidance. Prior to proceeding with biopsy in this high-risk patient population, surgeons and oncologists should carefully weigh the potential risks and benefits.

**Primary Presenter: Andrew Goschka**

Project Title: *Biomechanical comparison of traditional anchors to all-suture anchors in a double-row rotator cuff repair cadaver model*

Abstract:

**Background:** To further reduce the invasiveness of arthroscopic rotator cuff repair surgery the all-suture anchor has been developed. The all-suture anchor requires less bone removal and reduces the potential of loose body complications. The all-suture anchor must also have adequate biomechanical strength for the repair to heal. The hypothesis is there is no significant difference in the biomechanical performance of supraspinatus repairs using an all-suture anchor when compared to traditional solid-body suture anchors.

**Methods:** Using nine shoulders per group, the supraspinatus tendon was dissected from the greater tuberosity. The four different double row repairs tested were (medial row/lateral row): A: ICONIX2/ICONIX2; B: ICONIX2/ Stryker ReelX 3.9 mm; C: ICONIX2/Stryker ReelX 4.5 mm; D: Arthrex BioComposite CorkScrew FT 4.5 mm/ Arthrex BioComposite SwiveLock 4.75 mm. The ICONIX2 was the only all-suture anchor tested. Tendons underwent cyclic loading from 10 to 100 N for 500 cycles, followed by load-to-failure. Data was collected at cycles 5, 100, 200, 300, 400, and 500. One-way ANOVA analysis was used to assess significance ( $P \leq 0.05$ ).

**Findings:** The anchor combinations tested did not differ significantly in anterior ( $P = 0.4$ ) or posterior ( $P = 0.3$ ) gap formation, construct stiffness ( $P = 0.7$ ), ultimate load ( $P = 0.06$ ), or load to 5 mm gap formation ( $P = 0.84$ ). **Interpretation:** The all-suture anchor demonstrated comparable biomechanical performance in multiple double- row anchor combinations to a combination of traditional solid-body anchors. Thus it may be an attractive option to further reduce the invasiveness of rotator cuff repairs.

**Primary Presenter: Jason Hafer**

**Project Title:** *Biomechanical comparison of traditional anchors to all-suture anchors in a double-row rotator cuff repair cadaver model*

**Abstract:**

[](<http://dx.doi.org/10.1016/j.clinbiomech.2015.06.009>)

\* Goschka, A. M., Hafer, J. S., Reynolds, K. A., Aberle, 2., Nicholas S, Baldini, T. H., Hawkins, M. J., & McCarty, E. C. (2015). Biomechanical comparison of traditional anchors to all-suture anchors in a double-row rotator cuff repair cadaver model. *Clinical Biomechanics* (Bristol, Avon),30(8), 808.

[http://ucdenverhsl.summon.serialssolutions.com/#!/search?bookMark=ePnHCXMwPZ1NCoMwEIVDKfTHO5S5QECjUbNtaekB3JcZE6kgjail1-9EW3chi5AMQzJf4L05ii1zq9sw55RFcNovkv2qU-T82Ik9F-3BpEUdxOccNOZB4hp2BPXaeg98A0z6tI0-xIAj8PTDCJMH7Do5zn4b62z7AgTr39Q5yfAKg58CsUL9bhoY-FpveYwWOTIgbjATiep2rS53-Ws4IHvmNImZRpdQxsGNY6Qcsyl15GKbaCLr4IpbV5LRhMYQI026zK01uSLVKJU4TCNxWpZd3rJHvxhGPP4HTr8j11c\\_](http://ucdenverhsl.summon.serialssolutions.com/#!/search?bookMark=ePnHCXMwPZ1NCoMwEIVDKfTHO5S5QECjUbNtaekB3JcZE6kgjail1-9EW3chi5AMQzJf4L05ii1zq9sw55RFcNovkv2qU-T82Ik9F-3BpEUdxOccNOZB4hp2BPXaeg98A0z6tI0-xIAj8PTDCJMH7Do5zn4b62z7AgTr39Q5yfAKg58CsUL9bhoY-FpveYwWOTIgbjATiep2rS53-Ws4IHvmNImZRpdQxsGNY6Qcsyl15GKbaCLr4IpbV5LRhMYQI026zK01uSLVKJU4TCNxWpZd3rJHvxhGPP4HTr8j11c_)

<http://dx.doi.org/10.1016/j.clinbiomech.2015.06.009>

Primary Presenter: **Markus Hannan**

Project Title: *On Social Determinants of Health and How to Improve Awareness: A Collaboration Between LEADS and the CCMU*

Abstract:

**BACKGROUND:** In the United States, large sums of money are spent on healthcare for abysmal healthcare outcomes. Perhaps the most prominent reason for this disconnect between spending and outcomes is the social inequality within the U.S., which causes the U.S. to rank quite poorly on indicators of efficiency, equity, and outcomes. This social inequality is most easily conceptualized by a number of metrics called the social determinants of health.

**OBJECTIVE:** To evaluate methods that would allow healthcare providers to more effectively intervene on social determinant of health (SDoH) issues potentially affecting their patients.

**METHODS:** Perspectives of prominent individuals in the healthcare community within Colorado were collected and compiled to identify common themes toward which interventions could be later directed. It was concluded that the most fundamental problem might be a lack of awareness of social determinants of health among healthcare providers and the general population. The CCMU therefore resolved to raise awareness of SDoH issues in Colorado by developing an educational video geared toward both the general population and healthcare professionals. The video was produced, published on YouTube, and ultimately implemented in several programs across Colorado. It was evaluated quantitatively by tracking views and qualitatively by feedback provided from these programs.

**RESULTS:** Perspectives of twelve influential individuals in the healthcare community within Colorado were collected and compiled to identify common themes toward which interventions could be later directed. These problems included failure of communication, lack of knowledge, and inadequate workforce, infrastructure, and funding. Interviewees agreed that a video would be a cheap and effective intervention to raise awareness in both populations. The video itself was viewed 39,099 times as of February 1, 2016, and implemented into several training programs including a patient navigator fundamentals course in Colorado, a cultural competency training course in Missouri, a community health worker training program in Mississippi, and a public health course in Australia.

**CONCLUSION:** This project originally aimed to identify common issues related to the social determinants of health and ultimately intervened on the most fundamental problem, a lack of awareness that these issues exist, by producing an educational video. Although programs within and outside Colorado have successfully implemented the video, the video and its supplementary materials would have more far-reaching influence if implemented as part of a national training module for healthcare professionals.



**Primary Presenter: Philipp Hannan**

**Project Title:** *A Development of a Continuing Medical Education program to address LGBT Health Disparity in the Denver Area*

**Abstract:**

**Abstract**

**Background:** Within the health care system, lesbian, gay, bisexual, and transgender (LGBT) persons face inequity that contributes to health disparities. Two need assessment surveys “Invisible: The State of LGBT Health in Colorado and Becoming Visible: Working with Colorado Physicians to Improve LGBT Health” have uncovered a striking discrepancy between LGBT individuals’ health experiences and the perceptions thereof by health care providers. Many LGBT individuals believe there to be insufficient adequately trained health care professionals to address their LGBT-specific needs; in contrast, many providers believe themselves to be appropriately meeting these needs. While access to culturally responsive and clinically trained providers continues to be a critical issue in improving the health of the LGBT community, United States medical schools demonstrate a dearth in education surrounding LGBT individuals, and devote only a median of 5 hours on issues around LGBT health. This lack of training continues beyond undergraduate medical training, and thus justifies and invites further educational material regarding the health of LGBT individuals.

**Objective:** The primary objective of this project was to address the need for LGBT education among health care providers by creating an online educational module on LGBT health.

**Methods:** This project began with a literature review of LGBT health care guidelines and PubMed articles referencing LGBT health outcomes. By combining the literature review and the aforementioned need assessment surveys, the core curriculum for an online module was developed. In applying adult learning theory, the project was intended to capture and maintain an adult learner’s attention by employing multimedia, practical applications, and other strategies, and thus Adobe Captivate 7 “a platform for generating electronic media” was elected to build the module. After the module was completed, it was accredited by the Colorado Medical Society, and subsequently dispersed nationally. Additionally, the module was adapted for medical student use by supplementing its content with sexual history taking material. Assessment of the module was performed in three manners: (1) by using Google Analytics to detect the usage of the module on its server, (2) by allowing the user to register themselves after completion of the module, and (3) by dispensing a survey to medical students that completed the adapted version of the module.

**Results:** Usage analytics of the module revealed widespread utilization after its deployment, with over 3,500 users documented by the winter of 2015. Module usage was observed nationally and internationally, with the majority (2,319) of users being located abroad. While numerical enrollment in optional registration was poor, registration data revealed a diverse utilization of the module among medical personnel. Lastly, data from the modified class version demonstrated a high level of satisfaction with medical students. 92% of these student learners rated the quality of the module as “Very good” or “Excellent.”

**Conclusion:** This project describes the creation, deployment, and analysis of an online module intending to remedy health disparities among the LGBT population. The success of the module underscores the practicality of online learning, and the capacity of a module to distribute information to a diverse and international audience. The module’s broad reach to health care providers and high rates of satisfaction among medical students furthermore imply that resources regarding LGBT health and health care are not only necessary, but also well-received. Lastly, ongoing adaptations and new applications of the module provide opportunities for future projects to promote culturally responsive and clinically trained providers.

Link: <http://www.cms.org/resources/health-and-health-care-for-the-lgbt-community>

**Primary Presenter: Erin Hickey**

**Project Title: *Survey of Parents of Children and Youth with Developmental Disabilities and Behavioral/Psychiatric Diagnoses***

**Abstract:**

Children and youth with developmental disabilities and behavioral/psychiatric diagnoses are treated at the Emergency Department for behavioral crises and the patients/their parents do not feel they get adequate treatments/interventions before discharge. We designed and implemented a needs assessment to describe this problem by surveying parents of individuals with dual diagnoses who have previously been treated in the Emergency Department for a behavioral crisis. Our results show that this population does not currently have adequate options for responding to a behavioral crisis, and that Crisis Plans are helpful in averting patients from needing to go to the Emergency Department. We used this data to influence policy change in the state of Colorado.

Primary Presenter: Mark Hopkins

Project Title: Lymphovascular Space Invasion in Robotic Surgery for Endometrial Cancer

Abstract:

Background:

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Minimally invasive surgery has become a standard treatment for endometrial cancer and offers significant benefits over abdominal approaches. There are discrepant data regarding lymphovascular space invasion (LVSI) and positive peritoneal cytology with the use of a uterine manipulator, with previous small-scale studies demonstrating an increased incidence of these prognostically important events. We sought to determine if there was a higher incidence of LVSI in patients who underwent robot-assisted surgery for endometrial cancer.

Methods:

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We performed a single-institution review of medical records for patients who underwent open abdominal or robot-assisted hysterectomy for endometrial cancer over a 24-month period. The following data were abstracted: age, tumor grade and stage, size, depth of invasion, LVSI, and peritoneal cytology. For patients with LVSI, slides were reviewed by 2 pathologists for confirmation of LVSI.

Results:

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Of 104 patients identified, LVSI was reported in 39 (37.5%) and positive peritoneal cytology in 6 (4.8%). Rates of peritoneal cytology were not significantly different between the 2 groups (odds ratio, 0.55; 95% confidence interval, 0.10–3.17;  $P = .50$ ). LVSI was reported in significantly fewer robot-assisted hysterectomies than open procedures (odds ratio, 0.39; 95% confidence interval, 0.17–0.92;  $P = .03$ ). In subgroup analyses restricted to early-stage disease (stage I–II), there was no significant difference in LVSI between open and robot-assisted hysterectomies (odds ratio, 0.64; 95% confidence interval, 0.22–1.85;  $P = .43$ ).

Conclusion:

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In this retrospective study, we found that use of a uterine manipulator in robot-assisted surgery did not increase the incidence of LVSI.

Primary Presenter: jiahao hu

Project Title: *Transjugular vs Percutaneous Liver Biopsy: A comparison tissue adequacy*

Abstract:

**PURPOSE:** To measure, objectively, the quality of Tranjugular Liver Biopsy (TJLB) versus that of percutaneous liver biopsy (PLB) in terms of adequacy for staging fibrosis.

**BACKGROUND:** Liver fibrosis and subsequent cirrhosis is one of the top ten leading causes of death in the United States and is diagnosed via pathological examination of biopsy specimens. TJLB and PLB are two of the most commonly used methods of obtaining these samples. Though often considered the inferior method in the past, recent advances in TJLB have dramatically improved sample quality. This study aims to demonstrate that using objective measures of sample adequacy, specifically 11 or more complete portal triads (CPTs), TJLB samples are no longer inferior to those obtained via PLB.

**MATERIALS AND METHODS:** A retrospective review of consecutive patients who underwent non-targeted liver biopsy during the 10 month study period identified 212 patients. These patients were stratified into biopsies performed percutaneously by hepatology (n=63), percutaneously by interventional radiology (IR) (n=57), and transjular performed by IR (n=92). Procedural metrics, including needle gauge, number of passes, number of substantial samples, reason for biopsy, and indication for TJLB will be analyzed. Early (24 hours) and late complications (30 days) are a secondary outcome measured. Biopsy samples were obtained and re-read by trained pathologist. Sample metrics, including, sample length, total length, sample CPTs, total CPTs, fragmentation, and subjective tissue adequacy will be analyzed.

**RESULTS:** The following results represent only preliminary analysis of raw data. No differences in demographic characteristics were found between the three groups. Needle gauge for hepatology PLB was 16, for both TJLB and PLB in IR it was generally 18. Rate of fragmentation was 30.4 % of hepatology PLB, 84.8 % for IR PLB, and 73.6 % for TJLB. Mean total CPTs were 12.5 for hepatology PLB, 25.7 for IR PLB, and 22.2 for TJLB. Objective inadequacy (< 11 CPTS) occurred 31.1 % for hepatology PLB, 0.0 % for IR PLB, and 12.5 % for TJLB. Subjective inadequacy as determined by the pathologist occurred at a rate of 4.5 % for hepatology PLB, 0.0 % for IR PLB, and 17.9 % for TJLB. Early complications occurred at a rate of 4.8 % for hepatology PLB, 5.3 % for IR PLB, and 11 % for TJLB. Late complications appeared to occur at the same rate for all three groups at a relative rate of 4%.

**CONCLUSION:** The results of this study demonstrate that samples obtained via TJLB are in fact not inferior, if not superior, to those obtained via PLB using 11 CPTs as a measure of objective adequacy. Interestingly Subjective adequacy as determined by pathologist opinion demonstrated that PLB are in fact superior. Reasons for this discrepancy are unclear at this time but may suggest that using the number of CPTs as a measure of adequacy may not be representative of what the pathologist looks for when staging fibrosis.

Primary Presenter: **Andi Hudler**

Project Title: *HEMATEMESIS IN A PREGNANT PATIENT WITH HISTORY OF PANCREATITIS*

Abstract:

**Background:** Pancreatitis is a condition that can result in a variety of acute and chronic complications. This report will summarize the case of BH, a 23-year-old pregnant female with a history of necrotizing pancreatitis who presented to the ED for hematemesis. This case illustrates the potential for splenic vein thrombosis (SVT) as a complication of pancreatitis and looks into the details of this condition. Objectives include:

- \* What causes SVT?
- \* How does SVT lead to variceal bleeding?
- \* What are the treatment options for bleeding gastric varices due to SVT?
- \* What postoperative measures need to be taken when caring for patients after splenectomy?

**Methodology:** A review of the case in conjunction with a literature review on the topic was performed.

**Conclusions:** SVT is a complication of pancreatitis that can lead to gastric varice formation. While esophageal varices can usually be treated using EGD techniques, gastric varices secondary to SVT often require splenic artery embolization or splenectomy for definitive treatment.

Primary Presenter: **David Hughes**

Project Title: *Tracking Potential Disparities in Lung Cancer Staging Based on Insurance Status in the State of Colorado*

Abstract:

Cancer is the second leading cause of death in the United States of America, with just over 580,000 people dying from cancer annually (1). Early diagnosis and staging is critical for decreasing the mortality rate of cancer. Several screening tools now exist to diagnose cancers in early stages and many of these screening tools, including low-dose spiral CT scanning for high risk patients, are incorporated into primary care (2). Access to primary care providers is improving for underserved patients with the implementation of the ACA, however access for many underserved patients is limited by lack of insurance or a paucity of Medicaid providers in their area (3). Several cancers, including lung cancer, have been identified where the patients' insurance status correlates to the stage at which their cancer diagnosed and lung cancer (like many cancers) is far more deadly when diagnosed at later stages (4). Patients from lower socioeconomic classes are now more likely to smoke cigarettes and since 9/10 lung cancer patients are smokers, lung cancer will soon be a disease of the underserved (5, 6). We have conducted a case review of 186 patients diagnosed with Non-Small Cell Lung Cancer (NSCLC) in the Denver metro area and compared their stage at diagnosis with their insurance status. Our goal was to determine if the national trend, of Medicaid and uninsured patients being diagnosed with lung cancer at later stages as compared to their Medicare and privately insured counterparts, occurs in Denver. If we found disparities in care, our intent was to use this data to target patients being staged later and possibly develop an intervention to get them screened sooner. We did not find any differences in staging, comparing Medicaid, uninsured, or privately insured patients. Compared to Medicare patients, the odds ratio for being diagnosed with late stage disease for privately insured patients and uninsured patients was: 2.992 (95% CI: 1.089-8.218, p-value: 0.0335) and 4.509 (95% CI: 1.937-10.500, p-value: 0.0005) respectively. There was no statistically significant difference between Medicare and Medicaid patients.

Primary Presenter: Sandy Huynh

Project Title: *Ultrasound Needs Assessment in Tanzania*

Abstract:

Ultrasound is a useful diagnostic tool that has revolutionized patient care and diagnosis, most notably in developing countries. Several small studies in Rwanda, Liberia, and the Amazon have shown that ultrasound use has a significant impact on clinical management and patient outcomes. However, because ultrasound is an operator-dependent tool, its effective integration requires provider training. The purpose of our study is to assess a variety of health centers in a particular region in Tanzania to determine available diagnostic resources, current uses of ultrasonography, and need for future resources and training. The study design was a qualitative needs assessment of ultrasound utilization in health facilities within the city of Mwanza. The results of the assessment demonstrated that the health system in Tanzania is quite complex and extremely limited in resources, particularly health care providers. Ultrasonography was only utilized at the hospital level and was primarily utilized for OB-GYN purposes and evaluation of kidney and gallstones. The health care providers involved with ultrasonography held training certifications and were not involved in educating other providers on ultrasound use. There were several limitations to our study, namely the complexity of the health system, small sample size, unexpected language barrier, and lack of pilot group.

Primary Presenter: **Matthew Iacovetto**

Project Title: *Educational Resources for Patients Considering a Left Ventricular Assist Device: A Cross-Sectional Review of Internet, Print, and Multimedia Materials*

Abstract:

Educational Resources for Patients Considering a Left Ventricular Assist Device: A Cross-Sectional Review of Internet, Print, and Multimedia Materials

Matthew C. Iacovetto, BS, Daniel D. Matlock, MD, MPH, Colleen K. McIlvennan, DNP, ANP, Jocelyn S. Thompson, MA, William Bradley, RN, Shane J. LaRue, MD, MPHS and Larry A. Allen, MD, MHS

Abstract

**Background**—Left ventricular assist devices (LVADs) are being used with increasing frequency to treat severe heart failure. To assist in decision making, patients often seek out informational resources when considering implantation. The primary study objective was to characterize the scope and quality of available LVAD educational materials.

**Methods and Results**—In July 2013, we performed a cross-sectional search of Internet, print, and multimedia resources available to patients considering LVAD. Written materials <10 sentences, videos <2 minutes, and materials clearly directed to healthcare professionals were excluded. Seventy-seven materials met inclusion criteria. Potential benefits of LVAD therapy were discussed in all (n=77), whereas less often mentioned were risks (n=43), lifestyle considerations (n=29), surgical details (n=26), caregiver information (n=9), and hospice or palliative care (n=2). Further analysis was conducted on the 14 materials that recognized a decision or alternate treatment option, in which 7 used outdated statistics, 12 scored above an eighth grade reading comprehension level, and 12 met <50% of International Patient Decision Aid Standards criteria. Survey participants rated all but one as biased toward accepting LVAD therapy.

**Conclusions**—Although many resources exist for patients considering an LVAD, the content is suboptimal. Benefits of LVADs are often presented in the absence of risks, alternative options, and caregiver considerations. Most materials use outdated statistics, are above the reading level of average Americans, and are biased toward accepting LVAD therapy. There is no tool that would qualify as a formal decision aid.



Primary Presenter: **Michael Jarrett**

Project Title: *Influence of Gelatin-Thrombin Matrix Tissue Sealant on Bacterial Colony Formation and Risk of Pelvic Infection*

Abstract:

ABSTRACT

**OBJECTIVE:** Gelatin-thrombin matrix tissue sealant (GTM) use was previously identified as an independent predictor of pelvic infection following hysterectomies. We aim to elucidate contributing factors by assessing influence of GTM on bacterial colony formation and characterizing bacteria present at the vaginal cuff.

**METHODS:** Escherichia coli was incubated in phosphate-buffered saline (PBS) and pelvic washings with and without GTM to assess influence on colony formation. Pelvic washings of the vaginal cuff were collected from hysterectomies occurring June through October 2015. In vitro techniques, 16S rRNA gene qPCR, and 16S amplicon sequencing was performed with washings to characterize bacteria at the vaginal cuff.

**RESULTS:** Mean bacterial colony formation in PBS was greater for E. coli incubated in the presence of GTM ( $1.48 \times 10^7$  CFU/ml) versus without ( $9.95 \times 10^5$  CFU/ml) following 20 hours incubation ( $p = 0.001$ ). Out of 61 pelvic washings samples, 3 were culture positive ( $\geq 5000$  CFU/ml) with Enterococcus faecalis.

**CONCLUSION:** In vitro experiments conclude GTM supports colony formation of E. coli in PBS. Analysis of pelvic washings revealed presence of E. faecalis, but results were inconclusive. Further studies are recommended.

**Primary Presenter: Emily Johnson**

Project Title: *Molecular Identification of Staphylococcus aureus in Airway Samples from Children with Cystic Fibrosis*

Abstract:

**Background:** Staphylococcus aureus is a common and significant pathogen in cystic fibrosis. We sought to determine if quantitative PCR (qPCR) and 16S rRNA gene sequencing could provide a rapid, culture-independent approach to the identification of S. aureus airway infections.

**Methods:** We examined the sensitivity and specificity of two qPCR assays, targeting the femA and 16S rRNA gene, using culture as the gold standard. In addition, 16S rRNA gene sequencing to identify S. aureus directly from airway samples was evaluated. DNA extraction was performed with and without prior enzymatic digestion.

**Results:** 87 samples [42 oropharyngeal (OP) and 45 expectorated sputum (ES)] were analyzed. 59 samples (68%) cultured positive for S. aureus. Using standard extraction techniques, sequencing had the highest sensitivity for S. aureus detection (85%), followed by FemA qPCR (52%) and 16SrRNA qPCR (34%). For all assays, sensitivity was higher from ES samples compared to OP swabs. Specificity of the qPCR assays was 100%, but 21.4% for sequencing due to detection of S. aureus in low relative abundance from culture negative samples. Enzymatic digestion increased the sensitivity of qPCR assays, particularly for OP swabs.

**Conclusion:** Sequencing had a high sensitivity for S. aureus, but low specificity. While femA qPCR had higher sensitivity than 16S qPCR for detection of S. aureus, neither assay was as sensitive as sequencing. The significance of S. aureus detection with low relative abundance by sequencing in culture-negative specimens is not clear.

Primary Presenter: Ilan Kaye

Project Title: *Association Between Clean Intermittent Catheterization and Urinary Tract Infection in Infants and Toddlers with Spina Bifida*

Abstract:

**Introduction:** The primary goal of urologic management in children with spina bifida is to reduce risk of urinary tract infection (UTI) and associated renal injury. While clean intermittent catheterization (CIC) has been the mainstay of treatment, recent studies suggest that this approach is not without risk. The objective of this study was to examine the association between alternative bladder management strategies and UTI in infants and toddlers with spina bifida.

**Methods:** We conducted a retrospective cohort study of spina bifida patients aged 0-3 years seen in a multidisciplinary spinal defects clinic between 2008 and 2013. Inclusion criteria included a primary diagnosis of meningocele, myelomeningocele, or lipomyelomeningocele. Patients were excluded if they had less than one year of follow-up, had urologic surgery prior to initial evaluation, or had incomplete data for analysis. Bivariate analyses were performed using  $\chi^2$  or Fisher's exact tests. Multivariate analyses were performed using logistic regression.

**Results:** A total of 107 patients meeting study criteria were identified. The majority of patients had lumbar lesions (74.8%) and ventriculoperitoneal (VP) shunts (72.9%). Initial bladder management was by CIC in 39.3% of patients and spontaneous voiding in 60.8% of patients. Median age at follow-up was 2.5 years. During the study period 23.4% of patients switched from spontaneous voiding to CIC. Patients managed with CIC were more likely to have UTIs at final follow-up than patients managed with voiding (35.7% vs. 18.5%;  $p=0.045$ ). Patients with vesicoureteral reflux (VUR) were also more likely to have UTIs (54.5% vs. 17.9%;  $p=0.015$ ). Patients who switched from voiding to CIC over the study period were more likely to be evaluated with urodynamics (72.0% vs. 31.8%;  $p<0.0001$ ) than patients managed with voiding alone. Patients who switched to CIC were also more likely to have VUR (16% vs. 0%;  $p=0.09$ ) and UTIs (24% vs. 15%;  $p=0.06$ ) than patients managed with voiding alone; however, these differences were not statistically significant.

**Conclusions:** In our series, infants and toddlers with spina bifida initially managed with voiding had a lower risk of UTI than those managed with CIC. Patients who switched to CIC after a period of initial observation with voiding did not have a significantly different risk of UTI compared to those managed with CIC alone. These findings suggest that early initiation of CIC may not be warranted in all infants with spina bifida. Further studies are needed to more clearly define optimal indications for initiation of CIC in these patients.

Primary Presenter: **Michael Kem**

Project Title: *Exploring Geographic Distributions of Penetrating Trauma in Cape Town, South Africa*

Abstract:

TITLE: Exploring Geographic Distributions of Penetrating Trauma in Cape Town, South Africa

BACKGROUND AND OBJECTIVES: South Africa bears one of the most significant burdens of traumatic injury in the world. As such, there is ongoing interest in developing increased understanding about patterns of trauma €” with an eye towards enhancing emergency medical response and prevention. One tool that holds promise towards this end is the use of Geographic Information Systems (GIS). The primary aim of this project is to utilize GIS to further explore spatial distributions of trauma in Cape Town, and secondarily to examine demographic and socioeconomic factors that may play a part in such distributions.

METHODOLOGY: A retrospective chart review was conducted for a cohort of patients (n=909) with penetrating trauma to the torso presenting to a tertiary referral center in Cape Town. Geographic data obtained included patients€™ residential postal codes and geographic locations of injury. In conjunction with census data, GIS maps were created to illustrate the distribution of cases by postal code, suburb, and main place. Additional demographic and socioeconomic data were mapped in juxtaposition with traumatic case distribution.

RESULTS: On mapping, the data from this cohort demonstrate a geographic distribution significantly different from those illustrated in previously published studies on this topic. It was also found that mapping cases by residential postal code represents a different spatial distribution than mapping by geographic location of injury €” with the latter heavily clustered around primary facilities that refer patients to higher levels of care €” particularly those in Delft, Elsies River, Khayelitsha, and Kraaifontein. Finally, Apartheid planning has left a legacy of highly dense and segregated sub-populations that tend to rank on the lower end of socioeconomic measures examined, which moreover tend to overlap with higher incidences of trauma.

CONCLUSIONS: Despite a variety of limitations €” it was possible to meet the primary objective of improving understanding of the geographic distribution of trauma in Cape Town through retrospective chart review and GIS mapping €” thus offering a novel contribution to the understanding of spatial injury patterns in Cape Town. Plentiful future directions are possible with this research, perhaps ideally beginning with more sophisticated geo-statistical analyses relating spatial injury patterns to other demographic, socioeconomic, and descriptive variables of the built environment. Such efforts may ultimately hold promise for improving decisions in regards to the targeting and allocation of finite public health resources.

**Primary Presenter: Charles Kemmler**

**Project Title:** *Inter-Rater Reliability in the Evaluation of Increased Intracranial Pressure using Ultrasound Measurement of Optic Nerve Sheath Diameter*

**Abstract:**

Ultrasound (US) measurement of the optic nerve sheath diameter (ONSD) has emerged as a rapid, inexpensive alternative to CT imaging for the detection of elevated intracranial pressure (ICP). To elucidate the potential of ultrasound for this application, it is important to assess the degree of precision among operators measuring ONSD. Furthermore, the development and validation of an optic nerve sheath model could provide a reproducible, accessible method for measurement training. The objective of this study was to evaluate the inter-rater reliability (IRR) of ultrasound ONSD measurement among users with varying degrees of experience, using ultrasound images of both in situ optic nerve sheaths and ONS models. Sixty Emergency Medicine residents, fellows and attendings took part in the study, with 12 of those reporting 0 previous ONSD US measurement experiences, 35 reporting 1-25 and 13 reporting >25 previous experiences. Measurements of all study US images had an average SD of 0.667, 0.627, and 0.612 ( $p = 0.878$ ) among users with 0, 1-25 and >25 previous experiences, respectively. Sensitivity for the detection of increased ICP, as reflected by detection of an ONSD above 5.5 mm, ranged from 69.2 to 92.3%, with variation due to user experience and in situ vs model sheath measurement. Precision of ONSD measurements did not vary significantly between users based on previous levels of experience. Further evaluations are necessary to elucidate the reliability of ONSD measurement for the detection of increased ICP in users of various experience as well as the efficacy of optic nerve sheath models for the teaching of ONSD US measurement.

**Primary Presenter: Stephanie (Stevie Lynne) Kohler**

**Project Title:** *Germinal Center T Follicular Helper Cells (GC TFH) are Highly Permissive to HIV-1 and Alter Their Phenotype During Virus Replication*

**Abstract:**

HIV-1 replication is concentrated within CD4+ T cells in B-cell follicles of secondary lymphoid tissues during asymptomatic disease. Limited data suggest that a subset of T follicular helper cells (TFH) within germinal centers (GC) is highly permissive to HIV-1. Whether GC TFH are the major HIV-1 virus-producing cells in vivo has not been established. Here, we investigated TFH permissivity to HIV-1 ex vivo by spinoculating and culturing tonsil cells with HIV-1 GFP reporter viruses. Using flow cytometry, higher percentages of GC TFH (CXCR5<sup>high</sup>PD-1<sup>high</sup>) and CXCR5+PD-1<sup>low</sup> cells were GFP+ than non-GC TFH (CXCR5+PD-1<sup>intermediate</sup>) or extrafollicular (CXCR5<sup>-</sup>) cells. When sorted prior to spinoculation, however, GC TFH were substantially more permissive than CXCR5+PD-1<sup>low</sup> or extrafollicular cells, suggesting that many GC TFH transition to a CXCR5+PD-1<sup>low</sup> phenotype during productive infection. In situ hybridization on inguinal lymph node sections from untreated HIV-1-infected individuals without AIDS revealed higher frequencies of HIV-1 RNA+ cells in GC than non-GC regions of follicle or extrafollicular regions. Superinfection of HIV-1-infected individuals' lymph node cells with GFP reporter virus confirmed the permissivity of follicular cells ex vivo. Lymph node immunostaining revealed 96% of CXCR5+CD4+ cells were located in follicles. Within sorted lymph node cells from four HIV-infected individuals, CXCR5+ subsets harbored 11- to 66-fold more HIV-1 RNA than CXCR5- subsets, as determined by RT PCR. Thus, GC TFH are highly permissive to HIV-1, but downregulate PD-1 and to a lesser extent CXCR5 during HIV-1 replication. These data further implicate GC TFH as the major HIV-1-producing cells in chronic asymptomatic HIV-1 infection.

**Primary Presenter: Kevin Krughoff**

**Project Title:** *Change in Cystectomy Complications Following use of Pericardial Collagen Matrix Strips*

**Abstract:**

Introduction: With the adoption of radical cystectomy as the standard treatment for muscle-invasive and chemo-resistant, high-risk non-muscle-invasive bladder cancers,<sup>1</sup> the reconstructive aspects of urinary diversion have garnered increasing attention.<sup>2</sup> Orthotopic ileal neobladder and variations on this technique are widely accepted solutions after radical cystectomy,<sup>2</sup> however surgical anastomoses may be subject to certain complications due to intraluminal changes during the postoperative period. In the early weeks of healing, adhesions can develop and create areas of tension during filling, eventually thinning and reducing the elasticity of the intestinal lumen.<sup>3</sup> A seromuscular tear during overfilling can open the reconfigured lumen to surrounding pelvic structures, including the small bowel, colon, rectum, vagina, and iliac vessels.<sup>3</sup> Although rare, these complications necessitate intensive management and can lead to protracted periods of follow-up care and recovery, increased morbidity, and higher treatment costs.<sup>3,4</sup> Suture line failure has been implicated as a contributing factor to anastomotic leaks and fistula formation, and while the use of bovine pericardial collagen matrix strips (BPS) for staple-line reinforcement has demonstrated success in avoiding these complications in gastrectomy and lung reduction surgery, use of BPS in urologic surgery has yet to be reported in the literature.<sup>3-8</sup> Here we retrospectively compared the outcomes of patients undergoing cystectomy and one of three surgical reconstruction techniques using BPS with those who did not receive buttressing. Our aim was to assess whether reinforcing staple-lines with BPS reduced the incidence of fistula formation in this series of cases.

Methods: Records from all patients undergoing radical cystectomy from 2005-2014 were reviewed from a tertiary care hospital in Denver, Colorado. Rates of fistula formation and bowel obstruction were tracked prior to and after incorporation of Peri-strips<sup>®</sup> (Baxter Healthcare Corporation). Covariates included age, stage at diagnosis and cancer type if applicable, surgical repair type (neobladder, Indiana pouch or continent urinary diversion), use of adjuvant or neo-adjuvant chemotherapy, pathological surgical margin status and history of partial cystectomy.

Results: 397 records were analyzed, 317 cases were performed prior to incorporation of BPS and 80 cases utilized BPS. A significant decrease in the odds of bowel obstruction occurrence was found subsequent to incorporation of BPS (OR=0.237; 95% CI 0.027, 0.967; p=0.0394). A non-significant decrease in the odds of fistula occurrence was found when using BPS (OR =0; 95% CI 0, 2.11; p=0.353), however when evaluating of frequency of fistula or bowel obstruction together there yielded a significant decrease in the collective odds of complication occurrence (OR=0.194; 95% CI 0.022, 0.784).

Conclusions: Our results show that following the routine incorporation of BPS in radical cystectomy cases there is a significant decrease in the odds of bowel obstruction or fistula occurrence. These results imply that routine BPS use may serve to decrease the odds of serious complications occurring following cystectomy. While a statistical significance was not found when evaluating fistula complication rates as a separate entity, we feel that the absolute difference in fistula rate following incorporation of BPS carries clinical significance given the protracted periods of follow-up care and recovery, increased morbidity, and higher treatment costs associated with a single episode of fistula occurrence.

**Primary Presenter: Do Yeon Kwon**

Project Title: *Blood Sample Handling in Metabolomics: Effects of Vacutainer Selection and Storage Temperature*

Abstract:

Metabolomics is a study of endogenous metabolites in a biological organism and is emerging as a valuable tool in medicine. However, one major challenge in metabolomics is a lack of quality control protocol for sample collection and handling. In this study, we conducted a small scale metabolomics analysis of serum and plasma from 3 volunteers. Each sample was collected in 3 different vacutainers, Tiger, EDTA, and P100, and stored at 4°C for various durations before centrifugation. There was a notable clustering of metabolites found for each biological subject but not for the tube type or time point. Tiger vacutainer consistently obtained more metabolites compared to EDTA and P100 vacutainers. There was not a significant difference between the EDTA and P100 tubes. Finally, no consistent trend was found in metabolites at time points 0, 0.5, and 1 hour. Our results suggest that biological variation plays a major role in determining metabolites found in serum and plasma more so than any variation in sample collection and handling.



Primary Presenter: **Jennifer LaBudde**

Project Title: *Communications Training in Obstetrics for Third Year Medical Students: An Online Training Program for Standardized Patients that Improves Inter-rater Reliability when Rating a Checklist*

Abstract:

Purpose: To create a training program that improves-rater reliability among standardized patients when rating students on a videotaped obstetrical communications student-patient encounter. The goal was to design a training program composed of written materials and online modules that would teach standardized patients to rate students more objectively using a checklist format.

Method: 4 cases that each focused on a difficult obstetric communication situations were written. Trained standardized patients acted out these cases with third year medical students and were videotaped. These videotapes were used to create a training program to teach standardized patients how to evaluate each student based on a specialized checklist. A written guide was created to scoring each item on the checklist. A medical student rater, and three other faculty raters came to a consensus on ratings for each student for 28 different videos, 7 for each case. These ratings were then used to create an in-person training session for each of the 4 cases, as wells as an online module for each of the 28 videos that would give feedback to standardized patients on the accuracy of their checklist ratings.

Results: A written guide and appendix were created. 4 different in-person training sessions were designed for each case. 28 different online modules were created, with standardized ratings for each item on a checklist.

Conclusion: Our next steps are to run our training program and assess whether our standardized patients are able to use our guide and online modules to reach at least 80% accuracy in their ratings.

Primary Presenter: **Paul Leccese**

Project Title: *Documentation of Symptoms and Diagnosis Accuracy in Children with Blunt Head Trauma*

Abstract:

**BACKGROUND:** Head injury is a common cause of pediatric ED visits, but definitive diagnosis of mild traumatic brain injury (mTBI), or concussion, is often not made.

**OBJECTIVE:** To examine how emergency providers document symptoms associated with mTBI and how accurately they discriminate diagnoses (mTBI vs. closed head injury).

**METHODS:** Retrospective chart review of 162 children presenting to a single ED following head injury to determine symptoms documented in the patient and the clinical diagnosis made. We compared the presence or absence of symptoms in the provider note to those in our study database for the same patients, as well as the clinical diagnosis made by ED providers to our study definition of mTBI: GCS of 13-14, any loss of consciousness (LOC) or amnesia, or  $\geq 2$  symptoms typical of concussion (1).

**RESULTS:** 162 patients' data was available for review. A median number of 3 symptoms were documented in all patients and in the subset meeting the study definition of CHI ( $p=0.88$ ). 129 children (80%) received a clinical diagnosis of CHI, but 115 (89% of those) met the study definition of mTBI. All 33 children with a clinical diagnosis of mTBI met the study definition.

**CONCLUSIONS:** ED providers infrequently document mTBI symptoms and frequently misdiagnose mTBI based on our study definition, potentially leading to a lack of appropriate follow-up care and an underestimation of the true incidence of mTBI.

**Primary Presenter: Emma LeWinter**

Project Title: *Developing a culture of quantitative data collection to enable quality improvement projects for the Healthy Beginnings Clinic at Warren Village*

Abstract:

Abstract:

Background: Medical student-run free clinics fill a void within the medically underserved populations nationwide. The experience medical students gain via volunteering at these clinics also provides a necessary initiation to becoming providers within the systems-based healthcare system. Though there are many student-run clinics at medical schools throughout the US, there is little literature on how they are run. Furthermore, there is even less literature on how to assess the clinic populations'™ needs and how best to address them. Healthy Beginnings Clinic is a student-run free pediatric clinic for the residents of Warren Village, a non-profit providing housing services to single parent families. Many of the residents at Warren Village are new immigrants to the US and often do not yet have a primary care pediatrician. Healthy Beginnings Clinic strives to provide a starting off point for these families, via free health care, vaccines, and assistance in finding a primary care provider. Though this clinic was started 16 years ago, there has never been an assessment of what the main needs are of the population, and if the clinic is meeting those needs.

Methods: A primary survey was created to assess how easily or disruptive a new data collection tool could be integrated into the current clinic flow, as well as how many responses would be gathered from the patrons. A second survey focusing on integral questions about not only how the clinic is currently providing care, but also how it could better serve its population has been created. This later survey will also collect data about the volunteers at the clinic and their educational experience. Data from this later survey will be assessed at the end of each semester starting after integration of the follow-up study. All data will be de-identified and stored in a secure, web-based server through the University of Colorado, entitled REDCap.

Results: The initial results were gathered over 10 weeks at the Healthy Beginnings clinic. Of these 10 clinic nights, patients were missing the newly introduced questionnaires from three clinic nights showing that 70% of the clinic nights had successful and complete data collection. The preliminary results in assessing the rate of data collection showed that 78% percent (33 of 42) of the total patients seen during the 10 clinic visits since the new tool was introduced had completed the questionnaire.

Conclusions: The results above provided crucial data as to how effective the implementation of a survey within the current clinic process will be. These reassuring findings add support to the implementation of a more extensive survey into the clinic'™s protocols. The data from this new survey will be pooled at the end of each semester and reported back to the student clinic managers. System-based changes reflecting these data implemented into the following semesters clinics. Hopefully within one year of integration of this data collection, Healthy Beginnings Clinic will have instituted new policies providing better and more appropriate care to its patrons.

Primary Presenter: Erin Lindsay

Project Title: *The International Medical Response to the 2010 Earthquake in Haiti: Lessons for Future Disaster Relief*

Abstract:

Abstract:

Title: The International Medical Response to the 2010 Earthquake in Haiti: Lessons for Future Disaster Relief

Background and Objectives: On January 12, 2010, a 7.0 magnitude earthquake struck Haiti. The impact was immediate and devastating, with hundreds of thousands killed. The international community's relief efforts were the largest in history, but repeated and amplified damaging, unsustainable, and counterproductive effects identified in prior disasters. The objective of this paper was to explore the most frequently cited barriers to an effective medical disaster relief effort.

Methodology: Relevant, existing literature was identified via Pubmed and Google Scholar and analyzed in order to delineate the most prevalent themes that arose after the international medical response to the Haiti earthquake.

Conclusions: The most frequently cited themes included issues relating to coordination and cooperation among responding organizations, lack of preparation on the part of some organizations and international volunteers, and the need for standardization and professionalization among medical responders to natural disasters in order to ensure that patients are treated with the highest ethical standard and quality of care.

Primary Presenter: **Brian Locke**

Project Title: *When Wells Isn't Good Enough: A Resident-Driven EHR Decision Support Tool for Evidence-Based CTPA Ordering in an Academic Emergency Department*

Abstract:

Authors: Karina Handoyo DO, Patrick Kneeland MD, Kyle Lamb MD, Brian Locke MS3, Allison Nitsch MD

Learning objectives:

- \* Understand the scale of resource utilization related to CT PE scanning at a tertiary care hospital
- \* Understand tools to increase appropriate ordering of imaging
- \* Identify how the integration of an electronic medical record with decision support can help to reduce unnecessary imaging

It is estimated that as many as 900,000 Americans will have a pulmonary embolism this year and as many as 200,000 of these will be fatal. This risk leads inpatient and outpatient physicians to order potentially millions of CT pulmonary angiograms across the US annually. Although pulmonary embolism can be a fatal condition, it is estimated that as many as 30-55% of scans are not indicated by standard, validated screening algorithms, which exposes patients to unnecessary ionizing radiation, risks renal injury, lowers the testing yield and drives significant health system costs.

Project Aim: The aim of our project is to (1) Evaluate the current state of CT-PE utilization across our own institution, (2) Describe existing tools for provider decision support for CT-PE ordering within our institution, (3) Identify potential targets for enhanced provider decision support for CT-PE ordering, and ultimately (4) Increase the utilization of standard risk factor assessment tools to reduce the number of non-indicated CT PE scans by 50 % within 12 months at the University of Colorado Hospital.

Process design: Reducing unnecessary imaging is an ongoing focus for both cost and quality considerations. As a result, a variety of stakeholders were already in place at the University of Colorado Health center. Our team mapped key stakeholders and connected with champions from each division, which included emergency medicine, internal medicine, radiology and information technology, among others. We reviewed data that had previously been collected on ER ordering practices and compared this to inpatient internal medicine ordering practices. In both groups, a retrospective revised Geneva score was calculated to understand if validated risk assessment tools had been appropriately applied prior to scanning to confirm the indication and appropriateness for CT PE. A survey was conducted to understand awareness of currently available internal diagnostic pathways. Finally, in conjunction with the ER and radiology departments, we integrated the internal pathway with the EMR for decision support at the time a CT PE was ordered.

Findings: Our initial process identified confirmed that 30-50% of CT scans ordered from the ER and IM units were unnecessary and did not follow validated diagnostic guidelines. While the ER currently had previously developed a diagnostic pathway to guide ordering, this required physicians to actively pull the guide this from the intranet. IM had no such pathway. Little is known about how the ER pathway is used and with what outcomes. Data collection is ongoing and final results will be presented shortly with the completion of our survey and introduction of modifications to the EMR order interface.

Primary Presenter: Seth Lofgreen

Project Title: *Integrating The Integrated Skin Exam Film into Medical Education*

Abstract:

**Background:** The mortality rate for melanoma continues to rise and the greatest improvement in melanoma survival is attributable to early detection with skin cancer screening exams. However, physicians feel that limited training in the skin examination and limited clinical time both serve as barriers to adequately assess high-risk lesions.

**Objective:** To test the use of The Integrated Skin Exam film as an instructional tool to teach the skin exam in a live classroom setting, outside of the purview of the original formal study.

**Methods:** Identical cross-sectional surveys were administered pre- and post-film to a class of first-year medical students at the time of viewing The Integrated Skin Exam film. Results were compared to the initial assessment of this film as a teaching tool in a research setting.

**Results:** Of the maximum 182 possible surveys administered, we collected 148 pre-surveys and 142 post-surveys (81.3% and 78.0% response rates, respectively). After viewing the film, students showed improvement in identification of high-risk demographic groups (79.3% vs 58.9%,  $p < 0.001$ ) and high-risk anatomic sites in both women (91.9% vs 59.6%,  $p < 0.001$ ) and men (92% vs 62.1%,  $p < 0.001$ ). Students demonstrated increased confidence in the skin cancer examination (SCE) (52.2% vs 6.9%,  $p < 0.001$ ) and a greater proportion (74.4% vs 48.3%,  $p < 0.001$ ) of students believed less than 3 minutes were required to integrate a SCE into the routine examination.

**Conclusions:** The Integrated Skin Exam film is a valuable training tool as proven by increased knowledge of and improved attitudes about the SCE after viewing the film. In addition, there was a striking similarity in outcomes when using this film in a live classroom environment compared to the original study setting.

**Primary Presenter: Reed Louderback**

Project Title: *Inter-Rater Reliability in the Evaluation of Increased Intracranial Pressure using Ultrasound Measurement of Optic Nerve Sheath Diameter*

Abstract:

Ultrasound (US) measurement of the optic nerve sheath diameter (ONSD) has emerged as a rapid, inexpensive alternative to CT imaging for the detection of elevated intracranial pressure (ICP). To elucidate the potential of ultrasound for this application, it is important to assess the degree of precision among operators measuring ONSD. This study evaluated the inter-rater precision of US ONSD measurement among emergency medicine residents and faculty using ultrasound images of both in situ optic nerve sheaths and optic nerve sheath models. Each of 56 de-identified participants measured 5 US images of in situ optic nerve sheaths and 5 images of optic nerve sheath models of varying diameters. A paired, two-tailed t-test was used to compare standard deviations between groups. Measurements of in situ sheaths had a SD of 0.724 and 0.652 ( $p = 0.681$ ) among users with 1-30 and greater than 30 previous experiences, respectively. Measurements of model sheaths had a SD of 0.553 and 0.572 ( $p = 0.895$ ) among users with 1-30 and greater than 30 previous experiences, respectively. Sensitivity of the detection of increased ICP, as reflected by increased ONSD above 5.5 mm, ranged from 69.2 to 92.3%. Thus, precision of ONSD measurements did not vary significantly between users based on previous levels of ONSD measurement experience. The accuracy of measurements of optic nerve sheath models of known diameters was not increased with increased user experience. Data demonstrate a degree of sensitivity for the detection of increased ONSD, even among users with minimal previous experience. Further evaluations are necessary to elucidate the reliability of ONSD measurement for the detection of increased ICP in users of various experience.

Primary Presenter: Kelsey Luoma

Project Title: *Ultrasound use in Mwanza, Tanzania: a needs assessment*

Abstract:

Ultrasound is a useful diagnostic tool that has revolutionized patient care and diagnosis, most notably in developing countries. Several small studies in Rwanda, Liberia, and the Amazon have shown that ultrasound use has a significant impact on clinical management and patient outcomes. However, because ultrasound is an operator-dependent tool, its effective integration requires provider training. The purpose of our study is to assess a variety of health centers in a particular region in Tanzania to determine available diagnostic resources, current uses of ultrasonography, and need for future resources and training. The study design was a qualitative needs assessment of ultrasound utilization in health facilities within the city of Mwanza. The results of the assessment demonstrated that the health system in Tanzania is quite complex and extremely limited in resources, particularly health care providers. Ultrasonography was only utilized at the hospital level and was primarily utilized for OB-GYN purposes and evaluation of kidney and gallstones. The health care providers involved with ultrasonography held training certifications and were not involved in educating other providers on ultrasound use. There were several limitations to our study, namely the complexity of the health system, small sample size, unexpected language barrier, and lack of pilot group.



Primary Presenter: **Alexandra Ly**

Project Title: *Working to End Teen Obesity*

Abstract:

Background:

Childhood obesity in Aurora and select Denver neighborhoods is increasing at a disproportionate rate compared to state and national levels. To address the issue of teen obesity, we sought to understand teenager perspectives on how health care providers (HCPs) can best engage teenagers in conversations about body weight and body image (BW/BI) to provide effective counseling.

Methods:

Community-based participatory research was performed in collaboration with a teenager advisory board (TAB). The TAB provided insight into the key issues through descriptions of their experiences discussing weight with providers and then co-developed the focus group questions. Teenagers participating in this study were recruited from local high schools with the help of high school guidance counselors. Focus groups were voice recorded, transcribed, and analyzed with open qualitative coding by three coders. Descriptive statistics were used. Participants of the focus groups as well as the TAB were compensated with \$25.00 gift cards. The protocol was IRB exempt: 13-1670.

Results:

Two 2-hour focus groups were conducted consisting of 9 Latina girls and 8 Latino boys ages 15-18 from Aurora, CO. Sixteen reported having a conversation with a health care provider (HCP) about BW/BI; all respondents believed it was important for HCPs to know how to initiate conversations about BW/BI. Five main themes emerged: open the conversation by getting to know the teenager and make them feel comfortable; elicit patient-centered goals and motivation around health; identify concrete weight management suggestions specific to the teenager's culture, family income, and access to food and exercise; provide information about weight loss expectations; and encourage them by verbal affirmations of support. In the second arm of this study, two 2-hour focus groups were conducted consisting of 8 boys and 8 girls of mixed races. Analysis for this set of focus groups is ongoing at this time.

Conclusion:

Teenagers feel that the conversation they have with their HCPs regarding BW/BI can be improved. Teenagers express that the most effective way for HCPs to discuss BW/BI is to build trust, elicit information to develop personalized recommendations, and encourage them to feel positive and motivated about BW/BI goals.

**Primary Presenter: Brittney Macdonald**

Project Title: *Developing Education Materials for an Early Childhood Health and Development Program in Southwest Guatemala*

Abstract:

**Purpose:** International organizations have recognized the importance of the first two years of life for children's physical and mental growth. Many deficits arise from problems with malnutrition, hygiene, and development in these early years. The purpose of our research was to pilot test education materials for mothers in the Trifinio region of Guatemala regarding child development topics like nutrition, health, hygiene, development, and injury prevention.

**Methods:** Two 30-page interactive flipchart talks were created for 0-6 month olds and 6-12 month olds. Guatemalan community health workers presented the information to groups of 5-10 mothers. The talks provided an interactive education environment via the use of games, activities, and open-ended questions. We gave learning assessments to the mothers before the intervention, immediately after the intervention and 1-2 weeks after the intervention. After the presentation, we conducted focus groups (13 total) with the mothers to elicit qualitative feedback about the flipcharts.

**Results:** We piloted the educational materials with 76 women in the community (38 women in both flipchart groups). Scores improved for the 0-6 month flipchart from 77% to 87% ( $p < .0001$ ), and then to 90% ( $p = 0.01$ ) for the pre-, immediate post-, and 1-2 week post-assessments, respectively. Likewise, scores for the 6-12 month flipchart improved from 78% to 89% ( $p < .0001$ ), and then to 92% ( $p = 0.03$ ) for the pre-, immediate post-, and 1-2 week post-assessments, respectively.

**Conclusion:** Mothers significantly increased their knowledge about health and development topics following this intervention. Their knowledge continued to increase 1-2 weeks after the intervention without re-exposure to the materials, presumably by informal reinforcement with other mothers. Employing an interactive education intervention may be an effective way to educate mothers on child health and development and may, in turn, positively influence the health of their children.

**Primary Presenter: Cory Manly**

Project Title: *Exploring the Role of the lncRNA HOTAIR with a Genomic "Calling-Card" in an Inducible Mammalian System*

Abstract:

HOTAIR is a long non-coding RNA (lncRNA) which aids in silencing the HOXD gene locus of chromosome 2 by binding Polycomb Repressive Complex 2 and Lysine Specific Demethylase 1, and is thus highly associated with breast cancer metastasis when overexpressed. Its 5' and 3' ends have been previously shown to be both necessary and sufficient to bind these two proteins, respectively. We created cell lines able to stably express either the 5' or the 3' ends of affinity-tagged HOTAIR. These doxycycline inducible cell lines can be used to investigate where HOTAIR associates in the genome by utilizing the "genomic calling-card" method adapted from Wang et al. 2012. Our system utilizes an RNA tagging system to associate a transposon with the lncRNA constructs, leading to insertion of a "calling-card" DNA sequence. HOTAIR constructs were transfected into HeLa Tet-On 3G cells and clones with the highest HOTAIR RNA expression were selected. Reverse transcription Quantitative PCR (RT-qPCR) was used to confirm test induction and expression levels. In summary, cell lines were created which could express the first 360 bp of HOTAIR on the 5' end, and the last 649 bp of the 3' end for future calling card utilization to explore how the components which bind PCR2 and LSD1 of HOTAIR interact with the genome.

**Primary Presenter: Natasha Marvi**

**Project Title: *Teledermatology as an Educational Tool for Teaching Dermatology to Residents and Medical Students***

**Abstract:**

Although teledermatology (TD) is regarded as a tool to improve patient access to specialty healthcare, little has been done to evaluate its role in medical education. We describe the TD program at the Denver (CO) Department of Veterans Affairs Medical Center and evaluate its use as an educational tool for teaching dermatology to dermatology residents and medical students. Dermatology residents manage TD consultations and review all cases with a faculty preceptor; medical students participate as observers when possible. This study assessed dermatology resident (n = 14) and medical student (n = 16) perceptions of TD and its usefulness in teaching six core clinical competencies. Both residents (79%) and medical students (88%) strongly agree or agree that TD is an important educational tool. In general, medical students were slightly more satisfied than residents across all of the core competencies assessed except for patient care. Medical students and residents were most satisfied with the competencies of practice-based learning and improvement and medical knowledge, whereas they were least satisfied with those of interpersonal and communication skills and professionalism. Overall, TD is valued as a teaching tool for dermatology in the areas of patient care, medical knowledge, practice-based learning and improvement, and systems-based practice.

**Primary Presenter: James McCullough**

**Project Title:** *The Role of IL-10 and B-Cells in Acute Kidney Injury*

**Abstract:**

IL-10 AND THE ROLE OF B-CELLS IN ACUTE KIDNEY INJURY James McCullough University of Colorado School of Medicine, Aurora, CO, USA.

Following ischemic injury to the kidneys, there is a rapid and robust inflammatory response mediated by the alternative path of the complement pathway that results in acute kidney injury. B-cells participate in this injury in both an aggravating and mitigating role, where the mitigation of injury is suspected to occur via IL-10 cytokine signaling. It is the goal of this project to elucidate the time course and location of IL-10 expression following ischemic injury, the role that B-cells play in that expression and to better understand the effects of IL-10 and B-cells in the extent of acute kidney injury following ischemia/reperfusion injury.

To characterize the location and time course of IL-10 production, a mouse model was used with collection of serum, kidney, and spleen following ischemic injury. Injury was induced via bilateral clamping of the renal pedicles for 24 minutes followed by reperfusion. IL-10 levels were monitored via ELISA and quantitative PCR. To evaluate the role of B cells and the effect of IL-10 in acute kidney injury, genetically modified IL-10 knockout mouse models were subjected to ischemia/reperfusion injury. Additionally, genetically modified mu mice with absent B cells and mice depleted of B cells via anti-CD 20 antibodies were subjected to the procedure as well. Finally, mu mice with absent B cells were subjected to ischemic injury with pre-injury injection of IL-10. The extent of acute kidney injury was monitored with serum measurement of blood urea nitrogen and creatinine.

Efforts to characterize the time course and location of IL-10 production revealed a two-fold increase in serum concentrations of IL-10 24 hours after ischemia/reperfusion followed by a rapid return to baseline at 48 hours as measured by ELISA. Tissue specific IL-10 expression also showed similar increases in the kidney and spleen with 2 fold and 5 fold, respectively which peaked at 24 hours after reperfusion and declined steadily thereafter. Ischemia/Reperfusion of IL-10 knockout mice which were expected to have significantly more injury suffered less severe acute kidney injury relative to wild-type controls. Mu mice with absent B cell production did appear to suffer more severe injury relative to wild-type controls. At this time, depletion of B cells with injection of with anti-CD 20 has yet to reveal statistically significant results.

From these experiments, there does appear to be a predictable and reproducible effect of ischemia/reperfusion injury on the expression and location of IL-10 production in the serum, kidney, and spleen. However, genetic modifications that remove IL-10 or pre-injury modifications depleting B cells, the suspected source of IL-10 production, have not generated a phenotype that is more susceptible to acute kidney injury, as expected, although there does appear to be a susceptible phenotype in mu-mice that do not have B cells. Further characterization of these results is currently underway as attempts are made to perform more focused experiments targeting specific sources of IL-10 production.

Primary Presenter: **Sterling McLaren**

Project Title: *Survey of Parents of Children and Youth with Developmental Disabilities and Behavioral/Psychiatric Diagnoses*

Abstract:

Children and youth with developmental disabilities and behavioral/psychiatric diagnoses are treated at the Emergency Department for behavioral crises and the patients/their parents do not feel they get adequate treatments/interventions before discharge. We designed and implemented a needs assessment to describe this problem by surveying parents of individuals with dual diagnoses who have previously been treated in the Emergency Department for a behavioral crisis. Our results show that this population does not currently have adequate options for responding to a behavioral crisis, and that Crisis Plans are helpful in averting patients from needing to go to the Emergency Department. We used this data to influence policy change in the state of Colorado.

**Primary Presenter: Alexander Metoxen**

Project Title: *Hepatocyte Growth Factor as a Downstream Mediator of Vascular Endothelial Growth Factor-Dependent Preservation of Growth in the Developing Lung*

Abstract:

Impaired vascular endothelial growth factor (VEGF) signaling contributes to the pathogenesis of bronchopulmonary dysplasia (BPD). We hypothesized that the effects of VEGF on lung structure during development may be mediated through its downstream effects on both endothelial nitric oxide synthase (eNOS) and hepatocyte growth factor (HGF) activity, and that in the absence of eNOS, trophic effects of VEGF would be mediated through HGF signaling. To test this hypothesis, we performed an integrative series of in vitro (fetal rat lung explants and isolated fetal alveolar and endothelial cells) and in vivo studies with normal rat pups and eNOS<sup>-/-</sup> mice. In comparison with controls, fetal lung explants from eNOS<sup>-/-</sup> mice had decreased terminal lung bud formation, which was restored with rhVEGF treatment. Neonatal eNOS<sup>-/-</sup> mice were more susceptible to hyperoxia-induced inhibition of lung growth than controls, which was prevented with rhVEGF treatment. Fetal alveolar type II (AT2) cell proliferation was increased with rhVEGF treatment only with mesenchymal cell (MC) co-culture and these effects were attenuated with anti-HGF antibody treatment. Unlike VEGF, HGF directly stimulated isolated AT2 cells even without MC co-culture. HGF directly stimulates fetal pulmonary artery endothelial cell growth and tube formation, which is attenuated by treatment with JNJ, a c-Met inhibitor. rhHGF treatment preserves alveolar and vascular growth after postnatal exposure to SU-5416, a VEGF receptor inhibitor. We conclude that the effects of VEGF on AT2 and endothelial cells during lung development are partly mediated through HGF-cMet signaling, and speculate that reciprocal VEGF-HGF signaling between epithelia and endothelia is disrupted in infants who develop BPD.

Primary Presenter: Logan Mims

Project Title: "Adopt-a-Disease" Empathy Training for Medical Students

Abstract:

**Purpose:** This study aims to add to the literature about empathy training in medical school and pose a useful, effective exercise to improve students'™ empathy and prepare them for clinical encounters. The experiential learning activities created in this study serve as an alternative educational program; this unique, non-lecture, non-small group discussion format could spark new learning potential and engender ways to achieve educational objectives through enjoyable means.

**Hypothesis:** By simulating having a disease, students will gain greater appreciation and understanding of a disease and how managing that disease affects their lives. As a result of that experience, their knowledge of the disease and empathy in their future patient-physician relationships will be enhanced.

**Method:** Students were assigned to one of three groups corresponding to a disease (diabetes, asthma, or aging). Students were instructed to adopt the disease for a minimum of 4 days. Pre-activity Toronto Empathy Questionnaire (TEQ) scores were compared to post-activity TEQ scores. Students also received disease-specific information and participated in a debriefing discussion.

**Results:** The two-tailed P value (post vs pre-activity TEQ score) of groups A & C were not statistically significant (0.487 & 0.769, respectively). Group B did produce statistically significant results (two-tailed P value of 0.017). In the debriefing, many students described an increased understanding of the difficulty they experienced in complying with the treatments and adjustments to daily living activities required to manage their disease.

**Conclusions:** The goals of increasing students'™ insight, knowledge, and appreciation of what patients with a disease experience was achieved as evidenced by student responses during the debriefing session. This experiential learning activity increased students'™ stated appreciation of the psychosocial impact of having a disease and empathy with future patients.



Primary Presenter: **Emily Moreno**

Project Title: *A Critical Analysis of the Literature Concerning Euthanasia in the Netherlands and the United States*

Abstract:

The practice of euthanasia in the Netherlands has an interesting history, going from being illegal- yet tolerated- to being explicitly allowed under certain circumstances. Though euthanasia is not legal in the United States, there are several States that allow physician assisted suicide. The purpose of this paper is to research euthanasia practices, beliefs and the ethical framework in the Netherlands and the United States. This was conducted by examining cultural, social, and historical characteristics through a comprehensive literature review. Although the two countries certainly have many differences, they also have similarities, for instance their emphasis on autonomy and their bioethical tools.

Primary Presenter: **Bethany Morris**

Project Title: *ROUTINE HEALTH SCREENING: THE DENVER NATIONAL WESTERN STOCK SHOW EXPERIENCE*

Abstract:

Background: Rural communities represent unique, medically underserved populations. Given the difficulties these populations have in accessing healthcare, health-screening fairs can be utilized to obtain baseline health status of these populations, and provide a venue to connect them to further care.

Objective: To assess baseline health status in adults living in rural communities across the US Mountain West region.

Methods: These data were collected as part of a prospective cohort study at the National Western Stock Show (NWSS), an annual livestock and agricultural exhibition in Denver, CO. Sponsored by Colorado Area Health Education Centers (AHEC), University of Colorado Anschutz Medical Campus students were trained to perform rapid blood glucose, total cholesterol screens, and provide basic counseling on patients with health risk factors. All NWSS attendees were eligible to participate in the health screening study. Data were collected and stored using Research Electronic Data Capture (REDCap). The main outcomes of interest included: patient age, sex, zip code, population density of residence area, weight, height, BMI, blood pressure, blood glucose and non-fasting blood cholesterol. Insurance status, and identification as a farmer or rancher, were self-reported. A chi-squared test for association was used to assess for relationships between demographic measurements and categorical outcome measures. An analysis of variance (ANOVA) was used on variables that had multiple interactions.

Results: Between 2009-2013, 10,216 patients participated in the NWSS screening program. Farmers and ranchers accounted for 13.1% and 14.5% of participants, respectively. There was no significant difference between BMI of farmers and ranchers (28.4 and 27.9,  $p=0.29$ ). Mean systolic blood pressure of farmers was 128.0 and that of ranchers was 123.9 ( $p<0.0001$ ). The difference in mean diastolic blood pressure between farmers (80.3) and ranchers (79.2) was not significant ( $p=0.30$ ).

Conclusions: The NWSS has the capacity to reach thousands of patients each year. While the dataset captured a snapshot of baseline health status of participants and demonstrated statistically significant differences between groups, the question remains whether those differences are also clinically relevant. The groups between whom this difference was found received similar counseling about their health risk factors. Steps to further increase the impact of the health-screening booth at the NWSS would be to include providing patients with concrete information about how to access local medical providers and clinics.

Primary Presenter: **Timothy Newton**

Project Title: *A novel Mer tyrosine kinase inhibitor mediates increased cell killing in combination with FGFR inhibition*

Abstract:

Purpose of Study:

Although therapies targeting recently identified oncogenic drivers of non-small cell lung cancer (NSCLC) are in clinical use, a significant proportion of patients still lack a molecularly-targeted therapeutic option. Therefore, there is a continued need for development of new therapeutic strategies. We recently demonstrated oncogenic roles for Mer receptor tyrosine kinase in NSCLC. More specifically, we showed aberrant expression of Mer in approximately 70% of NSCLC patient samples compared to normal lung. Additionally, shRNA-mediated Mer inhibition resulted in increased cell death, decreased colony formation in clonogenic assays, increased chemosensitivity, and decreased tumorigenesis in murine xenografts. These data validate Mer as a potential therapeutic target in NSCLC. Fibroblast growth factor receptors (FGFR) are another class of tyrosine kinases that are aberrantly expressed and function to promote tumorigenesis in NSCLC. FGFR inhibition has been validated as a therapeutic strategy in preclinical NSCLC models and several FGFR inhibitors are currently in clinical development for treatment of NSCLC. Although Mer can signal through both the MEK/ERK and PI3K/AKT pathways, in NSCLC Mer signals mainly through PI3K/AKT. Because Mer and FGFR signal primarily through complementary pathways that mediate survival and proliferation (PI3K/AKT and MEK/ERK, respectively), we hypothesized that dual inhibition of FGFR and Mer may provide a therapeutic advantage relative to inhibition of either kinase alone. In this study we investigated the interaction between UNC2025, a novel Mer-selective small molecule tyrosine kinase inhibitor (TKI), and AZD-4547, an FGFR TKI, in NSCLC cell lines.

Methods Used:

Colo699 (Mer+, FGFR+) and H226 (Mer+, FGFR+) NSCLC cells were cultured for 14 days in soft agar in the presence of UNC2025 and/or AZD-4547, alone or in combination, and colonies were stained and counted. Changes in the activity of downstream signaling pathways, including PI3K/AKT, MEK/ERK, and STAT proteins were evaluated by immunoblotting.

Results and Conclusions:

In the soft agar assay, Colo699 and H226 colony formation was inhibited in the presence of UNC2025 and AZD-4547, both as single agents and in combination. Importantly, concurrent treatment with UNC2025 and AZD-4547 resulted in a greater decrease in colony-formation relative to either single agent. Immunoblotting revealed increased inhibition of pro-survival signaling in cells treated with both inhibitors relative to the single agents. Taken together, these data suggest that combination therapies targeting Mer kinase and FGFR may be effective for treatment of NSCLC and indicate biochemical mechanisms by which the combination therapy may mediate increased anti-tumor activity.

Primary Presenter: **June Ng**

Project Title: *Inhibiting Monopolar Spindle 1 Kinase Suppresses Colony Formation in Medulloblastoma Cells*

Abstract:

Purpose of Study:

Medulloblastoma is the most common malignant pediatric brain tumor with less than optimal outcomes. Current therapies include cytotoxic drugs and radiation that target rapidly growing cells. These therapies are associated with significant long-term morbidity including neurocognitive defects and secondary tumors. Therefore, there is a critical need for medulloblastoma therapies that specifically target tumor cell populations.

The Vibhakar laboratory has recently identified several kinases involved in the G2/M cell cycle checkpoint to influence medulloblastoma cell viability. Among these is the Mps1 kinase. Mps1 is involved in chromosomal segregation during mitosis and overexpression of Mps1 is associated with aneuploidy. Studies have shown that inhibiting Mps1 induces abnormal chromosome segregation and apoptosis in breast cancer and osteosarcoma. Despite the abnormal overexpression of Mps1 in some medulloblastomas, the effect of Mps1 inhibition on medulloblastoma tumor cell growth has yet to be evaluated.

Methods Used:

Expression of MPS1 mRNA and protein in medulloblastoma tumor lines was evaluated using qRT-PCR and Western blot. To investigate the therapeutic efficacy of inhibiting Mps1, we used a clinically relevant inhibitor of Mps1 (NMS-P715). We performed cell proliferation and colony focus assays using well-characterized medulloblastoma cell lines.

Summary of Results:

Expression of MPS1 DNA and mRNA was elevated in all medulloblastoma samples and tumor lines as compared to normal cerebellum. Inhibition of Mps1 decreased amount of active Mps1 and significantly decreased the colony-forming ability of medulloblastoma cells.

Conclusions:

These analyses suggest that targeting Mps1 via small molecule inhibitors may be a valuable approach in medulloblastoma therapy.

Primary Presenter: **Phillip Nickerson**

Project Title: *Tinnitus in Children: Presentation and Proposal for a Clinical Pathway*

Abstract:

#### ABSTRACT

**BACKGROUND:** Bone conduction implants (BCI) are approved by the FDA for the treatment of conductive, mixed, and single-sided sensorineural hearing loss in children. The long-term complication rate and patient satisfaction of BCI are not well studied in children. The objectives of the study are to investigate these BCI features.

**METHODS:** Following IRB approval, a retrospective chart review of our BCI population at a tertiary academic children's hospital was performed. Following collecting demographic and clinical data, parents underwent a phone interview that included a satisfaction survey.

**RESULTS:** 39 subjects were identified, and 58 complications occurred in 29 of the subjects (mean/range 2.3/1-6). The majority of the complications were related to infection or skin overgrowth. 17 events required revision surgeries and 18 required oral antibiotic and/or office-based cauterization. No correlation was found between complications and surgical techniques or surgeons. Parents of 25 subjects underwent a phone interview. 76% rated the overall satisfaction as satisfied or very satisfied.

**CONCLUSIONS:** BCI has a much higher rate of complication in children as compared to adults. Plausible explanations include hygiene and unique dermatologic differences between children and adults. Despite these complications, parents viewed BCI as beneficial and were mostly satisfied.

**Primary Presenter: Claudia Nieuwoudt**

Project Title: *Student perceptions of reproductive health education in US medical schools: a qualitative analysis of students taking family planning electives*

Abstract:

Background: Abortion services will be sought by an estimated 1 in 3 U.S. women before they reach age 45. Despite the importance of family planning care, many medical schools do not currently offer formal education in this area, and students are unable to meet associated competency standards prior to graduation.

Purpose: The purpose of this study was to explore students'™ motivations in pursuing family planning (FP) electives throughout the U.S., their experiences during these courses and any impact of these rotations on their plans for future practice.

Method: We conducted a qualitative study consisting of semi-structured interviews with medical students upon completing 4th year FP electives at U.S. medical schools. Thirty-seven LCME-accredited U.S. medical schools offered 4th year FP electives. Course directors at 21 of these institutions recruited study participants between June 2012 and June 2013. Interviews were transcribed, coded and analyzed with ATLAS/ti software to identify salient themes.

Results: We interviewed 29 students representing fourteen institutions from all regions of the U.S. (East coast, Mid-west, South and West coast). Five central themes emerged. Medical students are using FP electives to fill gaps in the standard curriculum. Elective participation did not change students'™ pre-elective stance on abortion. Many students intend to provide abortion in the future but identified possible limiting factors. Proficiency in contraception and options counseling were top competencies desired and gained. Students reported excellent satisfaction with FP electives, and would recommend it to their peers, regardless of their personal beliefs.

Conclusions: Interview data revealed that students are using FP electives to fill gaps within pre-clinical and clinical medical school curriculum. Future physicians will be unable to provide comprehensive care for their female patients if they are not provided with this education. Research should be directed at development and analysis of comprehensive FP curricula, which will allow students to obtain the knowledge necessary to best care for their patients.

Key words: family planning, abortion, contraception, counseling, education

Funding: Funding was provided by the Association of Professors of Gynecology and Obstetrics, Martin L. Stone Award.

Primary Presenter: **Abigail Nimz**

Project Title: *Extended Daily Nevirapine Prophylaxis in HIV Exposed Breastfeeding Infants in Western Kenya*

Abstract:

**Background:** This study evaluated the rates of mother to child transmission (MTCT) and infant HIV testing for breastfeeding, HIV-exposed infants in Kenya.

**Methodology:** This cohort study compared MTCT rates and HIV testing uptake at three Kenyan clinics in Western Kenya before and after implementation of extended nevirapine (eNVP) prophylaxis for infants. The study prospectively followed infants on extended prophylaxis and compared HIV transmission and testing rates with a historical cohort at the same clinics who received single dose NVP at birth and 6 weeks of zidovudine. Primary outcomes included rates of MTCT and the proportion of infants returning for HIV testing.

**Results:** A total of 283 infants received eNVP which were compared to 362 infants in the historical cohort. The cumulative MTCT rate in the extending prophylaxis cohort was significantly lower than the historical cohort (eNVP: 5.5% vs. historical cohort: 22.3%,  $p < 0.001$ ). Multivariate analysis showed the odds of overall transmission at 18 months was 94.7% lower for eNVP cohort (OR 0.053,  $p = 0.005$ ) and infants on eNVP were 3.6 times (95%CI 1.8-7.1) more likely to complete 18 month testing compared to those from historical cohort.

**Conclusion:** Extended prophylaxis for infants is associated with significantly higher uptake of HIV-testing and reduced vertical transmission of HIV.

Primary Presenter: Funmi Ogunremi

Project Title:

*The Short Term Impact of a High School Science Summer Program on Educational and Career Paths*

Abstract:

In this article, we present the details of a 5-day interdisciplinary course for high school students at the University of Colorado School of Medicine. The week included series of didactics, problem-based learning, simulations, dissection lab and hands-on skills lab. The goal of the course was to serve as an avenue through which students can gain exposure to careers in the health care field, science, technology and medicine. We aimed to measure quantitatively, the short-term impact of a 5-day course through 2 methods: A pre and post course assessment as well as post course survey. We administered a 31-question, multiple-choice test that assessed the knowledge of cardiovascular and pulmonary anatomy and physiology prior to and after the 5-day program. The pre and post test mean scores increased for the cardiovascular anatomy and physiology portion of the assessment. This was found to be statistically significant- the average increased from 76% to 87% (pre and post test scores). The raw mean score difference between pre and post-test scores was 3.375 (2.162 - 4.588 95% CI), p-value of 0.0001. While the students did have an increased mean score in their pulmonary examination, this was not statistically significant however. Furthermore, we wanted to assess the participant's perceived academic gain from participation in the program as well as the impact of the program on their interest in the STEM and healthcare related careers. Our post course survey indicates that participant's believed to have experience an academic gain related to their participation in the course. The overall test scores also aligns with this perception. The survey participants also associated an increase in their interest in the sciences, healthcare related fields with participation in the program.



**Primary Presenter: Leslie Palacios-Helgeson**

**Project Title:** *Rapid estrogen signaling negatively regulates PTEN in endometrial cancer cells*

**Abstract:**

Hyperestrogenicity is a risk factor for endometrial cancer. 17 $\beta$ -estradiol (E2) is known to stimulate both genomic and nongenomic estrogen receptor- $\alpha$  (ER $\alpha$ ) actions in a number of reproductive tissues. However, the contributions of transcription-independent ER $\alpha$  signaling on normal and malignant endometrium are not fully understood. Phosphatase and tensin homolog (PTEN) is a tumor suppressor that decreases cellular mitosis primarily through negative regulation of the phosphoinositide 3-kinase/AKT signaling axis. PTEN levels are elevated during the E2 dominated, mitotically active, proliferative phase of the menstrual cycle, indicating possible hormonal regulation of PTEN in the uterus. In order to determine if rapid E2 signaling regulates PTEN, we used ER $\alpha$ -positive, PTEN-positive, endometrial cells. We show that cytosolic E2/ER $\alpha$  signaling leads to increased phosphorylation of PTEN at key regulatory residues. Importantly, E2 stimulation decreased PTEN lipid phosphatase activity and caused consequent increases in phospho-AKT. We further demonstrate that cytosolic ER $\alpha$  forms a complex with PTEN in an E2-dependent manner, and that ER $\alpha$  constitutively complexes with protein kinase2- $\alpha$  (CK2 $\alpha$ ), a kinase previously shown to phosphorylate the C-terminal tail of PTEN. These results provide mechanistic support for an E2-dependent, ER $\alpha$  cytosolic signaling complex that negatively regulates PTEN activity through carboxy terminus phosphorylation. Using an animal model, we show that sustained E2 signaling results in increased phospho-PTEN (S380, T382, and T383), total PTEN, and phospho-AKT (S473). Taken together, we provide a novel mechanism in which transcription-independent E2/ER $\alpha$  signaling may promote a pro-tumorigenic environment in the endometrium.

Primary Presenter: **Hamza Pasha**

Project Title: *The Role of Hypothalamic Agouti-related peptide in Energy Homeostasis with Diminished Neuronal Lipoprotein Lipase Activity*

Abstract:

**Background:** In a genetically-modified mouse lacking neuron specific LPL (NEXLPL<sup>-/-</sup>), there was a marked increase in AgRP expression before the development of obesity. The development of obesity was associated with an increase in food intake and a subsequent decrease in energy expenditure. To explore the mechanism by which LPL deficiency could be modulating AgRP expression, we used siRNA technology to knockdown LPL mRNA in mouse hypothalamic mHypoE44 cells. We also reduced AgRP gene expression with siRNA to further evaluate the relationship between the AgRP and LPL.

**Methods:** mHypoE44 cells were newly characterized and served as an in vitro model for neuronal lipid signaling. For the siRNA transfection experiment, the N44 cells were cultured and then transfected with a complex containing LPL siRNA and lipofectamine. In addition to LPL mRNA expression, LPL activity was measured for two different fractions of N44 cells, extracellular and intracellular, by using radiolabeled triglyceride to determine the enzymatic activity of LPL.

**Results:** The LPL siRNA transfection resulted in an 83% decrease in LPL gene expression ( $P < 0.05$ ) and an increase of 48% in AgRP mRNA ( $P = 0.09$ ). Moreover, the AgRP siRNA transfection resulted in a 69% reduction in AgRP mRNA expression ( $P = 0.001$ ) and an increase of 42% in LPL gene expression ( $P < 0.05$ ). The LPL activity in within cell extracts was also significantly increased by 27% compared to the control ( $P = 0.01$ ) but of interest, the enzyme activity released from cell surfaces by heparin was not changed.

**Conclusion:** These data suggest that there is an inverse relationship between AgRP and LPL gene expression in LPL-deficient mice validated the in a cultured mHypoE44 hypothalamic cells. The mHypoE44 cell line appears to be an excellent model to study the molecular basis of the inverse relationship between LPL and AgRP gene expression in NEXLPL<sup>-/-</sup> mice.

Primary Presenter: Travis Peveto

Project Title: Pediatric Bone Conduction Implants: Long-term Complication and Parent Satisfaction

Abstract:

ABSTRACT

**BACKGROUND:** Bone conduction implants (BCI) are approved by the FDA for the treatment of conductive, mixed, and single-sided sensorineural hearing loss in children. The long-term complication rate and patient satisfaction of BCI are not well studied in children. The objectives of the study are to investigate these BCI features.

**METHODS:** Following IRB approval, a retrospective chart review of our BCI population at a tertiary academic children's hospital was performed. Following collecting demographic and clinical data, parents underwent a phone interview that included a satisfaction survey.

**RESULTS:** 39 subjects were identified, and 58 complications occurred in 29 of the subjects (mean/range 2.3/1-6). The majority of the complications were related to infection or skin overgrowth. 17 events required revision surgeries and 18 required oral antibiotic and/or office-based cauterization. No correlation was found between complications and surgical techniques or surgeons. Parents of 25 subjects underwent a phone interview. 76% rated the overall satisfaction as satisfied or very satisfied.

**CONCLUSIONS:** BCI has a much higher rate of complication in children as compared to adults. Plausible explanations include hygiene and unique dermatologic differences between children and adults. Despite these complications, parents viewed BCI as beneficial and were mostly satisfied.

Primary Presenter: John Pham

Project Title: *DETERMINING THE ROLE OF INCREASED INFLAMMATION IN MODULATING THE SELECTION FOR ONCOGENICALLY INITIATED B-PROGENITORS*

Abstract:

The incidence of cancer is greatest amongst the elderly although the mechanism for the aged related increase in incidence has not been entirely elucidated. We hypothesized that increased inflammation will alter the metabolic profile of Ba/F3 cells and could thus be used as a high throughput system to determine the mechanism whereby chronic inflammation reduces the fitness of B-cell progenitors leading to increased leukemogenesis. Herein we show that Ba/F3 cells are responsive to inflammatory stimuli IFN- $\gamma$  with increased production of STAT1 ( $p < .05$ ), however, do not generate a significant response to LPS, LTA, IL-6, and TNF- $\alpha$ . In addition, we found that inflammation recapitulates the aged phenotype in Ba/F3 cells with reduction in STAT5 expression ( $p = .0549$ ). However, competition assays in an inflammatory environment did not show a selective preference for Ba/F3-Bcr-Abl cells. Thus, although Ba/F3 cells are capable of responding to inflammation, their limited response to several cytokines and bacterial antigens may limit their use in evaluating inflammation and adaptive oncogenesis.

Primary Presenter: Ryan Phan

Project Title: *Benefits of Exercise in the Survivorship of Colorectal Cancer Patients*

Abstract:

**Background and Objectives** Colorectal cancer (CRC) is the third most prevalent cancer and has the third highest incidence in the United States (1). Exercise and physical activity are known to reduce the risk of cancer incidence but the mortality benefit of physical activity is still unclear.

**Methods** A literature search was performed through PubMed, using various combinations of the terms: "colon cancer", "colorectal cancer", "colon neoplasm", "physical activity", "exercise", "survival", "mortality", "morbidity" and "recurrence". We reviewed the primary endpoints and secondary endpoints of the articles matched to our query.

**Results** Nine studies were found to assess the effect of physical activity and fitness on mortality in colon and rectal cancer survivors. Pre-diagnosis levels of physical activity may improve mortality rate in CRC patients according to some studies but post-diagnosis physical activity shows consistently lower mortality rates in the same population.

**Conclusions** There is convincing evidence that regular, consistent physical activity has a beneficial effect on overall mortality and cancer-specific mortality in this population group.

Primary Presenter: **Rebecca Pollard**

Project Title: *GABA-A receptor binding is abnormal in cervical dystonia*

Abstract:

**OBJECTIVE:** To assess whether GABA receptor binding is abnormal in cervical dystonia (CD).

**BACKGROUND:** Dysfunction within the GABAergic system is thought to be involved in the pathophysiology of adult-onset focal dystonia, of which CD is the most common subtype. Previous studies have suggested DYT1 and sporadic dystonia may be associated with abnormal GABA receptor binding. In this study we compared GABA-A receptor binding between CD patients and healthy controls (HC) using 11C-flumazenil PET imaging. We hypothesized that GABA-A receptor binding would be reduced within the sensorimotor network in CD.

**METHODS:** 60-minute dynamic PET scans were acquired on 10 CD patients (8F; 61.3+/-8.3yrs) and 6 HC (3F; 65.0+/-8.9yrs). GABA-A receptor binding potential was estimated using a simplified reference tissue (corona radiata) model. A voxel-wise two-sample t-test was used to identify GABA-A binding differences between CD and HC. Pearson correlations were used to test for relationships between altered GABA-A receptor binding and disease severity and duration.

**RESULTS:** Compared to HC, CD patients had significantly decreased GABA binding ( $p < 0.005$  uncorrected, cluster size=50) in the cerebellum, dorsal premotor cortex, insula, hippocampus, parahippocampus, calcarine, and lingual areas. Increasing disease severity of CD patients (TWSTRS score) correlated with reductions in GABA-A binding in the posterior cerebellum ( $r = -.74$ ,  $p = .01$ ), cerebellar crus ( $r = -.72$ ,  $p = .01$ ), premotor cortex ( $r = -.77$ ,  $p = .01$ ), insula ( $r = -.76$ ,  $p = .01$ ), and hippocampus ( $r = -.67$ ,  $p = 0.03$ ). There were no significant correlations between disease duration and GABA-A binding.

**CONCLUSIONS:** CD patients have reduced GABA-A receptor binding compared to HC within a distributed set of brain regions involved in motor control including cerebellum, premotor cortex, and insula. Furthermore, reductions in GABA-A binding may predict disease severity in CD and play a key role in its pathophysiology.

**Primary Presenter: Seerat Poonia**

**Project Title:** *EGFR Exon 19 Deletion Mutations and Systemic/Central Nervous System Miliary Metastasis: Clinical Correlations and Response to Therapy*

**Abstract:**

The presence of diffuse miliary pulmonary nodules and a miliary pattern of CNS disease have independently been associated with NSCLC harboring EGFR exon 19 deletion mutations. EGFR tyrosine kinase inhibitors (eg, erlotinib) are the preferred first-line therapy for patients with activating mutations in EGFR, because of superior efficacy and tolerability compared with standard chemotherapy. Penetration of erlotinib into the CNS is limited by the blood-brain barrier, but it may still demonstrate activity against leptomeningeal metastases. In our report, we describe a miliary pattern of intrapulmonary and CNS metastasis in the same patient, suggesting that an increased probability of metastasis may exist for both organ systems in patients with this specific EGFR mutation. In addition, we describe a prolonged systemic and CNS response to standard-dose erlotinib for > 8 months with nearly complete resolution of visceral disease. This case report further emphasizes the safety, tolerability, and clinical benefit of erlotinib in a scenario in which supportive care was the sole other recommendation. Our patient achieved an almost complete return of previous functional status for an extended period. This underscores the notion that poor performance status and consideration for palliative care/hospice should not eliminate molecular testing from evaluation and treatment algorithms.

Primary Presenter: **Bianca Pullen**

Project Title: *Tackling Racism and White Supremacy through the Lens of Medical Education*

Abstract:

**Backgrounds and Objectives:** Diversity curricula in medical school education are important in shaping peer-to-peer interactions amongst medical students, and ultimately physician-patient relationships. We examine the current state of multicultural education, with its most pervasive iterations being cultural competence and an understanding of implicit bias. We then establish an alternative model focusing on the examination of white supremacy and an understanding of racism beyond individual interactions to a systemic scope. Lastly, we will outline specific curricular strategies that will be effective for meeting these objectives. **Methodology:** A literature review was conducted from October 15, 2015 through January 15, 2015. Databases searched included PubMed, ERIC, CINAHL, and GoogleScholar. **Results:** A combination of the terms racism and medical school education yielded 72 articles. Searching the term white supremacy yielded 14 articles. Searching the combination of terms racism or prejudice or cultural competence and teaching methods yielded 17 articles. Of the articles found, 50 were relevant. Gaps in the literature include specific writings on the implementation of critical pedagogy in the medical school setting. **Conclusions:** The literature suggests critical multiculturalism and critical pedagogy are effective methods for anti-racism teachings. Supportive settings include opportunities for reflection and emotional safety. Future efforts should include the evaluation and standardization of curriculum based on critical multiculturalism and critical pedagogy.



Primary Presenter: **Shamita Punjabi**

Project Title: *Survey of Parents of Children and Youth with Developmental Disabilities and Behavioral/Psychiatric Diagnoses*

Abstract:

Children and youth with developmental disabilities and behavioral/psychiatric diagnoses are treated at the Emergency Department for behavioral crises and the patients/their parents do not feel they get adequate treatments/interventions before discharge. We designed and implemented a needs assessment to describe this problem by surveying parents of individuals with dual diagnoses who have previously been treated in the Emergency Department for a behavioral crisis. Our results show that this population does not currently have adequate options for responding to a behavioral crisis, and that Crisis Plans are helpful in averting patients from needing to go to the Emergency Department. We used this data to influence policy change in the state of Colorado.

Primary Presenter: Stephen Quach

Project Title: FUNDING AND INTEGRATION OF MENTAL HEALTH CARE IN SCHOOL-BASED HEALTH CENTERS

Abstract:

Purpose

Mental health care in school-based health centers (SBHCs) is not fiscally self-supporting. There also exist barriers to full integration between physical and mental health providers. The purpose of this report is to summarize what the common barriers are to financial sustainability and full integration and to outline current best practices and solutions to overcoming these barriers. SBHCs do not operate under a standard model; therefore not all the listed barriers and solutions will apply. However, the goal of this work is to recommend solutions to common findings, and not to change systems that are currently functioning well.

Methods

Our methods consist of meeting with school-based mental health care providers, school-based health center administrators, and individuals representing advocacy groups involved in behavioral health care funding and integration and Behavioral Healthcare Organizations (BHOs) to identify common barrier. The individuals that we interviewed were identified based suggestions from CASBHC, taking into consideration their availability, geographic location, and professional experience. We contacted them via either email or telephone based on CASBHC's contact information. We conducted interviews with a list of questions in mind (see exhibit 4) but also left the interview open to more free-flowing conversation. We also performed literature searches on how Colorado funds behavioral health, current pilots that are addressing integration and funding of behavioral health care, information on the reasoning and structure of the current system, and how SBHCs in other states have addressed this problem. Searches were performed using the PubMed database with the key words "school based health centers," "mental health," and "community mental health center." The information gathered was then placed into a report consisting of barriers with a listing of possible solutions.

Summary of Results

The current system for Medicaid reimbursement is inadequate, not flexible, and overly complex for it to be practical for SBHCs to easily navigate. Without strong partnerships with providers that are part of a large infrastructure, or a partnership with a Community Mental Health Center (CMHC), billing Medicaid for mental health services is not possible. Even within these partnerships the carved-out, capitated payment model is cumbersome and inadequate. Both short term and long term solutions are needed to provide a sustainable funding source for behavioral health care in SBHCs.

The capitated carve-out system also creates barriers for integration. Different organizations act as providers for mental and physical care. These providers have separate electronic medical records that are not accessible to the other provider. There is also confusion surrounding what health information can be shared between providers and when consents to share have been given.

Conclusions

Short-term solutions to address the inadequate funding and integration difficulties SBHCs face include improving SBHC access to Medicaid reimbursement, standardizing credentialing requirements, implementing flat rate reimbursement for services, state funding for uninsured, and patient billing on a sliding scale, and developing stronger community engagement and supports.

Long-term changes must include payment reform. This ideally would be a global payment model that includes increased payments to mental health providers, and removal of unnecessary fragmentation involved in behavioral health care.

In addition, integrated visits must be truly reimbursable, electronic medical records must be able to be viewed by all health providers, and regulations for privacy and what can be shared between providers and patient consent must be outlined.

**Primary Presenter: Anireddy Reddy**

**Project Title:** *HEROES: Health Esteem futuRe pOwer Encouragement Speak up*

*Using Community Based Participatory Research to Create a Minority Youth Leadership & Advocacy Program*

**Abstract:**

HEROES: Health Esteem futuRe pOwer Encouragement Speak up

Using Community Based Participatory Research to Create a Minority Youth Leadership & Advocacy Program

Anireddy Reddy, Owetta McNeil, Amelia Bowman, Daniel Hecht, Janet Meredith, Tillman Farley

2040 Partners for Health | University of Colorado School of Medicine | Vickers Boys & Girls Club

**Introduction:** In this era of healthcare reform, addressing racial disparities in health is crucial. There is abundant research showing that discrimination felt by patients contributes to poor health outcomes. C-STAHR (Community-Students Together Against Healthcare Racism) is a group of health profession students, physicians, 2040 Partners for Health, and community members that is dedicated to addressing discrimination in Aurora/Denver. One of C-STAHR's aims is to address the dearth of minority healthy providers by empowering minority youth and increasing their exposure to healthcare careers. C-STAHR sought to create a program for minority youth unlike most traditional pipeline programs by utilizing Community Based Participatory Research (CBPR) techniques.

**Methods:** C-STAHR held community meetings to define 1) needs of local youth 2) program components and 3) evaluation measures/outcomes; this was supplemented by a literature review of essential leadership skills, using CBPR approaches with youth, and considerations when working with youth of color. This evidence based, community driven approach yielded the creation of a youth leadership & advocacy program called HEROES (Health Esteem futuRe pOwer Encouragement Speak up). The program consisted of six sessions focusing on empowerment, advocacy, personal health, career exploration, nutrition, and social determinants of health. Sessions were held with a community partner, Vickers Boys & Girls Club, and included guest speakers and field trips. The program incorporated two pre/post assessments to measure outcomes important to community members, including self-confidence, dedication to community, interest in healthcare, and skills gained. Additionally, an informal focus group was held to discuss program strengths and areas to improve.

**Results:** The HEROES program had 15 participants, with three members who attended all sessions. At the end of the program, 6 students expressed a desire to join C-STAHR. Evaluation showed a trend towards increased knowledge of health careers and interest in pursuing them, but these were not statistically significant. However, participants reported a significant increase in "feeling confident I can achieve my dreams" ( $p=0.019$ ). Focus group feedback included the following suggestions: 1) changing the times to avoid conflicts with summer school 2) meeting more frequently 3) asking speakers to further simplify medical jargon 4) incorporating more "hands-on" sessions and 5) creating shadowing and volunteer opportunities for students.

**Conclusion:** Overall, the HEROES program was well received by the community and is an innovative model of how to create a youth program using CBPR techniques. This curriculum has since been adopted as an ongoing program with the Vickers Boys & Girls Club, which is directed by incoming C-STAHR students and community members.

Primary Presenter: **Romany Redman**

Project Title: *Colorado Refugee Health Elective Course: Reassessment and Updates to Curriculum*

Abstract:

As the Refugee Health Elective for fourth year medical students and internal medicine residents has evolved in response to feedback from elective participants and changes in the landscape of refugee health services and logistical feasibility, a reassessment of the current elective activities and updates to the curriculum are warranted. How can the curriculum be changed to reflect the learning objectives and goals of health professions learners, as well as meaningfully contribute to the activities with the Spring Institute's Project SHINE with community health outreach and patient navigation?

The Refugee Health II Elective (RHII) has undergone considerable changes since its inception just a few short years ago. Initially envisioned as the secondary clinical correlate to the more didactic Refugee Health I (RHI) elective, changes in the landscape of refugee health specifically in Denver, Colorado, coupled with feedback from residents and students naturally led to gradual, informal adjustments to the elective activities. At this time, it is necessary to review the current RHII elective to assess how the current activities that comprise the elective reflect the original learning objectives of the curriculum and if or how the curriculum needs to be adjusted to reflect the new opportunities and emphasis in community health and outreach.

Primary Presenter: **Jessica Rice**

Project Title: *Application of SNP microarrays to the genome-wide analysis of chromosomal instability in premalignant airway lesions*

Abstract:

Chromosomal instability is central to the process of carcinogenesis. The genome-wide detection of somatic chromosomal alterations (SCA) in small premalignant lesions remains challenging because sample heterogeneity dilutes the aberrant cell information. To overcome this hurdle, we focused on the B allele frequency data from single-nucleotide polymorphism microarrays (SNP arrays). The difference of allelic fractions between paired tumor and normal samples from the same patient ( $\Delta f$ ) provides a simple but sensitive detection of SCA in the affected tissue. We applied the  $\Delta f$  approach to small, heterogeneous clinical specimens, including endobronchial biopsies and brushings. Regions identified by  $\Delta f$  were validated by FISH and quantitative PCR in heterogeneous samples. Distinctive genomic variations were successfully detected across the whole genome in all invasive cancer cases (6 of 6), carcinoma in situ (3 of 3), and high-grade dysplasia (severe or moderate; 3 of 11). Not only well-described SCAs in lung squamous cell carcinoma, but also several novel chromosomal alterations were frequently found across the preinvasive dysplastic cases. Within these novel regions, losses of putative tumor suppressors (RNF20 and SSBP2) and an amplification of RASGRP3 gene with oncogenic activity were observed. Widespread sampling of the airway during bronchoscopy demonstrated that field cancerization reflected by SCAs at multiple sites was detectable. SNP arrays combined with  $\Delta f$  analysis can detect SCAs in heterogeneous clinical sample and expand our ability to assess genomic instability in the airway epithelium as a biomarker of lung cancer risk.

Primary Presenter: **Santiago Rodriguez Rodriguez**

Project Title: *Subcapital Phalangeal Fractures: A Retrospective Review*

Abstract:

Subcapital Phalangeal Fractures: A Retrospective Review

MSA Question: How should pediatric subcapital phalangeal fractures be managed?

Background: Phalangeal neck fractures represent a special subset of pediatric hand injuries which pose unique challenges to the treating physician. Also termed "subcapital" fractures, many advocate the prompt reduction and stabilization of these fractures given their propensity for instability and avascularity. Most agree that restoring anatomic alignment, providing bony stability, and preserving vascularity are essential to good functional outcomes. The aim of this study was to look retrospectively at our experience with both nonoperative and operative treatment of subcapital phalangeal fractures in a pediatric population over a 5-year period.

Methods: A retrospective chart review was performed on pediatric patients who received treatment for a subcapital phalangeal neck fracture of the middle or proximal phalanx between 2009 and 2014. Outcome measures were compared between nonoperative and operative treatments, including: mechanism of injury, radiographic parameters, delays in treatment, time to union, and rate of complications.

Results: 118 patients met eligibility criteria for the review. The degree of sagittal plane translation and sagittal angulation were predictive factors for surgical treatment. No significant difference in time to surgery was found between CRPP and ORIF subgroups. 13% (15/118) of patients were delayed in treatment, with 27% (4/15) of these requiring surgery. A delay in treatment with subsequent surgery was predictive of a need for ORIF over CRPP ( $p=0.036$ ). Time to union was significantly higher in the operative group ( $p=0.001$ )

Conclusions: This study demonstrates that a strong correlation between initial sagittal plane displacement and a need for surgery. Though time to surgery was not different between the CRPP and the ORIF groups, a delay of treatment has a higher risk of requiring an open reduction. A nearly 3-fold longer time to union may be expected in patients requiring operative intervention, likely due to the higher degree of displacement and vascular insult from open reduction.

Primary Presenter: **Stacy Romero**

Project Title: *Developing a culture of quantitative data collection to enable quality improvement projects for the Healthy Beginnings Clinic at Warren Village*

Abstract:

Medical student-run free clinics fill a void within the medically underserved populations nationwide. The experience medical students gain via volunteering at these clinics also provides a necessary initiation to becoming providers within the systems-based healthcare system. Though there are many student-run clinics at medical schools throughout the US, there is little literature on how they are run. Furthermore, there is even less literature on how to assess the clinic populations'™ needs and how best to address them. Healthy Beginnings Clinic is a student-run free pediatric clinic for the residents of Warren Village, a non-profit providing housing services to single parent families. Many of the residents at Warren Village are new immigrants to the US and often do not yet have a primary care pediatrician. Healthy Beginnings Clinic strives to provide a starting off point for these families, via free health care, vaccines, and assistance in finding a primary care provider. Though this clinic was started 16 years ago, there has never been an assessment of what the main needs are of the population, and if the clinic is meeting those needs.

Primary Presenter: **Michelle Rybka**

Project Title: *Frequency of Child Life Utilization for Spanish Speaking Patients*

Abstract:

Frequency of Child Life Utilization for Spanish Speaking Patients

Introduction: Child life involvement reduces anxiety in hospitalized children.

However, rates of child life involvement in limited-English speaking patients, in whom language barriers may impede consultation, is unknown. The objective of this study was to evaluate the frequency of child life consultation for Spanish speaking, compared to English speaking, patients at a free standing children's hospital.

Methods: A retrospective chart review was performed for all children (age 3-14 years) who were admitted to the general pediatric inpatient service at Children's Hospital Colorado between 2011-2014. Referrals for child life were made subjectively by any healthcare provider (Physician, nurse, etc.) who felt the services of Child Life would benefit the patient. Primary language was assessed by review of patients' demographic face sheets. Rates of child life consultation (determined by identification of a child life note in the medical record) in Spanish-speaking children were compared to those in English-speaking patients and analyzed by using a 2-sample test for equality of proportions without continuity correction

Results: Of 15,611 hospitalized children 11% spoke primarily Spanish and 89% were English-speaking. Child life consultation rates were lower in Spanish-speaking children compared to English-speaking patients (37.2% vs. 31.5%) (mean difference 5.7%; 95% CI: 3.4, 8.1, P-value < 0.001).

Conclusion: Child life services may be underutilized in hospitalized Spanish-speaking children. An understanding of why this discrepancy exists is currently unknown. In order to increase access to child life services to Spanish speaking children, further investigation is warranted.



Primary Presenter: John (Hank) Schilling

Project Title: *Invasive coronary procedure use and outcomes among veterans with posttraumatic stress disorder: Insights from the Veterans Affairs Clinical Assessment, Reporting, and Tracking Program*

Abstract:

Background Posttraumatic stress disorder (PTSD) is prevalent in the general population and US veterans in particular and is associated with an increased risk of developing coronary artery disease (CAD). We compared the patient characteristics and postprocedural outcomes of veterans with and without PTSD undergoing coronary angiography.

Methods This is a multicenter observational study of patients who underwent coronary angiography in Veterans Affairs hospitals nationally from October 2007 to September 2011. We described patient characteristics at angiography, angiographic results, and after coronary angiography, we compared risk-adjusted 1-year rates of all-cause mortality, myocardial infarction (MI), and revascularization by the presence or absence of PTSD.

Results Overall, of 116,488 patients undergoing angiography, 14,918 (12.8%) had PTSD. Compared with those without PTSD, patients with PTSD were younger (median age 61.9 vs 63.7;  $P < .001$ ), had higher rates of cardiovascular risk factors, and were more likely to have had a prior MI (26.4% vs 24.7%;  $P < .001$ ). Patients with PTSD were more likely to present for stable angina (22.4% vs 17.0%) or atypical chest pain (58.5% vs 48.6%) and less likely to have obstructive CAD identified at angiography (55.9% vs 62.2%;  $P < .001$ ). After coronary angiography, PTSD was associated with lower unadjusted 1-year rates of MI (hazard ratio (HR), 0.86; 95% CI [0.75-1.00];  $P = 0.04$ ), revascularization (HR, 0.88; 95% CI [0.83-0.93];  $P < .001$ ), and all-cause mortality (HR, 0.66; 95% CI [0.60-0.71];  $P < .001$ ). After adjustment for cardiovascular risk, PTSD was no longer associated

with 1-year rates of MI or revascularization but remained associated with lower 1-year all-cause mortality (HR, 0.91; 95% CI [0.84-0.99];  $P = .03$ ). Findings were similar after further adjustment for depression, anxiety, alcohol or substance use disorders, and frequency of outpatient follow-up.

Conclusions Among veterans undergoing coronary angiography in the Veterans Affairs, those with PTSD were more likely to present with elective indications and less likely to have obstructive CAD. After coronary angiography, PTSD was not associated with adverse 1-year outcomes of MI, revascularization, or all-cause mortality.

Primary Presenter: Elaine Scholpp

Project Title: TEEN PREGNANCY IN THE UNITED STATES:

*Where Do We Go From Here?*

Abstract:

Teen pregnancy has long been recognized as a significant public health problem, leading to adverse birth and social outcomes. Despite decreasing teen birth rates in recent decades, the United States continues to have one of the highest teen pregnancy rates in the developed world.

Proponents of Colorado's Family Planning Initiative, a privately funded program that increased young, low-income women's access to Long-Acting Reversible Contraceptive (LARC) methods, claim that the program helped reduce Colorado's teen pregnancy rates by as much as 40 percent over five years while significantly reducing public healthcare spending. The program has been acclaimed as a pioneering example of teen pregnancy prevention for other states to model, but challengers contend that the program's success has been significantly overstated and that teen fertility rates would have declined even without the initiative. Some opponents argue that providing teenagers with contraception actually increases sexual activity and leads to more unintended pregnancies. The controversial program has sparked much debate, and a recent decision by the Republican-dominated state legislature failed to renew the program with state funding.

This paper reviews the available literature on pregnancy prevention programs and attempts to answer the question: What are the most effective interventions to prevent teenage pregnancy? In light of the available evidence, we evaluate the controversial Colorado initiative and make recommendations for future reproductive health policy.

Primary Presenter: Anna Schubert

Project Title:

Abstract:

Contraception for the purpose of pregnancy prevention has existed in various forms since ancient times. With the advent of hormonal birth control in the late 1950s, contraception has slowly become a more accepted practice among sexually active individuals. The most recent CDC report on modern-day contraception use reveals that 62% of women ages 15-44 use some form of contraception, with 49% of pregnancies still considered to be unintended. Among providers, a 2011 survey of obstetrician-gynecologists revealed that fewer than 2% of surveyed providers would object to providing contraception for their patients. Together, these numbers indicate that the medical community is largely supportive of contraceptive practices. However, despite modern physician acceptability of birth control, the high number of unintended pregnancies indicates that there is still a disconnect between acceptability of contraception and effectiveness. While there are many issues that may be contributing, the relationship between provider and patient in providing effective contraception must be closely examined, and the attitudes of health care providers towards contraception must be understood in the proper historical context. This paper utilizes a historical analysis with primary sources to analyze the attitudes of the medical profession towards contraception, from the beginning of modern medicine in the early 19th century to the advent of hormonal birth control in the 1950s.

Primary Presenter: **Joshua Shapiro**

Project Title: *Biomechanical Assessment of Three Patellar Advancement Procedures for the Treatment of Patella Alta*

Abstract:

Introduction: Crouch gait deformity is common in children with Cerebral Palsy and is often associated with patella alta. Patellar tendon advancement is typically utilized to correct patella alta and restore normal knee mechanics. We performed a study using a cadaveric model to determine which of three surgical techniques is biomechanically optimal for patellar tendon advancement in treating patella alta.

Methods: Twenty-four human cadaveric knees (8 per group) were prepared using one of 3 different surgical techniques commonly used: tibial tubercle osteotomy, patellar tendon partial resection and repair at the distal patella, and patellar tendon imbrication. The patella was loaded from 25N to 250N at 1 Hz for 1,000 cycles.

Results: A significant difference in patella displacement under cyclical loading was found between surgical techniques: Tibial tubercle osteotomy exhibited significantly less displacement under cyclical loading than distal patella excision and repair ( $P < 0.0001$ ) or imbrication ( $P = 0.0088$ ). Imbrication exhibited significantly less displacement than distal patella excision and repair ( $P = 0.0006$ ). Tibial tubercle osteotomy survived longest. Based on failure criteria of 5mm of displacement, tibial tubercle osteotomy lasted between 250 to 500 cycles. The other two techniques failed by 25 cycles.

Conclusions: This study offers quantitative evidence regarding the relative mechanical strength of each construct and may influence choice of surgical technique.

Primary Presenter: **Ramy Sidhom**

Project Title: *Implementation and Analysis of a Community Based Hip-hop Dance Intervention in Low-income Children with Obesity*

Abstract:

Title: Implementation and Analysis of a Community Based Hip-hop Dance Intervention in Low-income Children with Obesity

Objectives: To validate a Hip-hop dance intervention in low-income community settings for use in increasing the self-efficacy of participants to engage in physical activity in the future.

Background: Childhood obesity is a growing epidemic, especially in low socioeconomic settings. Dance has been explored as a means for weight management, but usually only in classical forms. Urban dance styles, such as Hip-hop have not been looked at extensively. The psychological effect of dance has not been well studied and has great potential to incite much progress in this epidemic.

Methods: We developed our intervention in conjunction with an already established community-based weight management program for children and their families. Participants were exposed to 5 45-minute long Hip-hop dance classes from community choreographers. Pre- and post-intervention surveys were used to help assess various psychological factors such as self-efficacy for physical activity and perceived barriers to activity. Physical fitness was assessed before and after the intervention using the FitnessGram test. Results were compared against similar children who did not participate in the Hip-hop portion of the program.

Conclusions: Participants who self-identified as having high levels of perceived barriers to activity or low self-efficacy to participate in physical activity showed improvements in both aspects after our intervention.

Primary Presenter: **Sam Skovgaard**

Project Title: *Additive Anatomy: The Constructed Hand Project*

Abstract:

Medical school does not routinely provide comprehensive education on the detailed anatomy of the hand, leaving surgical trainees to learn this information on their own. Many surgical trainees prefer to learn with hands-on, tactile styles which textbook learning does not provide. Currently available kits to build an anatomic model of the upper extremity are inappropriate for this audience. This project is a kit that surgical trainees can use to build a physical model of the upper extremity, and in doing so learn the anatomy in the way they prefer. The model is highly accurate, has movable joints, and is far cheaper than anything currently on the market today. The model is made using 3d printed plastic bones, ligaments and tendons made of Tyvek, and muscles/nerves/vessels made of latex stretch bands. All digital files and instructions have been made available for free on the internet and the total cost of materials to construct the model is \$50 for those with access to a 3d printer, and approximately \$250 if one uses an online 3d printing service.

Primary Presenter: Shilo Smith

Project Title: *MicroRNA-26a is Strongly Down-regulated in Melanoma and Induces Cell Death through Repression of Silencer of Death Domains (SODD)*

Abstract:

Melanoma is an aggressive cancer that metastasizes rapidly, and is refractory to conventional chemotherapies. Identifying miRNAs that are responsible for this pathogenesis is therefore a promising means of developing new therapies. We identified miR-26a through microarray and qRT-PCR experiments as an miRNA that is strongly down-regulated in melanoma cell lines as compared to primary melanocytes. Treatment of cell lines with miR-26a mimic caused significant and rapid cell death compared to a negative control in most melanoma cell lines tested. In surveying targets of miR-26a, we found that protein levels of SMAD1 and BAG-4/SODD were strongly decreased in sensitive cells treated with miR-26a mimic compared to the control. The luciferase reporter assays further demonstrated that miR-26a can repress gene expression through the binding site in the 3'UTR of SODD. Knockdown of these proteins with siRNA showed that SODD plays an important role in protecting melanoma cells from apoptosis in most cell lines sensitive to miR-26a, while SMAD1 may play a minor role. Furthermore, transfecting cells with a miR-26a inhibitor increased SODD expression. Our findings indicate that miR-26a replacement is a potential therapeutic strategy for metastatic melanoma, and that SODD in particular is a potentially useful therapeutic target.

Primary Presenter: **Meena Song**

Project Title: *The road to price transparency*

Abstract:

United States provides excellent medical care to nearly 90 % of its population. They are leaders in preventative care and diagnostic screening test. However, they also spend the most for their medical care. US is estimated to spend nearly 20% of its GDP on health care. In order to continue excellent care and contain the prices of healthcare, the government mandated health care reforms under Affordable Care Act. Price transparency is part of the ACA. At the core of its principle, it is making prices of services we receive made available to the consumers to create competition among hospitals. Although faced with many challenges since it began in 2010, I believe it is possible. Solutions to these challenges are patient/ provider education and awareness, hospital and private insurance reform among others. With continual effort, price transparency could revolutionize consumer health care shopping experience.



Primary Presenter: **L. Jane Stewart**

Project Title: *Science Discovery: The Medical School Experience*

Abstract:

Science outreach programs have become an increasingly prominent aspect of education in the United States. Organizations such as CU Science Discovery have formed in order to promote development of these programs. The goal of these programs is to assist students in gaining experience in science that they may otherwise not receive. Partnerships with large academic institutions give students exposure to the realities of careers in science and research that is impossible in a high school classroom. Our project aimed to develop such a science outreach program for a group of high school students in Aurora, Colorado in conjunction with the University of Colorado Health Sciences Center and Science Discovery. Through basic pre- and post-testing and student feedback, we were able to assess the impact of the weeklong program on the students' interest in a career in science and knowledge of basic medical principles covered during the course.

Primary Presenter: **William Stoddard**

Project Title: *Bradycardia and Mobitz Type I AV Block in a Case of Intraorbital Foreign Body*

Abstract:

A 25-year-old previously healthy male was brought in by ambulance to the emergency department with facial trauma and bradycardia. On examination patient had a complete hyphema and globe rupture of the right eye. EKG showed ventricular rate of 42 with Mobitz Type I heart block. On CT head a ballistic foreign body was noted to have traversed the right globe, crossed through the ethmoid sinuses, and was embedded in the left orbit. The open globe was repaired. Bradycardia persisted requiring SICU admission for IV atropine and glycopyrrolate and continuous hemodynamic monitoring. Left sided orbitotomy and fluoroscopy assisted foreign body removal was performed with prompt resolution of bradycardia. There are few reported cases of persistent bradycardia secondary to intraorbital foreign bodies, and this is the first case describing a Mobitz Type I atrioventricular block.

**Primary Presenter: Sam Tarshis**

Project Title: *Preventing High Altitude Cerebral Edema with Repurposed Anti-angiogenesis Pharmacotherapy*

Abstract:

INTRODUCTION: HACE is a fulminant, deadly, and yet still unpredictable brain disease. A new prophylactic treatment for high altitude cerebral edema (HACE) needs to be developed, without the contraindications or adverse effect profiles of acetazolamide and dexamethasone. Since neovascularization signals are likely key contributors to HACE, our approach was to examine already existing anti-angiogenic drugs to inhibit potential initiating HACE pathway(s). This approach can also reveal crucial early steps in the frequently debated mechanism of HACE pathogenesis. OBJECTIVES: To test pro- and anti-angiogenic drugs for efficacy in HACE prevention or exacerbation, guide future clinical research, and further elucidate the root cause of HACE. METHODS: We exposed four rat cohorts to hypobaric hypoxia and one to sea level (hyperbaric) conditions. Cohorts were treated with saline controls, an anti-angiogenesis drug (motesanib), a pro-angiogenesis drug (deferroxamine), or an intraperitoneal version of the established AMS prophylaxis drug, acetazolamide (benzolamide). Brain tissue was analyzed for cerebrovascular leak using the Evans Blue Dye (EVBD) protocol. RESULTS: We observed significantly increased EVBD in altitude-control and pro-angiogenesis (deferroxamine) cohorts, and significantly decreased EVBD in anti-angiogenesis (motesanib), established treatment (benzolamide), and sea level cohorts. CONCLUSIONS: Anti-angiogenesis-treated cohorts demonstrated less cerebrovascular extravasation than the altitude control and pro-angiogenesis treated rats, suggesting promise as an alternative prophylactic AMS/HACE treatment. The leak exacerbation with pro-angiogenesis treatment and improvement with anti-angiogenesis treatment support the hypothesis of early neovascularization signals provoking HACE. We demonstrate statistically significant evidence to guide further investigation for VEGF- and HIF-inhibitors as AMS/HACE prophylaxis, and as elucidators of still unknown HACE pathogenesis.

Primary Presenter: **Anne Taylor**

Project Title: *nNo Clear Etiology: Bronchiectasis in a Native American Adolescent*

Abstract:

n/a

**Primary Presenter: Sarah Tietz**

**Project Title: *Capacity and Access to Care in Colorado during Health Reform***

**Abstract:**

Health reform in Colorado represents a historic opportunity to increase health insurance coverage not seen since the creation of Medicare and Medicaid in 1965. By 2016, approximately a half-million Coloradans will join the ranks of the insured through Medicaid expansion, a new health insurance marketplace, and employer and individual mandates.<sup>1</sup> Patients that had previously avoided the healthcare system or presented as self-pay will access healthcare more regularly. People will less frequently postpone medical treatment and more likely access primary care as their usual source of care.<sup>2</sup> Additionally, inappropriate Emergency Department visits will likely decrease as more uninsured patients gain health insurance coverage.<sup>3-5</sup> All providers, whether primary care or specialty, stand to receive greater reimbursement for treating patients that were previously uninsured.

It is important to understand Colorado will only realize these opportunities by overcoming some challenges. Change is coming to the healthcare system, it is up to all Coloradans to either embrace the change proactively or react to change after it occurs. The influx of newly insured patients will exacerbate the already established primary care provider shortage. Many primary care clinics (especially on the Front Range) already have long waiting lists for new patients. In addition, the newly insured are overall less likely to have a chronic condition than those currently on Medicaid, but if they do have a chronic disease they are more likely to have it undiagnosed or uncontrolled.<sup>6</sup> Those currently uninsured with uncontrolled chronic diseases likely represent some pent up need coming into the healthcare system. Yet, the newly eligible Medicaid population is younger than the overall population in Colorado so they will likely access the healthcare system less than older Coloradans.<sup>7</sup> Medicaid will reimburse for primary care at Medicare rates for 2013 and 2014 which should encourage primary care providers to see more Medicaid patients, lessening the provider shortage.

Implementation of several practice-level and system-level changes could allow Colorado to overcome these challenges. Whether Colorado is ready for the change or not, it is going to happen. As Anita Rich with Colorado Children's Healthcare Access Program explained, one of the most important things that can be done to prepare for healthcare reform is to learn to manage change. If more providers embrace new models of care, Colorado can lead the country in providing access to quality healthcare. More efficient practice management allows primary care providers to see more patients in the same amount of time. Evidence suggests that Patient-Centered Medical Home<sup>8-10</sup>, appropriate delegation of tasks<sup>11</sup>, open access scheduling<sup>12</sup>, staff mix changes<sup>13</sup>, group medical visits<sup>14</sup>, and asynchronous communication<sup>15-17</sup> all have the potential to increase practice efficiency and effectiveness. At a system level, generating more primary care providers<sup>18</sup>, payment reform<sup>19</sup>, care coordination<sup>20</sup>, expansion of scope of practice of PAs and NPs<sup>21</sup>, and a robust health information exchange<sup>22</sup> can all improve the ability of the healthcare system to absorb the newly insured.

Now is the time for providers, payers, policymakers, and patients in Colorado to work together so that more Coloradans will receive timely and effective healthcare. Other states have gone through the process of similar reform and insurance expansion (notably Massachusetts) and those states now lead the country in healthcare. Learning the lessons from other states and instituting evidence-based practice and system reforms will ensure Colorado's continued place among the nation's healthcare leaders. This is an exciting time to be at the forefront of historic reform that can help our country be a healthier version of itself.

**Primary Presenter: Joel Tourtellotte**

**Project Title:** *Upgrade rate and risk factors for high risk breast lesions: a literature review*

**Abstract:**

#### Background

Core needle biopsies (CNB) occur in 1% of all mammographies and are performed when breast lesions are identified by other methods like a palpable lesion. Of these biopsies 20% represent high-risk lesions (HRL) that include atypical ductal hyperplasia (ADH), lobular neoplasia (LN) including atypical lobular hyperplasia (ALH) and lobular carcinoma in situ (LCIS), radial scar (RS), papillary lesions and others. The management of these lesions include observation and excision, and there are currently no clear guidelines in the US. The studies that have characterized these lesions are small, single institution, retrospective studies and have looked at occult malignancies not originally detected by CNB as well as risk for later development of breast cancer. The purpose of this report is to review the published data regarding the association with occult malignancy and ductal carcinoma in situ (DCIS) in biopsied HRLs in order to clarify the indications for surgical excision.

#### Materials and methods

A PubMed, Ovid Medline and EMBASE search was conducted to identify all published articles in English addressing the upgrade rate of ADH, ALH, LCIS, RS and papillary lesions diagnosed at CNB with subsequent excision.

#### Results

The studies that formed the basis for ADH included 2447 patients with an upgrade rate to invasive carcinoma or DCIS of 17.8%. The studies that formed the basis for ALH and LCIS (collectively LN) included 1673 patients with an upgrade rate to invasive carcinoma or DCIS of 10.3%. The studies that formed the basis for RS included 1112 patients with an upgrade rate to invasive carcinoma or DCIS of 5.1%. The studies that formed the basis for all papillary lesions included 1990 patients with an upgrade rate to invasive carcinoma or DCIS of 9.2%. Although these studies had different methods of biopsy, the authors chose them based on certain criteria. All the included studies contained only pure lesions. Limitations of these studies include small, single institution and retrospective with unclear inclusion criteria for excision versus observation, as well as no follow-up after excision.

#### Conclusions

Based on the reviewed literature, it is difficult to recommend excision versus observation for any of these HRLs. The incidence of occult malignancy is a very real concern. The published predictive factors are not consistent, thus currently does not seem to aid in clinical decision making. These studies demonstrate a need for a long-term randomized control trial in order to clarify the benefit, if any, for surgical excision.

Primary Presenter: **Nhat-Tuan Tran**

Project Title: *Taking Aim at Disparate Bystander CPR Provision:*

*Targeted Hands-Only CPR Training Where It Is Needed*

Abstract:

**Background:** Out-of-hospital cardiac arrest remains a significant cause of morbidity and mortality, disproportionately affecting low-income and black populations in neighborhoods where bystander CPR is rarely provided. The Denver HANDDS Program was developed to identify these “high-risk” neighborhoods, ascertain barriers to bystander intervention and implement a community intervention to address these disparities.

**Aim:** To implement and evaluate a community-based, culturally-sensitive, train-the-trainer hands-only CPR program in targeted neighborhoods.

**Methods:** Community liaisons recruited participants to CPR education sessions. These participants then used low-cost, reusable manikins to train friends and family. All trainees were offered a survey immediately before and after training. Participants returned data on friend and family trainees up to 4 weeks later.

**Conclusions:** The Denver HANDDS Program effectively recruited subjects from identified neighborhoods and increased both knowledge of and comfort with performing hands-only CPR. 344 primary trainees completed training, and they educated 886 secondary trainees. Per-topic survey performance improved for primary and secondary trainees, and total score increased significantly. 664 of 832 respondents felt comfortable with performing CPR after the intervention. 55 primary trainees and 103 secondary trainees lived within 1 mile of target neighborhoods.

Primary Presenter: **Paul Tran**

Project Title: *Are Two Cultures Better Than One: Evaluation of the Use of Two Blood Cultures in the Diagnosis of Sepsis in Pediatric Patients and Effects on Clinical Decision Making*

Abstract:

Are Two Blood Cultures Better Than One: Evaluation of the Use of Two Blood Cultures in the Diagnosis of Sepsis in Pediatric Patients and Effects on Clinical Decision Making

Multiple blood cultures, when used for the diagnosis of sepsis, have been shown to improve pathogen yield and increase rate of detection in adult patients, but not in pediatric patients. This study looks at an EPIC protocol at Children's Hospital Colorado encouraging the drawing of two blood cultures before the administration of antibiotics. We hypothesize that multiple blood cultures will improve clinical decision making, with favorable outcomes including reduction of overall antibiotic administration and modification to more appropriate coverage given culture results.

This was a retrospective review of patients from 2008-2013 at Children's who received antibiotics after having blood cultures drawn. Patient records had were classified in a number of ways, including by features of their antibiotic administration such as continued, modified, or discontinued antibiotics, inappropriate treatment, or inconclusive based on data. Statistical analysis was done comparing outcomes from the preintervention cohort, 2008-2009, to the post intervention 2011-2013.

Multiple blood cultures were almost twice as good (3.1%,1.7%, p .003) as drawing one blood culture in identifying an absolute pathogen. Antibiotic discontinuation rate was non-significantly different if one culture grew a contaminant vs. one of multiple cultures growing a contaminant. Additional analysis on variables such as length of stay and bacterial vs. non bacterial infections will be conducted.



Primary Presenter: Dong-Kha Tran

Project Title:

Abstract:

Introduction: Prevailing literature on surgical stabilization of rib fractures and flail chest consistently report severe pulmonary contusion as exclusion criteria for surgical fixation. Due to previous studies that were limited by small sample sizes, and retrospective methodology, we performed a prospective, controlled evaluation of SSRF as compared to optimal medical management for severe rib fracture patterns among critically ill trauma patients. With these developments, we sought to revisit this contention to hypothesized that SSRF improves acute outcomes and is safe in patients with moderate-to-severe pulmonary contusions.

Methods: A retrospective review of patients presenting to a level 1 trauma center with both flail chest and severe pulmonary contusion was conducted between 2010 and 2015. Patients who received SSRF were compared to those who were given best medical management. Outcomes included respiratory failure, tracheostomy, pneumonia, ventilator days, tracheostomy, length of stay, daily maximum incentive spirometer volume, narcotic requirements, and mortality. 21 operative patients with moderate-to-severe pulmonary contusion were matched with 29 historical non-operative patients. Moderate-to-severe pulmonary contusions were defined as a BPC18 score of  $\geq 6$ . Sub-group analysis was conducted wherein participants were re-grouped based on low (<16), medium (16-30) and high (>30) Injury Severity Scores (ISS).

Results: 50 patients were included; 21 operative, 29 non-operative. For the operative vs non-operative groups, median BPC18 was 7.0 vs 8.0,  $p=0.23$ . Medically managed patients had on average 10.3 involve ribs with 16.2 total fractures. The non-operative group had a significantly higher Injury Severity Score (36.3 vs 25.6, respectively,  $p=0.004$ ). After adjusting for ISS, patients with medium ISS duration of mechanical ventilation was  $10.8 \pm 9.5$  days compared with  $15.0 \pm 11.4$  ( $p=0.45$ ) for medically managed patients. Pneumonia were present in 7.7% of surgical stabilized patient compared with 33.3% of patient medically managed ( $p=0.14$ ). Narcotic requirement was reduced after surgical stabilization but did not statistically differ.

Conclusion: Surgical stabilization of rib fractures in patients with flail chest and severe pulmonary contusion is safe and feasible. Furthermore, early surgical intervention was associated improved patient outcomes including length of mechanical ventilation, days in the ICU and narcotic requirement. This treatment modality may represent an important strategy to improve outcomes for patients this particularly morbid condition.

**Primary Presenter: Tysen Trujillo**

Project Title: *Perceptions of Rural Track Students in Using a Problem/team-based Learning Format in an Upper Extremity Injuries and Splinting Workshop*

*University of Colorado School of Medicine - Rural Track*

Abstract:

**Background:** The Rural Track at the University of Colorado - School of Medicine is an elective curriculum that is focused on augmenting relevant clinical knowledge and technical skills for Medical and Physician Assistant students that are interested in rural medicine. Recently the addition of an orthopedic injury and splinting course was desired to augment the current curriculum. An ongoing trend in medical education has been the exploration of utilizing alternative learning models such as problem-based learning, team-based learning and various hybrids of the two.

**Purpose:** After considering the evidence of benefits shown by the literature the decision was made to utilize a hybrid learning model consisting of a problem-based learning approach in a team-based setting. The workshop was designed with the goal of answering this question: What are the perceptions of Rural Track students in using a hybrid problem/team-based learning format in an upper extremity injuries and splinting workshop?

**Methods:** The students evaluated a two-part workshop on organization, learning objective attainment, appropriateness, learner satisfaction, team member participation, team member cooperation, team member respect, team decision making, and learning format preference.

**Results:** The students indicated a high rate of satisfaction with the workshop. Additionally, they indicated that the workshop was well organized and executed. When asked about learning style it was shown that the majority preferred this hybrid learning format. It was shown that the students were positive about the case/problem-based format carried out in a team learning environment. Other aspects that the students commented on being done well was the availability of facilitators when needed, practicing presenting the case in front of the entire group and receiving formative feedback, and the ability to gain hands on experience practicing splinting.

**Conclusion:** The students of the Rural Track indicated overwhelming positive perceptions of the hybrid learning model. The benefits seen with the learning model utilized in the workshop included: increased satisfaction, focus on critical thinking and problem solving, application to real-world practice and development of technical skills.

Primary Presenter: Timothy Ung

Project Title: *Intraoperative fluorescein guidance facilitates aggressive resection at the infiltrative margins of glioblastoma*

Abstract:

ABSTRACT

**Objective:** Extent of resection is an important correlative prognostic factor in patients undergoing surgery for glioblastoma. Recent evidence suggests that intravenously administered fluorescein sodium associates with tumor tissue, facilitating safe maximal resection of GBM. In this study, we evaluated the safety and utility of intraoperative fluorescein guidance for the prediction of histopathology both in regions of contrast enhancement (CE), where this relationship has been previously established, and into the non-contrast enhancing (NE), diffusely infiltrated margins.

**Methods:** Thirty-two patients received fluorescein sodium (3mg/kg) intravenously prior to surgical resection. Intraoperative visualization of fluorescence was performed using a Zeiss Pentero surgical microscope equipped with a Y560 filter. Stereotactically localized biopsies were acquired from CE and NE regions based on preoperative MRI in conjunction with neuronavigation. The fluorescence intensity of these biopsies was subjectively classified in real time, with subsequent quantitative image analysis, histopathological evaluation of localized biopsies, and radiographic volumetric assessment of the extent of resection.

**Results:** Bright fluorescence was observed in all GBMs, and localized to the CE regions and portions of the NE margins of the tumors, thus serving as a visual guide during resection. Gross total resection (GTR) was achieved in 84% of patients with an average volume resected of 95%, which was higher among patients for whom GTR was the surgical goal (93.1% rate of GTR, average volume resected 99.7%). Intraoperative fluorescein staining correlated with histopathological alteration in both CE and NE regions, with positive predictive values by subjective fluorescence evaluation greater than 96% in NE regions.

**Conclusions:** Intraoperative administration of fluorescein provides an easily visualized marker for glioma pathology in both CE and NE regions of GBM. These findings support the use of fluorescein as a microsurgical adjunct for guiding GBM resection to facilitate safe maximal tumor resection.

**Primary Presenter: Rachna Unnithan**

**Project Title:** *Assessing Brief Changes in Adolescents' Mood: Development and Validation of the Fast Assessment of Children's Emotions (FACE)*

**Abstract:**

Mood states of youth have a strong influence on their cooperation, comfort, and engagement in many health care and educational settings. Children who are fearful, angry, or sad are more likely to have difficulty learning new skills or connecting with others. Many interventions are used in hospital and school settings to help youth, but it is difficult to assess their effectiveness without appropriate assessment tools that are easy to administer, age appropriate, and psychometrically sound. We examined the validity and reliability of the Fast Assessment of Children's Emotions (FACE). After obtaining parental consent and youth assent, 61 patients ages 12 to 17 years were recruited from the psychiatry services at a large children's hospital. Participants completed the FACE, the Brunel Mood Scale (BRUMS), and a measure of satiety at three time points—before and after a 60-minute psychotherapeutic intervention and after lunch. The FACE measure was significantly correlated with the BRUMS ( $r^2 = 0.85$ ;  $p < .001$ ) and not correlated with the satiety measure ( $r^2 = 0.17$ ; not significant). Cronbach's  $\alpha$  for the FACE was 0.7734. The FACE showed significant changes in mood from before to after the therapeutic intervention for all patients. For general psychiatry patients, the FACE did not change significantly after lunch, although for patients with eating disorders, the FACE did indicate an increase in distressed emotions after lunch. This finding indicates sensitivity to change in a clinically meaningful manner. The FACE is easy to use and may be used quickly to assess mood changes in adolescents.

**Primary Presenter: Lauren VanDam**

Project Title: *Physical Manifestations of Post Intensive Care Syndrome in ICU Survivors: A Review of the Etiology, Detection Strategies, and Management of ICU Acquired Weakness*

Abstract:

Background: PICS consists of persistent cognitive, psychological, and physical dysfunction after critical illness that can last for up to 8 years. ICU Acquired Weakness (ICUAW) occurs in at least 25% of ICU survivors and results in poorer outcomes such as profound weakness, difficulty ambulating, decreased quality of life, increased mortality, and increased health-related costs. The increasing interest in ICUAW in the last decade has resulted in a better understanding of the etiology, appropriate diagnostic strategies, and management of the condition which when applied clinically may result in improved outcomes for ICU survivors.

Objectives: Discuss the causes, diagnostic tools, and management strategies of ICUAW in order to identify clinical recommendations that may improve the physical outcomes of ICU survivors.

Methods: Critical analysis of texts. ICUAW appears to be caused by complex interactions between critical illness stress metabolism and risk factors such as prolonged mechanical ventilation, sepsis, prolonged immobility, and malnutrition. ICUAW lacks diagnostic criteria, but can be detected by EMG, NCS, muscle biopsy, volitional strength and exercise tolerance tests, and imaging such as CT, MRI, DEXA, and U/S. Preventative and therapeutic interventions include early mobilization, physical rehabilitation, EMS, glycemic control, and nutrition support with an emphasis on appropriate protein provision.

Conclusions: ICUAW is a complex disease state that requires further characterization and identification of management strategies, which are being explored by numerous studies underway.

Primary Presenter: **Fu Wang**

Project Title: *Game-based learning in undergraduate medical education: A Review*

Abstract:

**Background:** Game-based learning involving serious games has potentials to be an effective and engaging learning tool in undergraduate medical education. This review aims to evaluate the evidence and current state of serious games in medical education.

**Design:** Analysis of existing literatures.

**Methods:** Research studies and literatures that evaluated game-based learning and empirical research trials that tested this model of learning against traditional instructional method were reviewed.

**Results:** Twenty-four papers were identified, reviewed, and summarize. There is increase evidence suggesting game based learning to be effective tool for learning.

**Conclusions:** Serious games is an effective educational tool in promoting active self-learning, it is perceive as a positive method for learners and enhance motivation and satisfaction among medical students in pathology, cardiology, and urology course. Further application to other medical courses needs additional research and validation.

Primary Presenter: **Gabrielle Whitmore**

Project Title: *Colorado Refugee Health Elective Course: Reassessment and Updates to Curriculum*

Abstract:

As the Refugee Health Elective for fourth year medical students and internal medicine residents has evolved in response to feedback from elective participants and changes in the landscape of refugee health services and logistical feasibility, a reassessment of the current elective activities and updates to the curriculum are warranted. How can the curriculum be changed to reflect the learning objectives and goals of health professions learners, as well as meaningfully contribute to the activities with the Spring Institute's Project SHINE with community health outreach and patient navigation?

The Refugee Health II Elective (RHII) has undergone considerable changes since its inception just a few short years ago. Initially envisioned as the secondary clinical correlate to the more didactic Refugee Health I (RHI) elective changes in the landscape of refugee health specifically in Denver, Colorado, coupled with feedback from residents and students naturally led to gradual, informal adjustments to the elective activities. At this time, it is necessary to review the current RHII elective to assess how the current activities that comprise the elective reflect the original learning objectives of the curriculum and if or how the curriculum needs to be adjusted to reflect the new opportunities and emphasis in community health and outreach.

Primary Presenter: **Gabriel Williams**

Project Title: *Evaluation and Treatment of Opioid Use Disorder in Pregnancy*

Abstract:

Opioid use disorder has been increasing in prevalence among most demographic groups and in all regions of the United States. Opioid use in pregnancy is associated with numerous adverse maternal, fetal, and neonatal outcomes. The severity of potential outcomes, as well as the concerning increase in prevalence makes an understanding of opioid use disorder in pregnant women, its health effects, and its treatment imperative for any healthcare provider that may interact with this population. A systematic literature review on the topic was conducted using multiple databases and an extensive number of search terms. Included papers were in English and of varying study type due to the known difficulty of performing high quality randomized controlled trials in this population, and included randomized controlled trials, retrospective and prospective cohort studies, case-control studies, observational, and epidemiologic studies. This review discusses consequences of maternal opioid use, treatment options including detoxification to abstinence and opioid replacement therapy with methadone or buprenorphine, the role of psychosocial context and comorbid psychiatric illness, and additional prenatal care considerations unique to this population. A set of treatment guidelines based on the evidence review was produced.



Primary Presenter: Jason (JD) Williams

Project Title: *Assessing Perioperative Nutritional Practices and Attitudes—A National Survey of Colorectal Surgery and GI Surgical Oncology Fellowship Programs*

Abstract:

**Importance:** Appropriate perioperative nutritional support to improve surgical outcomes is well described, yet implementation of evidence-based surgical nutrition practice in the U.S. is hypothesized to be suboptimal and actual description of current practice is lacking.

**Objective:** To broadly describe nutritional practices and attitudes of gastrointestinal (GI) surgeons across the U.S.

**Design:** Survey assessing nutritional practice. Aggregated results were analyzed with descriptive statistics and a multiple regression analysis for explanatory factors of nutritional practice.

**Setting:** Predominantly high volume, academic centers with colorectal and surgical oncology fellowship programs.

**Participants:** Surgical faculty at U.S. colorectal and GI surgical oncology fellowship programs (75 total programs identified) were invited to participate.

**Main Outcome and Measures:** Quantification and description of local surgical nutrition practices and characteristics, attitudes regarding current evidence, and nutrition practice improvement barriers. We hypothesized that surgical oncologists, high-volume centers, university-affiliation, and the presence of a formal screening process would all predict higher estimated percentages of malnourished patients, nutritional screening, and nutritional supplementation prior to surgery.

**Results:** Overall program response rate was 64% (57% of colorectal and 81% of surgical oncology programs). Only 38% had formal nutritional screening processes in place. Average estimated percent of patients that: were malnourished, received nutritional screening, and received nutritional supplementation preoperatively were 28%, 43%, and 21%, respectively. Multiple linear regression analysis revealed only university-affiliation ( $p=0.0371$ ) and a formal screening process ( $p=0.0312$ ) predicted a higher rate of preoperative nutritional screening. In patients receiving perioperative nutrition intervention, protein-containing oral supplements were most commonly utilized (81%). Controversy existed regarding if sufficient evidence existed to support routine use of immunonutrition prior to major GI surgery with 39% in agreement. However, strong consensus (89% agreement) emerged that lack of awareness or knowledge about immunonutrition impedes its usage in clinical practice

**Conclusions and Relevance:** Surgeons in the U.S. recognize the benefits of proper perioperative nutritional support, but current practices do not meet current guidelines and evidence based practice recommendations. Improved identification and treatment of nutritionally at-risk patients through standardized protocols and quality improvement efforts are warranted.

**Primary Presenter: Elizabeth Lynne Wood**

**Project Title: Hepatitis C Screening at Federally Qualified Health Centers in Colorado**

**Abstract:**

**Abstract:**

**Background:**

Hepatitis C is a surprisingly common blood-borne illness. As of 2011, the CDC estimated 2.7-3.9 million people in the U.S. had the disease after accounting for under-reporting and undiagnosed patients [1]. In 2013, they calculated that up to 29,718 acute cases might have occurred [2]. Despite its pervasiveness, many patients go untested and infection with Hepatitis C is not discovered until patients present with complications like liver failure, cirrhosis or hepatocellular carcinoma [3]. Both screening practices and treatment options are rapidly evolving and improving, giving health care providers and public health organizations the opportunity to prevent more morbidity and mortality of the disease than ever before.

**Methods:**

We electronically distributed a 24 question online survey via SurveyMonkey to primary care physicians, nurse practitioners and physician assistants at 7 Federally Qualified Health Centers (FQHC™s) in Colorado to elucidate barriers to testing and screening for Hepatitis C. We then analyzed the survey responses for trends using averages of question responses and thematic analysis of comments so providers could describe the barriers they see firsthand.

**Results:**

We did not collect enough responses to yield statistically significant results, but several trends emerged. It was evident that while most providers (86.2%) screen based on risk factors like intravenous drug use or possible medical exposure before 1992, less than half (47.2%) screened members of the Baby-Boomer cohort. When they considered not screening patients with risk factors, it was usually because there would be no specialist available to treat them if they did test positive. Providers who diagnosed patients also reported that getting those individuals into treatment is difficult, in large part due to contraindications to therapy like substance abuse, but also difficulty with getting patients in to see specialists or having referrals rejected.

**Conclusion:**

The issues surrounding testing and counseling are largely related to time, lack of specialized knowledge and most prominently financial constraints. Additionally, difficulty with referrals to specialists for chronic hepatitis C is one of the biggest barriers. Our preliminary data suggest that this difficulty is due largely to lack of providers, lack of insurance or cost of treatment. Not all of these issues could be addressed with interventions by these investigators or the viral hepatitis team, but several seemed to be feasible targets for improving the identification and treatment of eligible patients with Hepatitis C after our survey. We chose to address knowledge gaps for PCP™s by updating the existing CDPHE/HealthTeamWorks screening and referral guidelines for Hepatitis B and C, to address lack of access to specialists by disseminating information about the burgeoning telemedicine project called Project ECHO. It has yet to be seen whether these interventions were effective in increasing screening or treatment rates among Colorado residents.

Primary Presenter: **Katharina Wyns**

Project Title: *Antibody and Immune Therapy in Childhood Glioblastoma*

Abstract:

Glioblastoma multiforme (GBM) is a WHO grade IV malignant astrocytic tumor that is classically associated with elevated levels of endothelial growth factor receptor (EGFR) expression. EGFR induces intracellular and extracellular changes that ultimately produce a pro-oncogenic environment for GBM development and metastasis. In conjunction with elevated levels of EGFR, the innate and adaptive immune systems also hold critical roles in advancing a pro-oncogenic environment. Previous experimental and clinical data indicate that cancer cell lines exhibit an "immunological shift" to promote tumorigenesis. To this end, we conducted a series of studies to investigate the role of T-cell stimulating cytokines in pediatric GBM immunotherapy. Primarily using U251 and U87 cell lines, cytotoxicity assays were developed to test combination drug therapies with cetuximab, GM-CSF and the following cytokines: IL-12, IL-2, and IL-10. LDH co-culture assays were performed on these cell lines to evaluate the therapies' cytotoxic effects. Immune-stimulating IL-12 and IL-2 cytokines were found to promote GBM cell lysis, whereas the pro-oncogenic IL-10 cytokine was observed to protect GBM cells from antibody "dependent cell-mediated cytotoxicity (ADCC). Combination therapy with IL-12 or IL-2, GM-CSF and cetuximab had the greatest ADCC effect. We verified cell line results using an ex vivo patient-derived organotypic slice culture. These findings were corroborated with TIL Annexin V studies, demonstrating increased rates of GBM apoptosis in the presence of combination immune stimulating cytokine therapy. Our BrdU/7AAD studies also revealed that the GBM cell lines arrest at or just prior to the G1 restriction checkpoint under the same pro-immunogenic conditions. As is evidenced by our studies, combined myeloid stimulation with cetuximab treatment results in increased GBM cell death as well as G0/G1 cell cycle arrest. Our preliminary data suggests that immune-stimulating therapies should be considered for further studies in tumor infiltrating leukocyte (TIL) models and in vivo studies.

Primary Presenter: Elise Yerelian

Project Title: Self-reported alcohol and substance use in pregnant women with depressive symptoms

Abstract:

Self-reported alcohol and substance use in pregnant women with depressive symptoms

Jennifer Hyer, MD, Elise Yerelian, Torri D. Metz, MD, MS, Amanda A. Allshouse, MS, M. Camille Hoffman, MD,

Background: Substance use disorders often coexist with depression. The objective of this study was to establish whether pregnant women reporting depressive symptoms were more likely to report use of alcohol, tobacco, marijuana or cocaine during pregnancy.

Methods: This was a secondary analysis from the Maternal-Fetal Medicine Units Network Preterm Prediction Study. Self-reported history of alcohol, tobacco, marijuana, and cocaine use were compared between pregnant women with and without depressive symptoms. Alcohol, tobacco, marijuana, or cocaine use were modeled with logistic regression as predicted by the presence of depressive symptomatology with adjustment for age, race, parity, education, and current work.

Results: When compared to women without depressive symptomatology (n=2190), women with depressive symptomatology (n=646) were more likely to report: any alcohol (OR 1.4 95%CI 1.1, 1.8), > 1 drink per week (OR 1.3 CI 95% 1.0,1.8), and >1 drink per day (OR 2.2 CI 95% 1.5,3.4). Women with depressive symptomatology were also more likely to report drug use before pregnancy (OR 1.5 95% CI 1.2, 1.8) and increased use of cocaine (OR 2.8% CI 95% 1.5, 5.3), marijuana (OR 1.8 CI 95% 1.2, 2.6) and cigarette use (OR 1.4 CI 95% 1.1, 1.7) during pregnancy.

Conclusion: Depressive symptomatology was associated with an increase in self-reported use of alcohol, tobacco, marijuana and cocaine during pregnancy. These data reveal the importance of targeted screening of pregnant women with depressive symptoms for substance use.