Thursday, March 7, 2013

**Poster Sessions**
Session A: 8:30 am – 9:30 am  
Session B: 9:45 am – 10:45 am  
Session C: 11:00 am – 12:00 pm

**Key Note Speaker**  
Dan Theodorescu, MD, PhD  
1:00 – 2:00pm  
*ED1 Room 1300*
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

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!

Daniel Chan, PhD  Joseph Brzezinski, PhD  John Tentler, PhD
Evgenia Gerasimovskaya, PhD  Barbara Helfrich,  Zung Tran, PhD
Peter Wu, Ph.D.  David Orlicky, PhD  Gregory Kinney, MPH, PhD
Ying Chen, PhD  Lisa Davis, MD, MSCS  Darlene Tad-y, MD
Todd Kingdom, MD  Catherine Battaglia, PhD, RN  Niklaus Mueller, PhD
Aik Choon Tan, Ph.D.  Elizabeth Brooks, PhD  Doug Graham, MDPhD
Adit Ginde, MD, MPH  Mark Deutchman, MD  Colleen Julian,
Patricia Heyn, PhD  Robert Dellavalle, MD. PhD, MSPH  Tullia Bruno, PhD, Immunology
Virginia Sarapura,  Jackie Glover, PhD  Lori Walker, PhD
Caroline LeClair, DO  Corry Robinson, PhD, R.N.  Lora Wilson, PhD
David Ammar, PhD  Robert Sclafani, PhD
ABSTRACTS

Actis, Richard

Project Title: Anesthesia Simulation at Denver Health

Thematic Area: Humanities, Social Science and Education

Abstract: Simulation has become an important part of resident and medical student education. Does simulation training improve clinical performance compared more than traditional didactic teaching [8]? Although most authors have reported that simulation confers an impact on clinical practice and patient outcomes [9-13] some recent reviews have disputed this assertion [3, 15, 18]. The evidence indicates that human patient simulation is superior to traditional teaching methods for introduction of novice learners to both clinical scenarios and technical skills prior to clinical practice. However as shown by Nishisaki et al. [15], simulation may not be the answer to refreshing learners on technical skills like intubation. Additionally as found by Friedman et al. [17] the simulator used does not necessarily need to be high-fidelity for it to be a useful teaching tool which is good news for programs interested in limiting cost. Overall, human patient simulation is likely the best way to teach technical skills, improve hand eye coordination and develop higher level cognition prior to the novice learners first patient experience. This may not only improve patient safety and comfort but may also quicken learning as shown by Niak et al. [14] and Niazi et al. [16] and increase the permanence of that knowledge as shown by Heinz et al. [21]. Personally I have been part of the development of simulation education at Denver Health Medical Center. Recent strides have been taken to provide incoming anesthesia residents and CRNA students at Denver Health with a quality simulation OR experience designed to prepare participants for both common and rare complications encountered during the preoperative period. It is our hope that through our simulation exercises participants have gained the experience they need to advance their clinical practice and improve patient outcomes.
**Project Title:** Have 35 Years of Educational Interventions to Improve Sleep Disorder Training in Medical School Been Effective?

**Thematic Area:** Clinical Science

**Abstract:** Have 35 Years of Educational Interventions to Improve Sleep Disorder Training in Medical School Been Effective? Background and objectives: Sleep disorders are highly prevalent and cause significant negative health consequences. Ten percent of the general population experiences significant daytime impairment related to poor sleep. Often, sleep disorders are not recognized by primary care physicians (PCP’s). Deficiencies in medical student education are thought to contribute to poor rates of recognition. This paper reviews the history of educational interventions designed to improve sleep disorder training in medical school and examines the effect on recognition of sleep disorders.

Methodology: A pub-med review of literature was performed to examine the relationship between educational interventions and recognition of sleep disorders. Conclusions: Efforts to improve sleep disorder training for medical students began 35 years ago. As late as the mid 1990’s at least 30% of medical schools did not offer any training in sleep medicine. More recent research initiatives have improved the tools used to evaluate sleep medicine education, however, it is unclear how much training medical students are currently receiving. Sleep disorders are consistently under-recognized in primary care settings and it is not clear if educational interventions have improved this problem.
**Project Title:** COLOCALIZATION OF NCX AND HCN4 IN THE MOUSE SINOATRIAL NODE

**Thematic Area:** Basic Science

**Abstract:** Colocalization of NCX and HCN4 in the Mouse Sinoatrial Node

Mechanisms describing the automaticity of sinoatrial myocytes have been a highly debated topic of study for over 50 years. Current opinions point toward both cell-surface voltage-gated membrane channels, primarily via HCN4 (which produces the funny current, If); as well as intracellular shifts in calcium mediated by NCX and the sarcoplasmic reticulum, which create a ‘calcium clock.’ This study investigates if there is physical colocalization between these two signaling pathways within mouse sinoatrial nodal cells. Sinoatrial nodal tissue was harvested from wild type mice. The specimens were frozen and sectioned into 6-8 micrometer sections, and immunohistologically stained using rabbit- and mouse-derived antibodies against NCX and HCN4. The samples were imaged using confocal microscopy and analyzed using ImageJ software to determine the extent of colocalization between the two molecules. Analysis revealed colocalization between the two channels both qualitatively and quantitatively. The association between the channels was stronger on the cellular level than within whole sections of sinoatrial node tissue. These results may indicate that NCX and HCN4 interact through an as-yet undefined common pathway to affect heart rate.
**Project Title:** Translating PCMH into Patient Centered Language

**Thematic Area:** Humanities, Social Science and Education

**Abstract:** Background: The Patient Centered Medical Home (PCMH) is an innovative model of health care delivery. It aims to make health care more effective and affordable and to reduce episodic care that has risen as a result of increasing health care costs and sub specialization. The PCMH model has been implemented in many different health care settings and has proven beneficial in terms of patient outcomes. It is unclear what the PCMH looks like in rural or underserved settings and it is unclear what the patients’ perspective of what the PCMH is. Currently the PCMH is being implemented in various healthcare clinics and communities across rural eastern Colorado. Objective: It is the goal of this project to ascertain what the patient perspective is of the PCMH and to develop a language that can be used to educate and promote patient participation with the PCMH in rural eastern Colorado. The ultimate and more long term goal being to promote rural and underserved patient participation with the PCMH, thus improving health outcomes in these medically underserved areas. Methods: The Community Advisory Committee (C.A.C.), a diverse group of individuals from various communities in rural eastern Colorado where PCMH is currently being implemented, were taught about the PCMH and how it will interface with them as patients. The C.A.C. was then asked to develop a language that would be used to educate and advertise the PCMH to the various communities in which the PCMH is being implemented. Results: The C.A.C. decided that the message of the PCMH should focus on the aspect of a relationship with a personal physician and how the PCMH promotes that relationship. Conclusion: The PCMH message that is intended for the patient population of rural eastern Colorado needs to be narrowed from the traditional message intended for health care providers. The message must emphasize the patient-physician relationship and should be tailored to the individual communities.
Project Title: Restraint Of Patients by EMS (ROPE)

Thematic Area: Clinical Science

Abstract: Objective: To determine whether there is a difference in timing of specific aspects of care among restrained patients in the Emergency Department (ED). Factors considered include: prehospital restraint use, end disposition, and basic demographic profile information. Methods: The study was conducted as a retrospective chart review of patients presenting to a university-based emergency department with a physician order for physical restraint. Two researchers using an IRB-approved data extraction tool evaluated 196 charts. Results: Of the 196 charts evaluated, 179 were eligible for inclusion in the study. Of the charts studied, 109 patients arrived via Emergency Medical Services (EMS), with 56 restrained prehospital and 53 not restrained until arriving in the department. Time to physician and total ED stay were shorter for patients restrained prehospital (5.8 vs 9.6 minutes, p=0.019; 9.95 vs 19.1 hours, p=0.011), however there was no significant difference in time to discontinuation of restraints (5.1 vs 7.5 hours, p=0.20). Analysis of the larger group of 179 demonstrated that patients with referral to psychiatry had longer total ED stays (10.1 vs 27.6 hours, p
Project Title: Understanding Lack of Support for Government by Progressive Citizens

Thematic Area: Humanities, Social Science and Education

Abstract: Certain progressive measures in the state of Colorado did not get as strong of support from traditionally progressive voters, as was expected. This triggered a study to investigate what influences the way they vote, and what they think of the government. Twenty interviews were conducted with various community leaders representing Latinos, Rural citizens, Working women, and Blue collar working men. Themes were extracted through the interviews which identified the values important to that particular group, and values that were important to all of the groups. The results showed that each of the groups had basic values that helped shape how they vote. For example, rural citizens feel left out of politics and thus tend to vote against big government, unless their needs are specifically attended to. All of the groups reiterated the importance of focusing on low-income voters to pass progressive legislation, the need to deliver the message personally and from similar individuals, and the benefit of transparency in government to increase trust. All of these ideas have been shown to impact voting preferences in other studies.
Project Title: Adventures of Dendy: A tale of a mighty dendritic cell and his friends. Can a graphic novel based on immunology spark interest in science among middle school readers?

Thematic Area: Basic Science

Abstract: Not available
Project Title: The Accuracy of Long Leg Radiographs

Thematic Area: Clinical Science

Abstract: Leg length discrepancy (LLD) is a common condition that can result in pain, deformity, gait abnormality, and if left untreated, early degenerative changes in the lower extremities and spine. Many clinical and radiographic methods have been developed for assessing LLD, and the most commonly utilized method is the standing, full-length, anterior-posterior (AP) computed radiograph (CR) also known as the teleoroentgenogram. However, knowing that the teleoroentgenogram is as reliable as the scanogram may not be enough to justify its use in routine practice. The teleoroentgenogram also must be accurate in order to justify its use. We employed a sawbone long leg model and imaged it in 0, 15, and 30 degrees of knee flexion and compared the computed image lengths to the actual measured length of the sawbone. We were able to conclude that the CR teleoroentgenogram is an accurate way of measuring LLD as long as flexion deformities of the knee are not present. We were able to demonstrate that at 15 and 30 degrees of flexion, the computed length of the long leg is less than the true length and that this calculated value can not be as reliably used. Overall, we recommend the routine use of CR teleoroentgenograms for the measurement of LLD in patients without flexion deformities of the knee.
**Project Title:** The Use of In Vitro Fertilization in the Management of Male Infertility - What the Urologist Needs to Know  
**Update in the Adverse Events Associated with Medical Therapy for Prostate Cancer**  
**Neoadjuvant Chemotherapy Prior to Cystectomy in pT2 Patients – Th**

**Thematic Area:** Clinical Science

**Abstract:** The Use of In Vitro Fertilization in the Management of Male Infertility - What the Urologist Needs to Know  
Infertility affects approximately 10-20% of reproductive age couples. Male factor infertility contributes to 2/3 of all cases. The urologist plays an integral role in male factor infertility, especially in cases where sperm harvesting is needed. In vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI) allows for men with severe infertility to have genetic offspring. IVF involves ovarian stimulation, oocyte retrieval, and fertilization outside of the body. ICSI involves injecting one sperm into the oocyte to promote fertilization. A brief overview of IVF and ICSI and the risks involved is provided to facilitate the care of the infertile couple.  

Update in the Adverse Events Associated with Medical Therapy for Prostate Cancer  
Prostate cancer is the most common non-cutaneous cancer among men in the United States and the second most common cause of cancer death [2]. Since about 19% [3] of men require medical therapy, the risks and benefits of this therapy are worth understanding. This update follows “An Update on the Changing Indications for Androgen Deprivation Therapy for Prostate Cancer” [1] which focused on risks and benefits of androgen deprivation therapy (ADT). This review examines recent evidence for the use of some recently investigated agents, including Abiraterone, MDV3100, and Sipuleucel-T. Abiraterone is a potent and irreversible inhibitor of the enzyme 17α-hydroxylase/C17,20 lyase (CYP17) that has FDA approval in the US [4] and Europe [5] for castration resistant prostate cancer (CRPC) and has been tested in several Phase I and II studies to evaluate safety and tolerability [6-11]. The anticipated toxicities are attributable to a syndrome of secondary mineralocorticoid excess—namely hypertension (10%), hypokalemia (17%), and lower-limb edema (31%). These are successfully managed with mineralocorticoid receptor antagonists [6,12]. Cardiac events include tachycardia (3%) and atrial fibrillation (2%); however, in published studies, there has been no significant increase in fatal cardiac events in the abiraterone group. Abiraterone was not tested in patients with baseline ejection fraction 50% decline) in 10% of patients and a longer time to disease progression, 34 weeks with Sipuleucel-T versus 13 weeks with placebo (P=0.03) [20,21]. Phase III trials demonstrated a statistically significant improvement in overall survival of 4.5 months (P=0.01) [20,21] and an increased rate of survival in patients treated with Sipuleucel-T at 36 months (34% with Sipuleucel-T versus 11% with placebo) [20,21]. The authors of this study note that progression free survival is very similar between Sipuleucel-T and placebo for the first 2 months with Sipuleucel showing a later improvement in progression free survival. This is thought to be due to the vaccine requiring 8-10 weeks for an adequate response [20,21]. The drug was administered in three infusions and was well tolerated by most study participants [19]. The most common adverse events were related to cytokine release syndrome [22] and included rigors (59.8%), pyrexia (29.3%), tremor (9.8%) and chills (8.5%) [19]. Most toxicities, 70.7%, were grade 1 or 2 and 95% of patients were able to complete all 3 infusions [23]. More serious adverse events included central venous catheter infection or other serious infection in 5% of treated patients [19]. Sipuleucel-T has not been tested against other drugs for hormone resistant
prostate cancer such as Docetaxel; thus, it is still unclear whether Sipuleucel-T has an advantage over more conventional treatments [24]. Multiple new treatments for castration resistant prostate cancer have emerged in recent years increasing overall survival for a disease that has been previously refractory to most drug therapies. Adverse events include increased cardiovascular risk and mineralocorticoid excess with Abiraterone; fatigue, anemia, arthralgias and asthenia with MDV 3100; and cytokine release syndromes and serious infection when using Sipuleucel-T. It is important to select patients for treatment in whom evidence predicts the most benefit and to carefully weigh the benefits of treatment against the costs and risks. Neoadjuvant Chemotherapy Prior to Cystectomy in pT2 Patients – Think Twice? INTRODUCTION AND OBJECTIVES: The role of neoadjuvant chemotherapy (NAC) with cystectomy is controversial. Although many studies have shown no advantage, a large, prospective randomized trial has shown an overall survival benefit to the administration of NAC with cystectomy. The study population for these studies included patients with a broad range of cancer stages (T0-T4a). Evaluation of results from a homogeneous clinical population may inform more individualized treatment decisions. We sought to evaluate the outcomes of patients treated neoadjuvantly with stage T2 bladder cancer as compared to radical cystectomy alone in a large-volume university setting. METHODS: Medical records were reviewed for 186 patients who underwent cystectomy for cancer by a single surgeon during a 68 month period at our institution. Patients with pathological staging of T2 pathology on cystectomy or radical transurethral resection of bladder tumors (if final pathology revealed T0 disease) were included for analysis (n=95). No patient had cancerous nodal involvement. Kaplan-Meier survival curves were generated for both cohorts and tested for a difference with the logrank test. As a shift to NAC was not experienced until 2009, only 21 of these patients received NAC prior to surgery and 74 patients underwent cystectomy alone. Patient follow-up continued between 0 and 57 months post-surgery (M = 18 months). There was no obvious selection bias for patients undergoing NAC. RESULTS: Surprisingly, T2 Patients who underwent combination therapy had a significantly worse survival rate than patients who underwent radical cystectomy alone (logrank: p
Project Title: Exercise after treatment, a cancer survivor wellness scoping study

Thematic Area: Public Health and Epidemiology

Abstract: Given the large amount of evidence that exists regarding improved cancer survivor health, body composition, energy, and overall feeling of wellness, evidence strongly suggested exercise prescriptions and programs would benefit cancer survivors with very little if any side effects or dangers of implementing these programs. Currently is only one published set of guidelines that exist to guide health care providers when prescribing exercise programs for this unique population. Given this lack of publicized guidelines, we have decided to perform a scoping study to evaluate the state of the literature that exists not only regarding the benefits of exercise programs, but what literature exists regarding the translation and implementation of these programs to community programs. Our question to be answered by this scoping study was: “What is known about the implementation of exercise programs for cancer survivors to guide program translation and dissemination?” Methods: Key terms of “cancer survivor” with “exercise”, “exercise implementation”, “evidence-based exercise”, “exercise translation”, “exercise health promotion”, and “exercise rehabilitation” between were searched in PubMed and SportDiscus. Our time frame was Jan 1980 to June 2012 with the main search being done in 2011 with updates in January of 2012 and June of 2012. Results: The search results returned 421 abstracts, 116 total for the scoping study collection that met criteria. 9 studies identified within the search results that met our criteria for inclusion directly studied the feasibility, efficacy, long term behavior, or translation of exercise programs to community programs of cancer survivors. Conclusions: While there are a very large number of scientific studies that have examined exercise programs for cancer survivors, very little research has been done on feasibility, implementation, translation, and long-term efficacy in the community setting. Furthermore there are no current published guidelines easily searchable on the Internet for health care providers to recommend to their cancer survivor population. There is a great need to develop evidence-based guidelines and disseminate these guidelines to health care providers in an easy to use fashion.
**Project Title:** Ghrelin: Inflammation, Injury, & Myocardial Ischemia/Reperfusion

**Thematic Area:** Basic Science

**Abstract:** **Outline** Ghrelin: Inflammation, Injury & Myocardial Ischemia/Reperfusion  
• Introduction to Ghrelin o GH, GHS-R, and the discovery of Ghrelin o Ghrelin structure and major functions overview. • Orexigenic activity • GH, Hypothalamic, and Pancreatic Stimulation • GI Functions • Neuroendocrine activity • Anti-Inflammatory activity • Direct Cardiovascular activity  
Ghrelin decreases countless inflammatory factors and cytokines in vitro and in vivo o Sepsis (LPS) o Renal infarct o Intestinal infarct and I/R o Myocardial infarct o Isolated myocardial I/R o Ghrelin and the Cardiovascular system o Direct Inotropic, vasodilatory, anti-apoptotic, and anti-inflammatory activity on cardiac myocytes. o Decreased inflammatory markers in LAD ligation • Decreased infarct sizes • Improved mortality o Decreased inflammation in isolated rat myocardial I/R • Ghrelin and global myocardial I/R o Syngeneic mouse model of global myocardial I/R with blood reperfusion o Decreased inflammatory markers (IL-1b, TNF-a, ICAM, VCAM) o Decreased monocyte and PMN infiltration into tissue o Decreased myocardial damage (decreased TN-I)  
• Conclusion
Azimi, Hassan

**Project Title:** An Accumulation of Frailty Characteristics Are Associated with Discharge to an Institutional Care Facility

**Thematic Area:** Clinical Science

**Abstract:** Objectives: Determine the relationship of frailty to the postoperative outcome of discharge to an institution. Background: Geriatric patients have a unique physiologic vulnerability often described as frailty. Frailty characteristics are not captured with standard preoperative assessment. Frailty has been shown to predict poor outcomes in hospitalized older adults. Methods: Subjects ≥ 60 years undergoing an elective operation requiring postoperative stay in the ICU were enrolled. Preoperative frailty assessments were performed prospectively. Primary outcome was discharge to an institution. Results: 31 subjects (age 68 ± 7) were studied. Incidence of discharge to an institution was 29% (9/31). Preoperative characteristics closely related to institutionalization included: increased co-morbidities – Charlson index ≥ 3 (P = 0.0538), self-reported exhaustion (P = 0.0377), slowed gait speed (P = 0.0152), and dependence in a single instrumental activity of daily living (P = 0.0772). Individuals discharged home had less (1.39 ± 1.05) characteristics compared to those discharged to an institution (2.78 ± 0.95) (P = 0.0004). Presence of ≥ 3 characteristics predicted institutionalization: sensitivity (67%), specificity (91%), positive predictive value (75%), and negative predictive value (87%). Conclusion: Preoperative frailty assessments provide unique insight into a geriatrics patient’s discharge disposition at no additional cost. Less characteristics were found in subjects discharged home and ≥ 3 characteristics predicted discharge to an institution.
Project Title: Potential outcome measures for Parkinson's disease dementia: a systematic review

Thematic Area: Clinical Science

Abstract: Background: Parkinson’s disease dementia (PDD) is a major cause of morbidity and mortality in Parkinson’s disease (PD), and is the leading cause of nursing home placement in PD. Unfortunately, current treatment options have relatively small impact on this condition. As novel treatments are developed there is a need to assess the clinical impact of these therapies in appropriately designed and controlled trials. To date there is no agreement on the optimal outcome measures for such trials. We examine potential PDD outcome measures relevant to clinical trials with the goal of informing future trial design and outcomes studies. Methods: We performed a literature review of clinical trials in patients with PDD with a focus on outcome measures. In the absence of use in clinical trials, we evaluated observational studies using potentially relevant outcome measures and/or informative studies from related conditions such as Alzheimer’s disease. Results: Outcomes were divided into major domains including cognitive, behavioral, functional, quality of life, caregiver and global. We found that, in general, the measures used for determination of outcomes were inconsistently used across trials. We provide a summary of potentially relevant outcomes including their validity, reliability, sensitivity to change and clinically meaningful change scores when known. Conclusion: There is a need for further research into available PDD trials outcomes and standards for trial design. Such work should improve comparability of trials and increase the ability of clinicians, researchers and policy-makers to interpret results. We provide suggestions for use of currently available measures and areas of future research.
Project Title: Distracted Driving Habits of Emergency Department Patients

Thematic Area: Public Health and Epidemiology

Abstract: Study Objectives: Recently there has been increased attention to “distracted driving” from cell phone use or texting while driving; population estimates suggest that 25% of drivers regularly talk on cell phones while driving and 18% regularly text or email while driving. Less is known about the driving habits of emergency department (ED) patients, who may be a group more prone to high-risk behavior. We sought to describe the beliefs and self-reported behaviors of ED patients concerning distracted driving. Methods: Research staff invited consecutive patients aged 18-64 visiting an urban ED to self-complete a pilot-tested, confidential survey regarding their beliefs about driving risk and their self-reported driving patterns and crash experiences. Non-English speaking patients, those who did not currently drive, and those with cognitive impairment or a critical illness were excluded. We calculated proportions and 95% confidence intervals (CI) to describe the beliefs and behaviors of drivers by age group (18-24, 25-34, 35-44, 45-54, and 55-64 years), and we used Fisher exact tests to examine differences among age groups. Results: Overall, 201 patients completed the survey (participation: 82%). Slightly more than half were female (60%) with a median age of 42 (interquartile range: 23). Most respondents drove everyday or almost every day (83%; 95% CI 77-88) and rated themselves as good drivers (88%, 95% CI 83-92). Most patients reported always wearing seat belts while driving (88%; 95% CI 83-92) and as passengers (85%; 95% CI 80-90), without significant differences by age group. More patients thought a driver is likely to be hurt if texting (94%) than if talking on a cell phone (84%) while driving, and more patients reported sometimes or always talking on a cell phone (39%) than texting (13%) while driving, with some differences by age groups (Table). In the past 12 months, 26% of respondents reported having been stopped by the police while driving and 13% reported having been involved in a motor vehicle crash as the driver, without differences by age group, gender, or texting or cell phone behavior. In this small sample, beliefs about the likelihood of being hurt by texting or cell phone use while driving were not associated with the self-reported behaviors themselves. Neither beliefs nor self-reported behaviors differed significantly by gender. Conclusion: Although most responding ED patients believed a person is likely to be hurt if talking on a cell phone or texting while driving, many reported doing these things themselves, especially talking on a cell phone, at rates higher than general population estimates. Younger patients, who appeared to have a lower perceived risk of cell phone use and texting while driving and a higher incidence of texting while driving, may be a particularly high risk group in need of targeted prevention messages.
Project Title: Phone Call Volume and Abandonment rates: Process Improvement in a Busy University-based Neurology Clinic

Thematic Area: Humanities, Social Science and Education

Abstract: Background and Objectives: A disproportionate monthly call volume and a significant call abandonment rate were noted at the University of Colorado Outpatient Neurology clinic. Why does this clinic receive a disproportionate monthly call volume, what can explain the observed high rate of call abandonment and what strategies are needed to improve clinic efficiency and patient-clinic communication with respect to these observed shortfalls? Methods: 1) 225 calls answered by clinic Care Team Assistants (CTA) were monitored. The reason for and outcome of each call was noted. Calls were then categorized into avoidable/potentially avoidable and unavoidable. 2) CTA communication strengths and weaknesses were noted for each call. 3) The number of abandoned phone calls was analyzed as functions of average numbers of agents, incoming phone calls and time of day. The average effect of additional agents and of number of incoming calls on the percentage of abandoned calls was also calculated. Results: 1) Percentage of avoidable or potentially avoidable calls was 55% of total. 2) Deficiencies in several areas of effective phone communication were found to be present at variable times and to variable degrees by different staff members. 3) For every additional CTA available to handle calls, the number of abandoned calls decreased. For every additional incoming call, the expected count of abandoned calls increased. The expected number of abandoned calls and the percentage of abandoned calls increased with the number of incoming calls. The percentage of abandoned calls increased for every additional incoming call received during a one hour interval. Conclusions: Improving phone coverage by adding call handlers, improving the clinic phone tree by clarifying existing choices and adding a direct line to key individuals, improving rates of patient registration with the “My Health Connection” online interface to improve patient-provider communication, improving communications training for call handlers and overhauling the referral system to reduce internal inefficiencies, and to increase the ease with which patients may check on their status are all possible methods by which the problems of high call volume and high call abandonment rates may be addressed in this clinic.
Project Title: Collaborative Care Between Mental Health and Primary Care

Thematic Area: Public Health and Epidemiology

Abstract: Depression is a growing burden on the current medical system and the majority of patients are not getting proper care. Collaborative models of care between mental health and primary care have been described and studied. While many studies demonstrate improvement in depression outcomes, many barriers such as definitions of health systems, finances, public opinion and education prevent rapid change. Through a large literature search, I seek to help define collaborative care, depict specific barriers to change, and propose future directions in collaborative care for depression.
**Project Title:** Medical Student Health Behaviors at the University of Colorado School of Medicine

**Thematic Area:** Public Health and Epidemiology

**Abstract:** Purpose: Healthy nutrition and physical activity habits are effective at reducing disease risk, yet few physicians and medical students advise their patients about lifestyle modification. The extent to which medical students believe in the importance of preventive counseling is directly correlated with their own personal health behaviors. Unfortunately, the diet and exercise habits of medical students have been shown to deteriorate as they progress through medical school; this trend may result in decreased counseling and have a negative effect on the health of their patients. The main objectives of this study were to evaluate the current nutrition and physical activity habits of students at the University of Colorado School of Medicine, and to determine students’ opinions as to how and why their habits might have changed while enrolled in medical school. Methods: Second, third and fourth-year medical students at the University of Colorado School of Medicine were recruited to complete a validated survey to assess their nutrition and physical activity habits during the 2010-2011 academic year. In addition, students were asked questions regarding how they felt their habits have changed since beginning medical school, and if so, why they believed any changes had occurred. The self-reported survey results were then compared statistically between classes of students. Results: 253 of 463 medical students completed surveys (response rate: 54.64%). 53.36% of students reported that their nutrition and/or physical activity habits had worsened since beginning medical school (p < 0.0001). Among these students, the most common reason given for this trend was “less free time” during medical school (chosen by 97.04% of students). Regression analysis of students’ self-reported health behaviors found no significant differences between the physical activity habits (reported as weekly exercise minutes) of students in different classes. However, an analysis of students’ nutrition habits demonstrated a statistically significant pattern of decreasing daily fruit and vegetable servings between second-year and fourth-year students (p = 0.0054). Conclusions: These results suggest that certain health behaviors of students at the University of Colorado School of Medicine do in fact decline during their four-year medical education. This trend may have a negative effect on the health outcomes of the patients whom these students counsel. Further research to quantify these changes over time, as well as health promotion interventions at our institution, are needed to evaluate and attempt to correct this problem.
Project Title: HIGH PRESSURE PROTEIN UNFOLDING: THERMODYNAMIC AND KINETIC CONTRIBUTIONS OF INTERNAL CAVITY FILLING IN T4 LYSOZYME MUTANTS

Thematic Area: Basic Science

Abstract: Three mutants of T4 Lysozyme with differing internal cavities were subjected to unfolding via increased hydrostatic pressure. Tryptophan fluorescence spectroscopy was then used to examine equilibrium unfolding thermodynamics. The changes of the resulting free energies of folding with pressure were used to determine the volume change of the reaction. It was observed that the pseudo-wild type protein had a decrease in volume upon unfolding of -80 ± 8 Å³. The two cavity mutants, L99A and L99A A130S had equilibrium volume changes of -107 ± 23 Å³ and -102 ± 25 Å³ respectively. Comparing these results to those predicted by x-ray crystallographic structures of a solvent excluded state, yielded a differences of -92.2 and -97.2 Å³, for the two cavity mutants, which correlate with the presence of an average of three water molecules inside the cavity formed by the L99A substitution in the pressure range used in this study. Kinetic analysis of the proteins, using rapid pressure jumps, showed pseudo transition states for the two cavity mutants with volume changes of -71 ± 38 Å³ for the L99A mutant and -53 ± 16 Å³ for L99A A130S. The volume changes correlate with an additional intrusion of two water molecules into the hydrophobic core of the proteins during the pressure unfolding process. These results indicate that there is a potential for significant solvent intrusion into the hydrophobic core of the protein during a pressure mediated unfolding process.
Project Title: Making Cavity Free at Three: Bringing Quality Improvement to Healthcare in Colorado

Thematic Area: Public Health and Epidemiology

Abstract: Dental caries (cavities) are the most common chronic disease of childhood. They are 5 times more likely than asthma (Sara L. Filstrup, 2003). They affect 40% of low income children (Calanan, Juhl, & Mauritson, 2012). Most patients have access to healthcare, but fewer have access to dental care. Children are 2.5 times more likely to lack dental coverage than medical coverage (Oral Health in America: A Report of the Surgeon General, 2000). In 2007, Cavity Free at Three (CF@3) was started to prevent oral disease in young children in Colorado. This organization aims to engage dentists, physicians, nurses, dental hygienists, public health practitioners and early childhood educators in the prevention and early detection of oral disease in pregnant women, infants and toddlers (Cavity Free at Three). Even though CF@3 has been quite successful in reaching out and educating physicians and nurses, it has not been able to successfully attract dentists and dental hygienists into the program. By using various Quality Improvement Tools, the author and the CF@3 program coordinator, Karen Savoie, were able to quantify and identify the following reasons to explain the dentists’ and hygienists’ reluctance to engage in the Cavity Free at Three program: low reimbursement for Medicaid patients, fear of patients not showing up, the application for dentist Medicaid eligibility is too long, inadequate training materials for dentists and other reasons. From this information, the Cavity Free at Three Team was able to propose several possible solutions to the above problems to include the following: a redesign of training materials to better suit dentists’ needs, training in group education and group scheduling techniques to help mitigate no/late shows and other recommendations.
Project Title: Direct Admissions Are Not an Independent Risk Factor for Unplanned ICU Transfers from an Inpatient Unit within 12 Hours of Admission

Thematic Area: Clinical Science

Abstract: DIRECT ADMISSIONS ARE NOT AN INDEPENDENT RISK FACTOR FOR UNPLANNED ICU TRANSFERS FROM AN INPATIENT UNIT WITHIN 12 HOURS OF ADMISSION. AM Blanchard, MD candidate University of Colorado School of Medicine. J Reese, MD (faculty sponsor); L Bajji, MD, MPH; S Deakyne, MPH; T Neubrand, MD; M Cunningham, MD. Children’s Hospital Colorado, Department of Hospital Medicine

Purpose: Appropriate patient placement at the time of admission to avoid unplanned transfer to ICU and codes outside of the ICU is an important safety goal for many institutions. Patients directly admitted to the hospital are thought to be at increased risk of unplanned transfer to the ICU. To determine if direct admission is an independent risk factor for unplanned transfer to the ICU within 12 hours of admission. Background: Appropriate patient placement at the time of admission to avoid unplanned transfer to ICU and codes outside of the ICU is an important safety goal for many institutions. Patients directly admitted to the hospital are thought to be at increased risk of unplanned transfer to the ICU. Objective: To determine if direct admission is an independent risk factor for unplanned transfer to the ICU within 12 hours of admission. Design/Methods: A retrospective review of all of unplanned ICU transfers within 12 hours of admission to an inpatient unit at a tertiary care children's hospital from January 2010-July 2011. Records were reviewed by the Patient Disposition Review Committee and cases were categorized as preventable or non preventable based on certain clinical criteria. Proportion of preventable unplanned transfers from each portal of entry were calculated and compared to overall admissions. Results: 166 unplanned ICU transfers occurred during the study period, 71 (43%) were preventable. The most common cause was misplacement based on illness acuity (37, 53%), followed by miscommunication (27, 39%), high ICU census (6, 8%), missed diagnosis (4, 6%) and other (4, 6%) (multiple selection was allowed). The proportion of patients with preventable unplanned transfers that were directly admitted, admitted from the ED or the OR were not different from these proportions of all patients admitted to the hospital (p = 0.3088)
Bock, Ashley

Project Title: α-Enolase Causes Pro-Inflammatory Activation of Pulmonary Microvascular Endothelial Cells and Primes Neutrophils through Protease-Activated Receptor Activation

Thematic Area: Basic Science

Abstract: Pro-inflammatory activation of the pulmonary endothelium leading to increased expression of adhesion molecules and PMN sequestration and activation is paramount in the development of acute lung injury (ALI) and multi-organ failure (MOF). Furthermore, although a necessary intervention in critically ill and injured patients, transfusion is an independent risk factor in the development of ALI/MOF. The pro-inflammatory mediators responsible for this process have remained elusive to date. Therefore, we hypothesize that mediators, such as α-enolase, which accumulate in stored RBCs and in injured patients, cause pro-inflammatory activation of human pulmonary microvascular endothelial cells (HMVECs), resulting in pulmonary PMN sequestration and activation, predisposing patients to post-injury ALI/MOF. Methods: Proteomic analyses (two dimensional gel electrophoresis and mass spectroscopy (MALDI-TOF)) of injured patients (blunt trauma) who later developed ALI/MOF identified a number of proteins which accumulate post-injury, specifically α-enolase. Moreover, these identical proteins were also found via proteomics in stored, but not fresh, packed red blood cells, which are used to resuscitate these injured patients. PMNs were isolated from whole blood drawn from healthy human donors using standard techniques. The PMNs were incubated for 30 minutes at 37°C with thrombin or α-enolase followed by fMLP activation of the NADPH oxidase and measurement of cytochrome c reduction. This reaction was inhibited by the addition of the protease inhibitor, AEBSF. The proteins from whole cell lysates from HMVECs were separated by SDS-PAGE, transferred to nitrocellulose and immunoblotted with antibodies to protease activated receptor-1 (PAR-1) and PAR-2. HMVECs were also incubated for 6 hours and 1) ICAM-1 was measured by flow cytometry, 2) isolated neutrophils (PMNs) were added allowed to settle and in selected wells PMN adherence to these activated HMVECs was measured by myeloperoxidase content in the lysate, or 3) after the PMNs settled, lysophosphatidylcholines (lyso-PCs) [4.5μM], lipids from stored platelets implicated in TRALI, were added and the number of viable HMVECs/mm2 were counted by microscopy. Results: α-enolase and thrombin significantly primed the fMLP-activated respiratory burst (n=7, p
Project Title: High Dose IgG Therapy in Murine Biliary Atresia Results in Decreased Bile Duct Injury Through Expansion of Regulatory T Cells and Inhibition of CD4+ Th1 Cell-Mediated Inflammation

Thematic Area: Basic Science

Abstract: A proposed etiology of biliary atresia (BA) is that a virus infection initiates bile duct injury, followed by progressive immune-mediated damage. High dose intravenous immunoglobulin (IVIg) has demonstrated clinical benefit in several inflammatory diseases. The aim of this study was to determine if bile duct injury is diminished with high dose immunoglobulin (IgG) treatment in a mouse model of BA. One day old BALB/c mice were injected with rhesus rotavirus (RRV) or control saline (BSS). Beginning on day 7 of life, RRV-infected, jaundiced mice were given intraperitoneal injections of high dose IgG (2 g/kg; RRV-IgG) or albumin (RRV-alb) every 2-3 days. Survival, liver and bile duct histology, serum direct bilirubin, liver immune cell subsets and cytokine production were analyzed in all groups. High dose IgG did not significantly improve survival in BA mice. However, the RRV-IgG group had markedly reduced portal tract and extrahepatic bile duct inflammation and obstruction, and significant decreases in serum direct bilirubin levels. Intracellular cytokine staining revealed significantly lower levels of IL-2, IFN-γ and TNF-α production by liver CD4+ T cells and significantly expanded liver regulatory T cells (Tregs) in RRV-IgG mice compared to controls. Immune therapy with high dose IgG was associated with decreased inflammation and injury of the bile ducts in the RRV-induced mouse model of BA. The expansion of Tregs and associated decrease in CD4+ T cell cytokine production identified in high dose IgG-treated BA mice suggest that IVIg therapy should be explored in human BA.
Project Title: Renal Impairment Associated with Crizotinib Treatment for ALK-positive Nonsmall Cell Lung Cancer

Thematic Area: Clinical Science

Abstract: BACKGROUND: The objective of this study was to document changes in renal function in a cohort of patients receiving Crizotinib therapy for ALK+ metastatic nonsmall cell lung cancer. METHODS: Glomerular Filtration Rate (GFR) was calculated using the CKD-EPI equations and percent change compared to baseline over the first 3 months of treatment. For a subgroup that stopped treatment due to disease progression, percent change in GFR was compared off the drug to GFR at last treatment. Patient charts were reviewed for possible confounders (Nephrotoxic drugs, IV contrast associated with imaging, systolic blood pressure to assess for hypotensive episodes, tumor lysis due to positive response to Crizotinib). RESULTS: Patients on Crizotinib experience a hit to renal function with half of them dropping GFR 30-39% below baseline. Another quarter had a more severe drop to a nadir of 40-60% below their starting kidney function. Of those who stopped the drug, four patients did not recover their lost GFR. For the remainder, an improvement in kidney function was found once the drug was terminated. CONCLUSIONS: Crizotinib is an effective and important drug to treat NSCLC. Renal function is impaired while on the drug and some patients will recover some of this lost function once they come off the therapy. This suggests that careful monitoring of renal function is warranted, especially in those patients who start therapy with renal insufficiency.
Project Title: Orthopaedic surgery in the developing world: resources and operative volumes in Ghana

Thematic Area: Clinical Science

Abstract: INTRODUCTION: Musculoskeletal disease is a growing burden for low- and middle-income countries (LMICs), and little research exists to assess the problem. The purpose of our study was to describe orthopaedic care in a developing nation hospital and to discuss the implications of the findings. We hypothesized the LMIC has a shortage of surgeons and post-graduate training programs; a tertiary care hospital in the country performs a large number of surgeries for traumas, severe fractures and infections; and the availability of subspecialty services at this center is limited. METHODS: The study location was the Komfo Anokye Teaching Hospital (KATH) in Kumasi, Ghana. National statistics for Ghana were compared to analogous data in a developed country, the US. Surgical volumes were compared to those at a primary referral center in an industrialized nation, the San Francisco General Hospital (SFGH). Differences in surgical volumes between institutions were evaluated with z-tests. RESULTS: There were 24 orthopaedic surgeons in Ghana, compared to 23,956 in the US. There were 7 orthopaedic residents and a single residency program in Ghana, versus 3,371 residents and 155 residencies in the US. Total case volume was 2,161 at KATH and 2,132 at SFGH. Traumas accounted for 95% of operations at KATH, compared to 65% at SFGH (z=24.24, p
Project Title: Telephones and talk: Can motivational interviewing and scheduled phone follow-up improve health-care seeking behaviors of high-risk participants in a free community health screening?

Thematic Area: Public Health and Epidemiology

Abstract: Title: Telephones and talk: Can motivational interviewing and scheduled phone follow-up improve health-care seeking behaviors of high-risk participants in a free community health screening? Background: Cardiovascular disease (CVD) is the leading cause of death in the US. Hypertension, hyperlipidemia, diabetes, and obesity are modifiable risk factors of CVD. Early screening, detection, and treatment of these factors is crucial in reducing risk yet more than half of Americans have not been screened. Community-based health screenings are one strategy for reaching this population yet little is known about the impact these services have on medical follow-up. Objectives: (1) To establish baseline demographic data on health screening users at a large, free, community-based event in Colorado. (2) To pilot a program in which high-risk participants received on-site motivational interviewing regarding their modifiable risk factors. (3) To establish scheduled telephone follow-up as a strategy for improving health-care seeking behaviors in this population. Methodology: Using prospective cohort-type study design, participants (n=61) with at least one modifiable risk factor (total cholesterol >200, BMI >30, or non-fasting blood glucose >200) were enrolled at large free community health screening event (1,913 screened). All enrolled participants received motivational interviewing regarding their modifiable risk factor(s) and were counseled to follow up with a health care provider. Participants were contacted at 3 and 9-month intervals to assess their rates of follow-up and barriers to follow-up. Demographic data and self-assessment of health status were obtained from participants at each contact interval. Conclusions: BMI was the most prevalent determinant of high-risk status among participants. Demographic data was similar among all screened participants, high-risk participants, and those consented for the study. Although overall attrition was high, over half of high-risk participants that were contacted had followed-up with a health care provider within the 9-month interval. Overall, this pilot project suggests that telephone follow-up is feasible and has meaningful qualitative impact. More resources and a larger sample size would be necessary to determine if there is a direct correlation between health screenings, motivational interviewing, and health care-seeking behaviors.
**Project Title:** Primary Care and Behavioral Health Care Providers' Perspectives on Integrated Primary Care in Eastern Rural Colorado

**Thematic Area:** Public Health and Epidemiology

**Abstract:** Integrated primary care provides better patient access to care at a lower cost with better outcomes that care as usual. The perspectives of primary care providers (PCPs) and behavioral health care providers (BHPs) toward integration are especially valuable because without their input and endorsement, a movement toward integration in their communities is unlikely to succeed. However, there is little research assessing or comparing PCP and BHP perspectives on integration, especially in rural areas. The objective of this study was to identify PCP and BHP perspectives on improving behavioral health care, barriers to integration, and achievability of integration. Surveys assessing these variables were distributed to PCPs and BHPs in rural eastern Colorado. PCPs were significantly more likely than BHPs to prefer improving the traditional referral model, while BHPs were significantly more likely than PCPs to prefer co-location, warm hand-offs, and shared visits, models found in integrated primary care literature. Lack of sufficient methods of payment for behavioral healthcare services was the most commonly selected barrier by both groups. PCPs were significantly more likely than BHPs to select recruitment and retention of behavioral health care staff as a major barrier. BHPs were slightly more optimistic than PCPs about the achievability of integration.
Project Title: Treatment of Acute Silicoproteinosis by Whole Lung Lavage

Thematic Area: Clinical Science

Abstract: Acute silicoproteinosis is a rare disease that occurs following a heavy inhalational exposure to silica dusts. Clinically it resembles pulmonary alveolar proteinosis (PAP); silica exposure is thought to be a cause of secondary PAP. We describe a patient with biopsy confirmed acute silicoproteinosis whose course was complicated by acute hypoxemic respiratory failure requiring mechanical ventilation. Without clinical improvement despite antibiotic and steroid treatment, the patient was scheduled for whole lung lavage under general anesthesia. Anesthetic challenges included double lumen tube placement and single lung ventilation in a hypoxic patient, facilitating lung lavage, and protecting the contralateral lung from catastrophic spillage.
**Project Title:** Disaster and Emergency preparedness in Rural Primary Care Offices in Colorado

**Thematic Area:** Clinical Science

**Abstract:** Introduction: A great deal of national attention has been focused on preparing emergency services for disasters, terrorist attacks, and other large scale emergencies. However, rural communities are often overlooked. Particularly, the role that primary care practitioners would play in locations where no other medical personnel may be able to help. This survey was designed to address this lack of knowledge. Methods: The survey tool was dispatched to two separate sets of clinic sites, once in October and once in November, 2012. The survey consisted of 18 items focusing on demographic information and various metrics designed to assess disaster preparedness and analyzed with simple descriptive statistics. Results: 28.3% of potential respondents responded. 64% were female and 82.4% were in family practice, the remaining were split between pediatrics and internal medicine. 47% had been in practice for less than 15 years, 53% for more than 15 years. 52.9% reported participating in county or community wide emergency preparedness activities. 41.2% reported that they had an agreement to function as “surge capacity.” 100% of respondents had a emergency or disaster plan for the clinic, excluding fire evacuation plans. Only 35.3% of respondents had clinic staff regularly re-familiarized with the plan. 68.8% of respondents reported that 100% of clinic staff were trained in Basic Life Support. 29.4% of clinics kept a stockpile of medications to treat staff. Conclusion: Our results show a poor response rate, making response bias a significant problem in the interpretation of our results. Our results show that the rural community health center in Colorado workforce is predominantly female and consists of providers who tend to be early in their career or in practice for over 25 years. Our results also point to difficulties with collaboration between county, community, and hospital teams with the clinics, a commonly sited complaint among rural preparedness coordinators. Similar, low numbers of respondents reported having all of the supplies and medications that would be useful as well as continual training, indicating the continuing problem with resource availability in rural areas.
Project Title: 1) National study of barriers to timely primary care and emergency department utilization among Medicaid beneficiaries 2) Changes in barriers to primary care and emergency department utilization.

Thematic Area: Public Health and Epidemiology

Abstract: 1) STUDY OBJECTIVE: We compare the association between barriers to timely primary care and emergency department (ED) utilization among adults with Medicaid versus private insurance.

METHODS: We analyzed 230,258 adult participants of the 1999 to 2009 National Health Interview Survey. We evaluated the association between 5 specific barriers to timely primary care (unable to get through on telephone, unable to obtain appointment soon enough, long wait in the physician’s office, limited clinic hours, lack of transportation) and ED utilization (≥1 ED visit during the past year) for Medicaid and private insurance beneficiaries. Multivariable logistic regression models adjusted for demographics, socioeconomic status, health conditions, outpatient care utilization, and survey year.

RESULTS: Overall, 16.3% of Medicaid and 8.9% of private insurance beneficiaries had greater than or equal to 1 barrier to timely primary care. Compared with individuals with private insurance, Medicaid beneficiaries had higher ED utilization overall (39.6% versus 17.7%), particularly among those with barriers (51.3% versus 24.6% for 1 barrier and 61.2% versus 28.9% for ≥2 barriers). After adjusting for covariates, Medicaid beneficiaries were more likely to have barriers (adjusted odds ratio [OR] 1.41; 95% confidence interval [CI] 1.30 to 1.52) and higher ED utilization (adjusted OR 1.48; 95% CI 1.41 to 1.56). ED utilization was even higher among Medicaid beneficiaries with 1 barrier (adjusted OR 1.66; 95% CI 1.44 to 1.92) or greater than or equal to 2 barriers (adjusted OR 2.01; 95% CI 1.72 to 2.35) compared with that for individuals with private insurance and barriers. CONCLUSION: Compared with individuals with private insurance, Medicaid beneficiaries were affected by more barriers to timely primary care and had higher associated ED utilization. Expansion of Medicaid eligibility alone may not be sufficient to improve health care access. 2) The 2010 Patient Protection and Affordable Care Act (ACA) aimed to expand health insurance coverage, improve access to medical care, and control health care costs. An implicit goal of health insurance expansion is to improve access and utilization of primary care services and divert patients from what is believed to be higher-cost emergency care. Indeed, annual emergency department (ED) visit rates have increased from 90 million in 1996 to 124 million in 2008. Using data from the 2005 National Health Interview Survey (NHIS), Rust et al4 reported an association between barriers to timely primary care and ED utilization. In Massachusetts, where health care reform legislation similar to the ACA was enacted in 2006, ED visits have remained high despite achieving near universal coverage (>98% of working-age adults). Thus, expanded national health insurance coverage in the setting of a primary care provider shortage may add to the problem of limited access to primary care services. To further evaluate this hypothesis, we quantified changes in national barriers to timely primary care access from 1999 to 2009, and their association with ED utilization. METHODS: We analyzed data from the NHIS, a cross-sectional household interview survey that approximates noninstitutionalized US civilian population. From 1999 to 2009, NHIS collected household interview data for a total of 317,497 adults (age, ≥18 years). Barriers to timely primary care captured in the survey included the following: (1) “Couldn't get through on the telephone”; (2) “Couldn't get an appointment
soon enough”; (3) “Once you got there, you have to wait too long to see the doctor”; (4) “The (clinic/doctor’s) office wasn’t open when you could get there”; and (5) “Didn’t have transportation.” These barriers were used to predict self-reported ED visits during the past 12 months. We performed statistical analyses using Stata 10.1 (StataCorp, College Station, Texas). Survey commands were used to create nationally representative estimates. Multivariable analyses adjusted for demographic, socioeconomic status, health conditions, and access to care variables. RESULTS Overall, 9.7% of adults per year had at least 1 barrier to timely primary care and 20.1% had at least 1 ED visit. Adults with a higher number of barriers were more likely to have at least 1 ED visit (18.8% for 0 barrier, 29.5% for 1 barrier, and 36.5% for ≥2 barriers). After adjusting for potential confounders, barriers to timely primary care were associated with increased ED utilization (compared with 0 barriers: adjusted odds ratio [AOR], 1.37 [95% confidence interval [CI], 1.31-1.43] for 1 barrier and AOR, 1.68 [95% CI, 1.60-1.78] for ≥2 barriers). Over the past decade, the prevalence of barriers to timely primary care among all adults, and specifically among those with at least 1 ED visit, has increased (Figure). From 1999 to 2009, the prevalence of having at least 1 barrier increased from 6.3% (95% CI, 6.0%-6.6%) to 12.5% (95% CI, 11.9%-13.1%). During that time, the strength of the association between number of barriers and ED utilization remained constant; for individual years, the AOR for at least 1 ED visit ranged from 1.29 to 1.44 (mean, 1.37) for 1 barrier and 1.54 to 1.91 (mean, 1.68) for 2 or more barriers. However, among adults with at least 1 ED visit, the prevalence of having at least 1 barrier increased from 12.0% (95% CI, 11.0%-13.0%) to 18.9% (95% CI, 17.6%-20.3%). COMMENT As previously reported using 2005 NHIS data,3 barriers to timely primary care were associated with increased ED utilization during 1999 to 2009. We extended these findings to demonstrate that these barriers have increased over the past decade, and were increasingly prevalent among those with ED visits. These results suggest that limited access to primary care services is an increasingly important contributor to rising ED volumes. While policy makers attempt to reduce ED utilization through expanded health insurance coverage, the well-documented primary care provider shortage will likely accelerate the observed trend of increased barriers to timely primary care.7 On the basis of our study results, we believe that the increasing prevalence of these barriers may result in even higher patient ED utilization. This study has some potential limitations. By using data from an existing survey, we were limited to questions that were already in the survey and could not alter or add other questions. The reported associations and temporal trends may be confounded by unmeasured factors not included in the NHIS. In addition, the NHIS was based on self-reported data, so barriers and ED utilization could not be confirmed and was subject to recall bias. In conclusion, the association between barriers to timely primary care and increased ED utilization has been consistent over the past decade, and the prevalence of these barriers has been rising. In the setting of limited primary care workforce resources, health insurance expansion and increased demand for services may contribute to even more barriers to timely primary care.8 Optimal health care delivery and attempts to limit ED utilization will likely require solutions beyond expanded health insurance coverage including improved access to primary care services through increasing the supply and availability of primary care providers.
Choi, Ray

**Project Title:** Refugee Health

**Thematic Area:** Humanities, Social Science and Education

**Abstract:**

Background: The refugee population in the US and Colorado is an important underserved population that continues to grow. Using data from a longitudinal survey, refugees and healthcare providers identified limitations in access to care and lack of culturally effective care as barriers necessary for effective healthcare. Aims: To provide students with the knowledge and attitudes necessary to provide high-quality, culturally effective care to the refugee population and to impact student beliefs and attitudes regarding cross-cultural care. Setting: A weekly elective consisting of eight, one-hour sessions offered during the lunch hour. Participants: The elective was offered to all pre-clinical medical students. Program Description: The curriculum was included a weekly one hour interactive didactic and panel discussion spanning 8 weeks. Program Evaluation: Students filled out a pre- and post-survey to assess self-perceived knowledge and attitude changes. They also filled out a survey to assess each session’s quality, organization, objective clarity and applicability. Students had statistically significant positive changes in self-perceived knowledge gains and were more interested in working with underserved populations after having taken this elective. Discussion: Subsequent electives should provide clinical exposure to refugees. Future studies should assess the impact of such training on students’ interest in caring for refugees and their ability to provide culturally-effective care.
Project Title: Characterization of Activated αA-Crystallin Chaperone-Like Activity for Development of a Potential Treatment for Cataract or Protein Aggregation Disorders

Thematic Area: Basic Science

Abstract: Purpose: Several protein aggregation disorders of the eye, including cataract and retinitis pigmentosa, are among the most common causes of blindness worldwide. We hypothesize that suppression of protein aggregation may help to prevent or delay vision loss in these conditions. The native lens proteins αA- and αB-crystallin have been shown to prevent protein aggregation in vitro, suggesting that they may have potential as therapeutic proteins. Chaperone-like protection against aggregation is enhanced by phosphorylation of serine residues in the α-crystallins, as demonstrated in previous studies with αB-crystallin. However, the effect of phosphorylation of αA-crystallin is unknown. The purpose of our studies is to determine whether phosphorylation of αA-crystallin at serine residues S45, S59, and S122, as well as at all three sites together, results in enhanced activity against protein aggregation. Methods: Phosphorylation mimics were created by site-directed mutagenesis at each of the 3 targeted serines to produce αA-S45D, αA-S59D, αA-S122D, and the triple mutant (αA-TM). Recombinant proteins were expressed in E. coli and purified to apparent homogeneity. Size-exclusion chromatography analysis was used to evaluate the formation of high-molecular-weight complexes (HMWC) of each protein. Chaperone-like activity (CLA) of each protein was measured by determining the suppression of chemically induced aggregation of substrate proteins. Results: All recombinant α-crystallins were soluble in host cell extracts and were purified by a series of chromatography separations. All proteins formed HMWC. Wild-type αA-crystallin as well as the αA-S59D and αA-S122D mutants formed HMWC of ~650kDa while αA-S45D and αA-TM formed larger complexes. CLA assays indicated all proteins could suppress protein aggregation. Moreover, stronger levels of chaperone-like activity were observed in the αA-S45D and αA-TM phosphorylation mimics. Conclusions: Phosphorylation mimics of αA-crystallin, like wild type αA-crystallin, were expressed and purified. In addition, all proteins could form HMWC and could prevent protein aggregation in vitro.
Project Title: The Importance of Palmitoleic Acid to Adipocyte Insulin Resistance and Whole-Body Insulin Sensitivity in Type 1 Diabetes

Thematic Area: Clinical Science

Abstract: Context: Type 1 diabetes is an insulin-resistant state, but it is less clear which tissues are affected. Our previous report implicated skeletal muscle and liver insulin resistance in people with type 1 diabetes, but this occurred independently of generalized, visceral, or ectopic fat. Objective: The aim of the study was to measure adipose tissue insulin sensitivity and plasma triglyceride composition in individuals with type 1 diabetes after overnight insulin infusion to lower fasting glucose. Design, Patients, and Methods: Fifty subjects (25 individuals with type 1 diabetes and 25 controls without) were studied. After 3 d of dietary control and overnight insulin infusion, we performed a three-stage hyperinsulinemic/euglycemic clamp infusing insulin at 4, 8, and 40 mU/m2 min. Infusions of [1,1,2,3,3-2H2]glycerol and [1-13C]palmitate were used to quantify lipid metabolism. Results: Basal glycerol and palmitate rates of appearance were similar between groups, decreased more in control subjects during the first two stages of the clamp, and similarly suppressed during the highest insulin dose. The concentration of insulin required for 50% inhibition of lipolysis was twice as high in individuals with type 1 diabetes. Plasma triglyceride saturation was similar between groups, but palmitoleic acid in plasma triglyceride was inversely related to adipocyte insulin sensitivity. Unesterified palmitoleic acid in plasma was positively related to insulin sensitivity in controls, but not in individuals with type 1 diabetes. Conclusions: Adipose tissue insulin resistance is a significant feature of type 1 diabetes. Palmitoleic acid is not related to insulin sensitivity in type 1 diabetes, as it was in controls, suggesting a novel mechanism for insulin resistance in this population.
**Project Title:** Timing of pre-meal insulin versus accurate carbohydrate counting in youth with type 1 diabetes

**Thematic Area:** Clinical Science

**Abstract:** Objective: It has been demonstrated previously that optimal postprandial glucose can be obtained by giving insulin 20 minutes prior to a meal. However this may be difficult, especially in children, due to not always knowing how much food will be consumed. The objective of this study was to determine the importance of administering a bolus of insulin 20 minutes prior to a meal verse the importance of the accuracy of the insulin to carbohydrates consumed in order to achieve optimal postprandial glycemic control in youth with type 1 diabetes. Study Design: Subjects between the ages of 7 and 17 years old participated in this cross over study. The study consisted of three treatment arms with different insulin delivery for a standardized breakfast meal. The arms included giving a full insulin dose 20 minutes before the meal (-20 Full), giving a half insulin dose 20 minutes before the meal (-20 Half) or giving the full insulin dose immediately before starting the breakfast meal (0 Full). Blood glucose levels were measured every 30 minutes following the start of the meal. Measurements of the area under the curve were analyzed. Secondary endpoints included comparing the peak glucose values and the change in glucose. Results: At an interim analysis, 11 subjects had completed all three study visits. The maximum blood glucose was 234 mg/dl for the -20 Half group, 214 mg/dl for the -20 Full group and 188 mg/dl for the 0 Full group. These values were not statistically significant. The change in blood glucose was 108 mg/dl for the -20 Half, 69 mg/dl in the -20 Full and 77 mg/dl in the 0 Full groups (p>0.05). The area under the curve values were also not significant. Conclusions: Although the data was not significantly significant, it was found that giving a half of a dose of insulin 20 minutes before the meal was able to maintain postprandial glucose levels similar to when giving the full bolus 20 minutes prior, until approximately 120 minutes after the meal. Given these results, it may be beneficial to at least give half of the dose of insulin for the carbohydrates prior to the meal, and then give the rest of the dose after finishing the meal and knowing the total number of carbohydrates consumed.
Project Title: Prevalence of Cervical Dysplasia Among Women in Rural Guatemala

Thematic Area: Global Health

Abstract: ABSTRACT: Objectives: To determine the prevalence of cervical dysplasia as detected by visual inspection of the cervix with acetic acid (VIA) among women in rural Guatemala. Methods: A retrospective chart review of data from 9,094 women who met inclusion criteria and attended screening clinics from January 2008 through June 2010. Results: The combined prevalence of an abnormal VIA was 1.6% across 11 regional departments of Guatemala. Only age correlated with abnormal VIA (mean age 31.7 years vs 35.5 years; p
**Project Title:** The acute effects of moderately loaded concentric-only quarter squats on vertical jump performance.

**Thematic Area:** Basic Science

**Abstract:** Limited research exists examining the effect of moderately loaded conditioning activities that are employed as part of a strength-power potentiating complex (SPPC). Additionally, no studies to date have explored the effects of using a concentric-only quarter back squat protocol as part of an SPPC. Therefore, the purpose of this study was to examine the effects of a moderately loaded (50-65% of 1RM) concentric-only quarter back squat protocol on the occurrence of potentiation effects at various time points. Twenty men who could quarter back squat a minimum of 2.4 times their body mass (3.7 ± 0.7 kg·per body mass) participated in this investigation. All subjects participated in 3 conditions: control (CT), a 50% of 1RM trial (50POT), and a 65% of 1RM trial (65POT). One minute before each condition, a maximal countermovement vertical jump (CMJ) was performed. One minute later, the subject performed 1 of 3 conditions: CT condition, 50POT, or 65POT, followed by vertical jumps at 0.5, 3, 5, 10, and 15 minutes after conditioning activity. A force plate was used to quantify displacement, peak power output, peak force, and the rate of force development for each CMJ. There were no significant differences (p > 0.05) in any of the performance measures quantified during the CMJ trials when comparing the CT, 50POT, and 65POT treatment conditions. However, 48% of the subjects demonstrated some degree of potentiation at the 30 seconds after completing the 65POT trial, but this percent increase was not statistically significant. From a practical perspective, if the goal of the SPPC is to create a maximization of the potentiation effect, moderately loaded activities may not be the best alternative.
**Project Title:** Differential barriers to integration impacting large and small primary care practices

**Thematic Area:** Public Health and Epidemiology

**Abstract:** Mental health, behavioral health, and substance use disorders are extremely prevalent in the primary care setting, and carry a high degree of burden to both the individual and the population. By integrating behavioral health treatment into the primary care setting, clinics may be able to decrease health care costs, improve patient outcomes, increase patient and provider satisfaction, and decrease stigma surrounding mental illness. For unclear reasons, large primary care sites in University of Colorado’s Advancing Care Together project seemed to be having more difficulty implementing integrative practices than small sites. Key informants from large and small primary care practices around Colorado were interviewed, and transcribed interviews were coded and analyzed. While there were more similarities than differences in how integration was implemented and practiced, several differences became evident. Most notably, difficulties socially integrating a behavioral health specialist onto a care team, heavy behavioral health staff workload, and rigid financial limitations seemed to weigh more on larger primary care sites compared with smaller sites. There may be techniques large primary care sites interested in integration can implement to mitigate some of these barriers and improve integration efforts.
Project Title: VZV DOWN-REGULATES THE IFN-A RESPONSE AND JAK/STAT PATHWAY IN HUMAN CEREBRAL ARTERY SMOOTH MUSCLE CELLS

Thematic Area: Basic Science

Abstract: VZV DOWN-REGULATES THE IFN-A RESPONSE AND JAK/STAT PATHWAY IN HUMAN CEREBRAL ARTERY SMOOTH MUSCLE CELLS Abstract Objective: Varicella zoster virus (VZV) is an alphaherpesvirus that infects differentiated cells. VZV establishes latency in host humans. Evasion of innate immunity is likely required for primary infection and establishing latency. Because interferons (IFNs) are known to limit VZV infection, we studied the capacity of VZV to counter the IFN response in human cerebral artery smooth muscle cells (SMCs), specifically looking at components of the Jak/STAT pathway. Methods: Human brain cerebral arterial SMCs infected with VZV were examined immunocytochemically using antibodies against phosphorylated STAT1 and Mx-1. mRNA extracted from VZV-infected SMCs and IFN-α treated SMCs was analyzed for expression by RT-PCR. IFN-α protein expression was quantified using MesoScale Diagnostics MULTI-SPOT Assay System. Results: Here we show VZV infection limits induction of the IFN response. Up-regulation of IFN-α protein expression was suppressed in VZV-infected SMCs. Similarly, up-regulation of RNA expression of Mx-1, STAT1 and Jak2 was suppressed in VZV-infected cells. STAT2 RNA expression showed up-regulation in VZV-infected cells. Immunofluorescence for phosphorylated STAT1 showed positive staining in both nuclear and cytoplasmic areas in VZV-infected SMCs. Immunofluorescent staining for Mx-1 showed negative expression in both nuclear and cytoplasmic areas in VZV-infected SMCs. Conclusions: VZV limits the IFN-α response and Jak/STAT pathway in SMCs. IFN-α expression is suppressed in SMCs. VZV acts on the Jak/STAT pathway to decrease RNA expression of a number of intermediates, specifically STAT1 and JAK2. VZV inhibits expression of the IFN-induced antiviral protein Mx-1 at the translational level.
Project Title: Analysis of Usage and Associated Cost of External Fixators at an Urban Level 1 Trauma Center

Thematic Area: Clinical Science

Abstract: INTRODUCTION: We reviewed the use of all lower extremity external fixation frames during a three-year period at our urban level-one trauma center. We identified the most common indications for external fixation, and we determined the relative frequency with which frames are intended for temporary versus definitive management of skeletal injuries. We determined the average annual cost of lower extremity external fixators for our institution, and we evaluate the feasibility of the accepted practice of purchasing frame components as "single-use" items. METHODS: We performed a review of our trauma database to identify all patients treated with external fixation frames for pelvic and lower extremity injuries between September 2007 and July 2010. We noted the indications for frame use, and we determined the average duration of external fixation for each indication. The cost of each frame was calculated. RESULTS:  

<table>
<thead>
<tr>
<th>Indication</th>
<th>Number of Fractures</th>
<th>Duration of Use</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temporary Fixation Pelvis</td>
<td>31</td>
<td>8.6 Days</td>
<td>$3,616.23</td>
</tr>
<tr>
<td>Definitive Fixation Pelvis</td>
<td>11</td>
<td>34.4 Days</td>
<td>$2,661.30</td>
</tr>
<tr>
<td>Temporary Fixation Femoral Shaft</td>
<td>75</td>
<td>8.0 Days</td>
<td>$6,366.94</td>
</tr>
<tr>
<td>Definitive Fixation Femoral Shaft</td>
<td>2</td>
<td>160 Days</td>
<td>$15,373.50</td>
</tr>
<tr>
<td>Temporary Fixation Distal Femur</td>
<td>31</td>
<td>6.6 Days</td>
<td>$6,699.90</td>
</tr>
<tr>
<td>Definitive Fixation Distal Femur</td>
<td>1</td>
<td>240 Days</td>
<td>$20,486.00</td>
</tr>
<tr>
<td>Temporary Fixation Tibial Plateau</td>
<td>71</td>
<td>10.2 Days</td>
<td>$5,932.64</td>
</tr>
<tr>
<td>Definitive Fixation Tibial Plateau</td>
<td>1</td>
<td>139 Days</td>
<td>$16,535.20</td>
</tr>
<tr>
<td>Temporary Fixation Tibial Shaft</td>
<td>37</td>
<td>6.7 Days</td>
<td>$6,615.83</td>
</tr>
<tr>
<td>Definitive Fixation Tibial Shaft</td>
<td>1</td>
<td>240 Days</td>
<td>$14,611.00</td>
</tr>
<tr>
<td>Temporary Fixation Tibial Pilon</td>
<td>55</td>
<td>18.7 Days</td>
<td>$5,851.16</td>
</tr>
<tr>
<td>Definitive Fixation Tibial Pilon</td>
<td>6</td>
<td>85.8 Days</td>
<td>$3,556.20</td>
</tr>
<tr>
<td>Temporary Fixation Ankle</td>
<td>15</td>
<td>14.6 Days</td>
<td>$6,729.67</td>
</tr>
<tr>
<td>Definitive Fixation Ankle</td>
<td>4</td>
<td>48.8 Days</td>
<td>$5,835.75</td>
</tr>
</tbody>
</table>

CONCLUSION: The majority of external fixators are intended as temporary frames, in place for a limited period of time prior to definitive fixation of skeletal injuries. As such, most frames are not intended to withstand physiologic loads, nor are they expected provide a precise maintenance of reduction. Given the considerable expense associated with external fixation frame components, the practice of purchasing external fixation frame components as disposable “single-use” items appears to be somewhat wasteful.
**Project Title:** The Effect of Anemia, Parasites, and Parenting Behaviors on Early Childhood Development in Southwest Guatemala

**Thematic Area:** Global Health

**Abstract:**

Introduction – The Center for Global Health at the University of Colorado has partnered with the JF Bolaños Foundation to improve maternal and child health outcomes for the families of employees of the Banasa plantation in the “Trifinio” region of Southwest Guatemala. A previous needs assessment revealed low income and education, poor infrastructure and sanitation, significant childhood disease, and insufficient food security. The Foundation’s “Happy Families” program uses community health workers (CHWs) to conduct education and small infrastructure projects to combat these problems. Iron deficiency anemia, intestinal nematode infections, and impaired childhood development are common in Guatemala and are likely related to one another. Certain behaviors, such as amount of parent-child interaction and positive feedback, impact early childhood development and later childhood performance. Our study aims to determine the prevalence of these problems in children aged 1-5 years in the Trifnio region, and explores the relationships between them, as well as with possible interventions. Methods – Our study sample was gathered from 8 communities by the CHWs. The children’s blood was tested for hematocrit level and their stool was examined for parasites. Children that tested positive for either were treated according to the standard of care. Mothers were given a survey evaluating demographic information, living conditions, and family behaviors. The children’s development was assessed by the Ages and Stages Questionnaire (ASQ) and the MacArthur Communicative Development Inventories (CDI). Data was analyzed using Chi-squared testing to determine associations between binary variables and using linear regression to determine associations between numerical variables, with alpha set to 0.10. Results – Our study included 82 children between 12 and 58 months of age. Average heights and weights were well below what were expected for age. The prevalence of anemia was 38.7% and the prevalence of parasites was 46.7%. The mean score on the MacArthur CDI was the 38th percentile and, on average, the children were delayed in at least one category of the ASQ. Mean age of children with parasites was significantly higher than the mean age of children without parasites (p=0.0007). In contrast, the mean age of children with anemia was significantly lower than the mean age of children without anemia (p=0.067). Children whose families had received a water filter from the “Happy Families” Program were significantly less likely to be anemic (p=0.09). Parasites were significantly associated with stunted growth (p=0.08). Neither anemia nor parasites predicted scores on the ASQ and MacArthur, but scores on these development indices were predicted by certain parenting behaviors, such as teaching children the names of objects, explaining eating, and playing with toys. Number of maternal pregnancies was significantly inversely related to a child’s performance on the ASQ (p=0.03). Limitations – Our small sample size likely prevented many of our results from reaching statistical significance. Accuracy of our development assessment tools (ASQ & MacArthur) may be impaired by cultural differences. Prior to our study, the “Happy Families” Program has been treating all enrolled children between ages 2-5 with the anti-parasitic medication albendazole every six months, which likely alters the prevalence of parasites in the community’s children. Discussion and Recommendations – Since anemia and parasites are highly prevalent and likely impair physical...
growth, it is worthwhile to treat and prevent them. The program’s children should be screened for anemia by the CHWs with the same test we performed. Anemia can be prevented with improved nutrition information, perhaps coupled with small garden or livestock projects. The water filters are likely decreasing anemia by preventing viral and bacterial sources of gastrointestinal disease, and therefore should be distributed to the remaining families. Education on small business income generation could also lead to better nutrition and fewer cases of anemia. While it is not practical to screen universally for parasites, the prevalence is high enough that it is worth continuing to treat the children empirically every six months. Since the parasites found in the region are spread by soil rather than water, prevention methods would include improving sanitation with composting toilets or community septic systems. Education should include hand washing, eating with utensils, and preventing children from putting their hands in their mouths. Since cognitive development was associated with several family behaviors, more programs should be implemented that encourage parent-child interaction and positive feedback, such as the Bright Beginnings Program.
Project Title: Refugees in Denver and Their Perceptions of Their Health and Healthcare

Thematic Area: Public Health and Epidemiology

Abstract: Background: Colorado receives approximately 2500 refugees each year from countries all over the world. We assessed the self-perceived health of and barriers to care for refugees in the Denver metro area in order to better understand the needs of this population. Methods: A 61 item questionnaire was completed by a convenience sample of 120 local refugees between June and December of 2009. Results: Only 10% of respondents reported their health as excellent, while 31% listed it as either poor or fair. The most prominent barriers to care included unemployment (91%), language (46%), lack of health insurance (41%), lack of transportation (43%), and distrust of doctors (22%). Conclusions: Our study suggests that refugees in Denver face significant barriers which affect their access to healthcare. Recommendations include improved job and language skill programs, a health navigator program, and healthcare provider training on culturally effective care of this population.
**Project Title:** Patient Handoffs in the Emergency Department: Observation and Intervention

**Thematic Area:** Clinical Science

**Abstract:** ABSTRACT [pending additional data]  Patient transport within the hospital is a high-risk process with significant opportunity for adverse events to occur. Handoffs are a method of communication devised to help improve safety during these transports. We observed 145 consecutive transports within the Emergency Department, where patients were taken to have a radiological study obtained. We observed poor compliance with both communication aspects of the handoff (0-6.2%) as well as poor compliance with usage of life-saving equipment such as portable oxygen and portable telemetry (8.9-32.4%). At this time, we are organizing an educational intervention for nursing and transport staff. During this intervention we will discuss essential components of handoff communication and proper equipment usage. After this intervention, we will re-assess compliance with handoff procedures.
**Project Title:** Characterizing Sexual Risk and Prevalence of Sexually Transmitted Diseases Among Adolescents with Substance Dependence

**Thematic Area:** Clinical Science

**Abstract:** Background: Half of the newly diagnosed STI’s in the United States occur among those 15-24 years of age (Weinstock et al., 2004), and in this age group, STI’s are more common among substance users than non-users (Hutton et al., 2008). Methods: All subjects were from an outpatient adolescent substance abuse treatment program, and were screened via several questioners (Demographics questioner, GAIN assessment, CARROL depression rating, and a Mood Disorder questioner), in order to guide treatment and prompt referrals, not only for STI testing, but also for general medical referrals and psychiatric referrals. Group analyses were then conducted using SPSS and the appropriate statistical test (t-test, Chi-squared test, or Multivariate logistic regression), depending on the type of variable. Results: Patient’s offered STI testing were more likely to be female (25% vs. 16%; p
Evans, Tiare

**Project Title:** Appendicitis in Pregnancy: A diagnostic dilemma

**Thematic Area:** Clinical Science

**Abstract:**

Abstract Background: Abdominal pain during pregnancy is commonly encountered by clinicians. One of the most well researched etiologies of abdominal pain in pregnancy is acute appendicitis. In the pregnant patient, common symptoms of appendicitis may be absent laboratory data may be skewed and imaging studies can be limited. These combined factors can result in the delayed diagnosis of appendicitis in pregnancy and subsequent poor maternal and fetal outcomes. May studies have been conducted in attempt to resolve the diagnostic dilemma of acute appendicitis in pregnancy. The following is a summary of key articles on the presentation of acute appendicitis in pregnancy, a critical analysis of studies on imaging for its diagnosis, and concludes with the identification of gaps in medical literature with propositions for future research. Aim: To achieve a greater understanding of the diagnosis of appendicitis in pregnancy and determine if an algorhythm to improve diagnostic accuracy of acute appendicitis in pregnancy is possible. Methods: With the use of PubMed, a literature search was conducted using phrases such as “diagnosis of appendicitis in pregnancy,” “imaging the pregnant patient,” and “appendicitis in pregnancy treatment.” The most recent articles were collected and compared to a similar search using Google Scholar to ensure the use of highly cited articles for the review. Conclusions: Appendicitis is difficult to diagnose during pregnancy. All imaging modalities are only helpful when the appendix is visualized. Currently, not enough research exists to create an algorhythm for the appropriate management of negative imaging findings in the case of suspect acute appendicitis in pregnancy. The risks of improved imaging modalities, such as CT imaging, must be weighed against the benefits. Similarly, diagnosing acute appendicitis by surgical intervention, a common strategy for non-pregnant patients, also has inherent risks unique to pregnancy. Hence, the value of the body of literature on the topic of appendicitis in pregnancy is the interpretation of the clinician. The pertinent patient characteristics were purposefully outlined in this analysis so that the studies can be applied in a meaningful way on a case-by-case basis. Disclosures: none
Project Title: Histological Characterization of the Cartilaginous Endplate in the Human Spine

Thematic Area: Basic Science

Abstract: Histological Characterization of the Cartilaginous Endplate Region in the Human Spine

Introduction: The cartilaginous endplate region within the human spine is the interface region between the mineralized vertebral body and the collagenous intervertebral disc (IVD). This area experiences a large amount of load stress from rotational, shear, and impact type forces during normal activity. As the largest avascular area of tissue within the human body the structural design of this tissue is primarily responsible for its ability to resist these forces. It has been previously hypothesized that there are collagen fibers that cross the cartilaginous endplate and anchor the IVD to the vertebral body. [1] The purpose of this study is to typify and localize collagens type I, II, IV, and X, which have previously been described in the IVD, in three different ages of human spine samples and the interface of these collagens with the vertebral body (VB).[2] Materials & Methods: Spine specimens: All spine specimens were obtained from the International Institute for the Advancement of Medicine (175 May Street, Edison, NJ 08837). Donated spines were obtained from a 20 gestation week still born fetus, a 56 day old infant (respiratory failure), and a 17 year old drug overdose victim. Specimens were obtained frozen and stored at -80°C until sectioning. Motion segments utilized were T3-T5 and L2-L3. Gross Sectioning: Spinal motion segments were removed from the intact spines with a transverse cut made with either a band saw, infant and 17 year old, or a scalpel, fetal spine, through the VB above and below the IVD of interest. Spine samples were then hemisected in the sagittal plane for further treatment. The 17 year old spine sample was further sectioned along the sagittal plane into 4-5µM slices. Decalcification: Samples were fixed in neutral buffered formalin for 48-72 hours, washed in deionized water and then decalcified in 0.5M EDTA (pH=7.4). The 20 week old sample was decalcified for a total of 8 weeks, the 56 day old sample for 12 weeks, and the 17 year old samples for 18 weeks. Fine Sectioning and Embedding: Decalcified samples were embedded utilizing standard techniques and given to the University of Colorado Denver Biorepository Core Facility for sectioning and mounting. Immunohistochemical staining: Immunohistochemical staining was undertaken in the established manner. Antibodies against collagens Type I, II were obtained from Millipore, Inc., Billerica, MA. Antibodies against collagen Types IV and X were obtained from Sigma-Aldrich of St. Louis, MO. All antibodies were monoclonal antibodies from rabbits. The VectaStain Elite ABC staining kit from Vector Labs, Burlingame CA, was used to amplify the primary antibody signal. The amplified signal was then enhanced utilizing the DAB substrate kit from Vector Labs. Microscopy: Slides were viewed on a Nikon bright field microscope with pictures taken utilizing the attached camera and image editing software. Results: No difference in staining pattern was noted between the thoracic and lumbar segments of any given spine specimen. Presented segments were used do to the slide quality. Collagen Type I was noted to localize to both the annulus fibrosus (AF) and nucleus pulposus (NP) region within all endplate specimens. In the fetus and infant samples staining was noted in the trabecular meshwork of the VB in a peripheral pattern surrounding a non-staining core. In the 17 year old spine the staining pattern for Type I was diffuse and non-focal. Collagen Type II diffusely stained the IVD of all samples but was only found to cross the CE region of the fetus and infant samples. Within the fetal and infant spines the Type II
collagen pierced through the CE region and into the growing vertebral trabecular meshwork as pillars that inserted into the center of individual trabeculae in roughly the same areas that were unstained by Type I collagen. Type II collagen did not cross the CE in the 17 year old samples. Collagen Type IV which is predominantly found in the basement membrane was not observed staining any area within either the IVD or CE region of our samples. Collagen Type X diffusely stained the IVD and trabecular meshwork of the vertebral body in all samples. Focal areas of intense staining were noted at the CE junction in all samples. The fetal samples also demonstrated staining of pillar like projections that pierced through the CE region and into the vertebral meshwork inserting into the middle of individual trabeculae with a lesser stained region surrounding the pillars. The infant spine also stained in a pattern similar to the fetal samples though the focal staining was less pronounced than the fetus. The 17 year old samples did not demonstrate the pillar-like focal staining seen in the fetal and infant samples. Discussion: Anecdotal evidence from spine surgeons working within our research group described greater difficulty in the removal of IVDs from a juvenile source when compared to discectomies in an adult. This suggests that as humans age there is a change in the interface between the IVD and vertebral body. Our hypothesis is that these changes are directly related to the changing distribution of collagen fibers in the IVD and vertebral body interface throughout the human life cycle. Data presented here suggests that during the aging process physiological events sever the IVD from the vertebral body. We observed that collagen fibers of various types crossed the cartilaginous endplate region within the developing spine of the fetus and infant but did not cross this same region in the 17 year old spine samples. The staining patterns for the Type I, II, and X collagens appear to provide anchoring of the IVD to the VB as it was noted that the Type II and X collagens were found throughout the IVD and also pierced through the CEP and inserted into the trabecular meshwork of the vertebral body in a pillar like manner. The pillars of these collagens appeared to be surrounded by collagen Type I. The fact that this staining pattern was noted only in the fetal and infant spines lends credence to theory that these collagen fibers play a large role in the loss of the anchoring of the IVD that was noted anecdotally. Significance: The treatment of degenerative disc disease is extremely costly, both in dollars as well as the significant morbidity for functional outcome. The cartilaginous endplate region and the localization of the main collagen types which is presented in this work may form the basis for understanding the pathological changes in disc degeneration, allowing us to find new treatment modalities both in prevention and treatment on a molecular level. 1. Kazarian, L., Injuries to the human spinal column: biomechanics and injury classification. Exerc Sport Sci Rev, 1981. 9: p. 297-352. 2. Nerlich, A.G., E.D. Schleicher, and N. Boos, 1997 Volvo Award winner in basic science studies. Immunohistologic markers for age-related changes of human lumbar intervertebral discs. Spine (Phila Pa 1976), 1997. 22(24): p. 2781-95.
Project Title: Outcomes of Varus Derotational Osteotomies for Neuromuscular Hip Dysplasia in Children with Cerebral Palsy and Predictors for Re-subluxation

Thematic Area: Clinical Science

Abstract: Title: Outcomes of Varus Derotational Osteotomies for Neuromuscular Hip Dysplasia in Children with Cerebral Palsy and Predictors for Re-subluxation  Body (Background/Objectives): Hip subluxation or dislocation is common in children with cerebral palsy (CP). Multiple therapeutic options exist, including varus derotation osteotomy (VDRO), open reduction (OR), capsulorrhaphy, and acetabular procedures. Due to the progressive nature of this neuromuscular disease, it is not uncommon for the hip to re-subluxate or re-dislocate after treatment, and it is therefore essential to choose the proper treatment algorithm. There is much controversy in the literature regarding the best surgical approach; however, investigation of the defining factors essential to the success of each approach is lacking. Previous reported series of open reduction and capsulorrhaphy done concomitantly have reported a concerning incidence of avascular necrosis (AVN). To address this, we designed a retrospective study to evaluate our experience in a cohort of patients with CP and hip dysplasia treated with VDRO without OR and capsulorrhaphy. Design: Retrospective Cohort Study  Participants & Setting: A consecutive series of 100 children (199 hips) diagnosed with CP and hip dysplasia was identified for retrospective review. All subjects were treated with VDRO performed by multiple surgeons in a metropolitan Children’s Hospital between August 2003 and June 2009. None of the subjects underwent capsulorrhaphy or additional bony procedures at the hip. Range of follow-up was 5 months to 6 years with 78 patients (156 hips) having ≥1 year follow-up. Materials/Methods: Migration percentage (MP), Shenton’s arch, and medial clear space difference (MCSD) were measured on the last pre-operative radiograph and all post-operative radiographs. Presence or absence of AVN was noted. Data was analyzed using paired t-test and Cox regression. Results: In the entire study sample, a concentric reduction was achieved in 99% of subjects in the immediate post-operative period. There was an average of 20% reduction in MP measured on the one month post operative radiographs (SD=19, p...
Project Title: Subjects or Objects? The Ethics of Documentary Filmmaking and the Ethics of Patient Care

Thematic Area: Humanities, Social Science and Education

Abstract: The world of documentary film is filled with conflicts of interest and ethical dilemmas that often mirror those in the fields of medicine and journalism. However, unlike these professions, documentary has no appreciable ethical code on which to stand. Thus, the question that naturally follows is: What are the ethical obligations of any documentary filmmaker, but especially the filmmaker who works with vulnerable populations such as children or patients? To answer this question, many facets of the filmmaker-subject relationship are examined. Inherent to this relationship is an unequal distribution of power, leaving one party vulnerable to exploitation. Because of this imbalance, a higher degree of trust in a filmmaker’s intentions and decisions is required. In order to establish and consolidate this trust, an equal degree of disclosure, confidentiality, truth telling, informed consent, and maintenance of privacy are needed. A documentarian, in particular, must also earn the trust of her audience by providing an accurate representation of the truth. Finally, as mentioned briefly above, the relationship between documentarian and subject parallels that of doctor and patient as well as journalist and subject in strikingly similar and dissimilar ways. Similarities include power differentials and the potential for exploitation, conflicts of interest, the rhetoric and language used for persuasion, and the act of story-telling or narration. Unlike the realm of documentary, the fields of medicine and journalism have discrete codes and principles on which to guide ethical decision-making. Because documentarians do not have such a code, an open and honest dialogue must be forged in the documentary world that acknowledges the ethical responsibility of documentarians to their subjects.
Project Title: Text messaging hotlines: an innovative way to educate teens about sexual health

Thematic Area: Public Health and Epidemiology

Abstract: Purpose: Text messaging is the most utilized form of communication among teens. Many teens lack access to reliable information about sexual health. The purpose of this project was to create a texting hotline to provide accurate sexual health information to teenagers and to examine its use in Colorado. Methods: The authors created In Case You’re Curious (ICYC), which provides evidence-based responses to sexual health questions via text messaging. The program used a web-based tool to track data regarding the text messages. The authors then analyzed the data from the program collected from September 2010 – October 2012. This included the total number of text messages received, the number of text messages per month, the number of repeat users, the average number of text messages per user, and the categories of questions asked. Results: From September 2010 – October 2012, ICYC received 3,777 text messages from 1,121 users. The number of text messages more than doubled between the program’s first and second years. Fifty-seven percent of the questions in the first year were about sexual acts, sexually transmitted diseases, birth control, or pregnancy. Conclusions: ICYC has grown steadily in its first two years of existence and has attracted many repeat users. Texting hotlines can effectively engage teenagers about health issues.
Project Title: Development of a toolkit for "I on Health:" A comprehensive rural, school-based health program created using Community-Based Participatory Research (CBPR) and PhotoVoice.

Thematic Area: Public Health and Epidemiology

Abstract: Development of a toolkit for I on Health: A comprehensive, rural school-based health program created using community-based participatory research and PhotoVoice. Amy E. Flammer Preceptor: Jack Westfall, MD, MPH Site: High Plains Research Network (HPRN) Background: Few interventions have been found effective in modifying child behaviors known to contribute to obesity. Even fewer are developed for rural communities where resources are limited and the prevalence of obesity is higher. PhotoVoice is an effective tool for community needs assessments. This study aimed to develop a practical toolkit for dissemination of a comprehensive, rural school-based health program, I on Health, which promotes physical activity and healthy nutrition in rural grade-school classrooms using PhotoVoice innovatively as an intervention tool. Methods: Using community-based participatory research, the High Plains Research Network Community Advisory Council (HPRN CAC) conceived, drafted and influenced the development of the program. Pre- and post-test questionnaires, focus group interviews and literature review identified important themes to produce program components and assessed effectiveness. The program was incrementally piloted in 12 classrooms with 184 children over 4 years. Results: Components developed incrementally based on questionnaire results and themes from interviews. The HPRN CAC guided development to utilize existing resources. Key challenges were funding, slow, time-consuming process and small sample size. The final project encompasses all levels of the ecological framework. Pilot data analysis shows this program is effective with significant positive change in physical activity. Conclusions: I on Health is low-cost, effective and utilizes existing resources within rural communities. Responding to multiple requests from schools and organizations a toolkit was developed. The final toolkit includes background, benefits, curricula, steps, evaluation options and policy discussions. Future research should focus on further evaluating impact and efficacy of the program/toolkit and ways to improve the program/toolkit.
**Project Title:** Neuro-Behçet’s Disease: An Unusual Cause of Headache

**Thematic Area:** Clinical Science

**Abstract:** Neuro-Behçet’s disease (NBD) is a serious complication of Behçet’s disease (BD) associated with high morbidity and mortality. Headache in BD is a diagnostic challenge as it may portend onset of NBD, but the use of neuroimaging is often unclear. Here we illustrate this challenge through a case-study of a 50 year-old woman with a history of BD who presented with headache in the absence of initial focal neurological deficits. She was misdiagnosed twice with postviral headache and pontine glioma, respectively, after which she was correctly diagnosed with NBD. We present an algorithm for the diagnosis of headache in patients with systemic inflammatory disorders like BD and discuss the etiology of and the appropriate use of neuroimaging for headache in BD.
Project Title: Characterization and treatment of patients with chronic rhinosinusitis and nasal polyps

Thematic Area: Clinical Science

Abstract: Background: Chronic rhinosinusitis with nasal polyps (CRSwNP) may be subdivided into aspirin sensitive (AS) and aspirin tolerant (AT) populations. These cohorts are not well characterized. Objective: The aims of this study were to examine the phenotypic characteristics, and determine the extent of medical/surgical interventions in CRSwNP patients. A secondary objective was to compare AS and AT subsets of the CRSwNP sample. Methods: Retrospective chart review at a tertiary academic hospital. Data included patient demographics, severity of asthma, peripheral eosinophil counts, Lund-Mackay CT score, presence of dysosmia, and therapeutic interventions. AS patients were compared to AT controls. Results: 182 patients, including 81 AS patients (45%) and 101 AT patients (55%). Asthma was present in 94% of CRSwNP (100% in AS versus 89% in AT subgroups, p=0.001). Moderate/severe persistent asthma made up 88% of CRSwNP sample. In AS versus AT subgroups, asthma severity was similar (p>0.6). CRSwNP sample reflected a mean CT score of 14.0, 44% with eosinophilia, and 46% with symptomatic dysosmia. More severe sinus disease noted in the AS group (Lund-Mackay CT scores (p=0.002) and olfactory symptoms (p=0.001)). Serum eosinophil levels were not statistically different between groups (51% AS, 39% AT (p>0.1)). Frequency of steroid bursts (2.6 vs. 1.3 annually, p
Project Title: An Ethical Analysis of the Arguments Regarding Physician-Assisted Death

Thematic Area: Humanities, Social Science and Education

Abstract: Physician-assisted death has been a long debated topic in the United States and abroad for many years. It is currently legal in Oregon, Washington and Montana. Oregon and Washington legalized the process via a democratic vote, while Montana legalized it via a Supreme Court ruling. There is a significant amount of literature regarding this topic, both in favor of the topic and against it. There are seven arguments against physician-assisted death that the debate centers on including: 1. The alternatives of physician-assisted death suffice, and are the moral high ground in end-of-life care. 2. The slippery slope argument. 3. Legalization would lead to distrust and loss of integrity within the healthcare system. 4. Abuse. 5. Palliative care advancements would decrease. 6. Patients would give up and kill themselves. 7. It violates the sanctity of life and is morally wrong. Each of these topics is argued individually using literature that has come out of legalization in Oregon and Montana. My final settlement on the debate is that I believe in many aspects of what physician-assisted death aims to do, but that we are not quite there yet to protect all patients seeking help in this endeavor. I think advancements in quality palliative care for all, and screening for mental illness must come first. And I believe that legalization via a judicial ruling leaves us open to much abuse, as there are no policies or regulations. There is still work to be done before I can definitively support physician-assisted death without reservation.
Project Title: Post-Earthquake Analysis of Emergency Pre-Hospital Transportation and Establishment of Healthcare Resource Guide in Cap-Haitien, Haiti

Thematic Area: Global Health

Abstract: On 12 January 2010, a 7.0 magnitude earthquake shook Haiti—the most powerful earthquake in 200 years. Aside from the immediate impact, this natural disaster highlighted significant deficiencies in the nation’s healthcare delivery. Among these deficiencies the Haitian Ministry of Health du Nord (MSPP) selected healthcare provider coordination and pre-hospital transportation services as most deserving of immediate analysis in the Nord department. We partnered with Konbit Sante on the ground in Cap-Haitien, Haiti to perform these evaluations. To better coordinate healthcare delivery, 102 healthcare providers were identified, interviewed, and selectively compiled into a comprehensive referral guide. To assess pre-hospital transportation services, all 9 local organizations were likewise identified, interviewed and documented. The analyses resulted in publication of a detailed referral guide for the coordination of healthcare services and a report of ambulance service capacities. Specifically, the referral guide included 31 healthcare providers and was distributed amongst community health workers and healthcare service providers. The ambulance assessment was presented to the MSPP along with specific recommendations for system improvement. Both projects resulted in successful interventions that improve healthcare delivery and demonstrate effective approaches to improving healthcare infrastructure in Cap-Haitien.
**Project Title:** Haiti

**Thematic Area:** Global Health

**Abstract:** See my paper.
Project Title: Clinical Presentation of Cervical Ribs in the Pediatric Population

Thematic Area: Clinical Science

Abstract: Cervical ribs may cause thoracic outlet syndrome in adults, but symptoms are poorly described in children. In our series, 88.8% of the 322 children were asymptomatic. The most common symptoms were neck mass and pain. Useful diagnostic tools were cervical spine and chest radiographs. Differential diagnosis of a supraclavicular mass includes cervical ribs.
Project Title: PALS- Parent Allies for Love and Support: A Mentoring Program for Parents of Children with Cancer

Thematic Area: Humanities, Social Science and Education

Abstract: Parent Allies for Love and Support or PALS is a parent-to-parent peer mentoring program providing emotional, informational and affirmation support to parents with a child battling cancer. Our motto: In the battle against cancer, you are your child’s ally! Who is yours? Our mission is to provide experiential empathy and first-hand knowledge in an effort to improve the psychosocial and emotional outcomes of parents of children with cancer while also strengthening the overall cancer community in Colorado. This is done in two ways; first we connect parents who have a child recently diagnosed with cancer to a veteran parent or peer-mentor who can offer new parents the support, understanding and knowledge that only a parent who has “been through it” can give. Within this community parents and caregivers may easily connect to the wealth of resources available for kids with cancer in Colorado including; camps, sibling support programs, group and private counseling, financial assistance, toy drives, celebrations of life (a.k.a. parties!) and more. These connections help parents forge new friendships and thrive within the extended family of support that is the pediatric cancer community. Our second mission is to help support the larger pediatric cancer community in Colorado by unifying parents and providing them with opportunities to give back. The research indicates that one-on-one peer mentoring is the most effective means of psychosocial support, the most effective form of peer support and that the use of online peer-mentoring may be even more successful in meeting the needs of parents and families affected by cancer. Therefore as pediatric cancer becomes a more common disease, and survival rates increase, more and more parents will be in need of peer mentoring support and encouragement. The future directions and goals of the PALS program, to provide online tools and resources and improve the cultural competency and effectiveness of the program all aim to support this need and work toward the common goal of a strong pediatric cancer community where research and advocacy combine to eradicate this terrible disease.
Project Title: Maximizing Teaching Effectiveness: Predictors of Learner Satisfaction with Teaching on Rounds

Thematic Area: Clinical Science

Abstract: Background: Medicine attending rounds are the foundation of patient care and medical education in American medical schools and residency. Although best practices in education is a frequently debated topic, there is very little research into what constitutes quality training on clinical medicine rounds. Objective: To evaluate which behaviors are associated with increased trainee satisfaction on teaching rounds in order to better understand what constitutes quality teaching in clinical medicine. Design: Cross-sectional observational study of internal medicine attending rounds. Setting: Four teaching hospitals associated with a large, public medical school. Participants: Fifty-six internal medicine attendings, 279 trainees, and 808 general medicine inpatients. Measurements: Activities performed on rounds as directly observed by trained research assistants are compared to survey results assessing satisfaction with overall teaching and key aspects of clinical teaching. Results: A total of 89 days of rounding were observed which included 808 patients, 56 different attendings, 164 residents, 379 interns and 252 medical students. Observed activities and survey questions on specific aspects of teaching were compared to overall teaching satisfaction. The best predictor of learner satisfaction based on survey questions was the attending adding to patient care with an odds ratio of 7.44, learner identifying their own topics, OR 2.48, references made to the medical literature, OR 1.83, attending teaching physical exam, OR 2.01, and the attending teaching history taking skills, OR 1.76. This was compared with the observed data where teaching history skills, OR 2.70, communication with the patient during rounds, OR 1.26, discussing the patient care plan, OR 1.26 and discussing all labs and imaging, OR 1.23, were the best predictors of satisfaction. Limitations: Single-system study of four teaching hospitals associated with one medical school, which may limit generalizability. Use of survey data measuring satisfaction with teaching is not an objective measure of outcomes. Conclusions: Attending rounds are an excellent forum for medical education. Attendings can maximize satisfaction with education by: 1) Discussing the patient care plan and explaining their clinical reasoning, 2) Teaching skills such as history taking and physical exam at the bedside, 3) Requiring thoroughness in presentations and including the patient in rounding.
**Project Title:** Off the Hook: Retained Suture Needle in Aortic Arch

**Thematic Area:** Clinical Science

**Abstract:** With the implementation of instrument counts and other preventative strategies, the incidence of retained surgical materials is low, but it is not zero. The increase in intravascular procedures has resulted in an increased incidence of intravascular retained surgical materials. Retained items located in the intravascular space present a risk of several complications, including thrombogenesis, embolization, and perforation. Percutaneous snare retrieval of intravascular surgical items and other foreign bodies is widely used as a safe and effective method of removal. After intravascular procedures, the most common intravascular retained items are catheter fragments, guidewire fragments, stents, and coils. To our knowledge, there are no literature reports of retained intravascular suture needles. We present a case of a suture needle retained in the aortic arch postrepair that was successfully retrieved using loop snare technique.
**Project Title:** Pulmonary Artery Input Impedance for Modeling Outcomes in Childhood Pulmonary Arterial Hypertension

**Thematic Area:** Clinical Science

**Abstract:** Background: Pulmonary arterial hypertension (PAH) in children is a disease with high mortality and morbidity, mainly due to right heart strain and subsequent failure. Current methods of quantifying PAH and predicting disease outcomes including pulmonary vascular resistance (PVR) do not include the dynamic components of right ventricular (RV) afterload influenced by stiffness of the proximal pulmonary arteries, and wave reflection. Impedance of the pulmonary arteries is a metric that includes both static and dynamic components of RV afterload, and is therefore hypothesized to correlate better with patient functional class and clinical worsening. Methods: Impedance and standard hemodynamic measures were collected on pediatric patients with PAH undergoing routine diagnostic catheterization. WHO functional class was collected at time of cath, and follow up approximately 1 year later. The presence or absence of clinical worsening was also noted. Univariate and multivariate logistic regressions of impedance harmonics (Z0, Z1, Z2, Z1+Z2, and Zsum), PVR, and PVS, on both outcomes were performed and models were compared. Results: Outcomes and impedance data were collected for 80 unique patients. All measures were significant predictors of functional status outcomes, as well as clinical worsening, in univariate models, although comparison of the models revealed no significant difference between the models accuracy. Similar results were noted on the subgroup of patients with primary PAH. Impedance did not improve the prediction of outcomes when included in a multivariate regression model. Conclusions: Impedance correlates with functional status outcomes and clinical worsening at one year, but did not model outcomes better than PVR, and did not contribute significantly to multivariate regression models. Further work evaluating survival is indicated.
**Project Title:** Intracranial impedance measurements using a laptop soundcard impedance bridge in a porcine neurosurgical model

**Thematic Area:** Clinical Science

**Abstract:** This paper presents a method for real-time intracranial impedance monitoring in a porcine neurosurgical model via a laptop soundcard impedance bridge. A portable system was implemented using a commercially available laptop, free ZRLC software, LMS impedance bridge, and IDE. The ZRLC software calculates a Direct Fourier Transform along a frequency sweep allowing vector magnitude of impedance to be calculated. Two to three intraparenchymal depth electrode (IDE) tracts were made per hemisphere resulting in a total of 28 tracts in 6 pigs. Real-time impedance was analyzed during passage of the IDE beginning at the cortex to a total depth of 30 mm per tract. Tracts were stained and brains sectioned for evaluation. Mean resistance values for initial IDE depths were significantly different than endpoint depths (1.56 kΩ ± 0.344 and 0.635 kΩ ± 0.131 respectively; P = < 0.001). Brain slices demonstrated stained tracts with ventricular entry. Real-time impedance monitoring with a laptop soundcard impedance bridge can be used to distinguish intracranial tissue and fluid regions.
**Project Title:** Stroke and neurocognitive outcomes comparable for aortic cross-clamp with and without partial occlusion clamp for CABG in low to moderate risk patients

**Thematic Area:** Clinical Science

**Abstract:** Background: Multiple applications of an aortic cross-clamp to the ascending aorta are thought by many cardiac surgeons to increase the risk of stroke and adversely affect neurological function. This study examined if a surgeon’s evaluation of the ascending aorta using traditional and contemporary methods may safely determine which patients will tolerate partial occlusion clamping for proximal anastomoses without incurring adverse neurological sequelae. Methods: From the on-bypass arm of the Randomized On and Off Bypass (ROOBY) trial, coronary artery bypass grafting (CABG) patient records were classified as having either single aortic cross-clamp (n=645) or cross-clamp and partial occlusion clamp (n=375) applications. The surgeon evaluated the quality of the ascending aorta intraoperatively using palpation, transesophageal echocardiogram, or epi-aortic ultrasound. At 1-year post-CABG, study endpoints included stroke, neurocognitive changes from baseline, nonfatal myocardial infarction, and all-cause death. Results: No differences were found in predictive markers of neurological complications between patients receiving single cross-clamp technique (SCT) or multiple cross-clamp technique with partial occlusion clamp (MCT). The quality of the ascending aorta was rated poor more frequently among SCT versus MCT patients (3.3% vs. 2.4%, p=0.03). There was no significant difference between SCT versus MCT in stroke rate (1.1% versus 0.3%, p=0.27) or 1-year neurocognitive outcomes. There were no differences in rates of perioperative or 1-year myocardial infarction or mortality. Conclusions: Multiple aortic cross-clamp technique during CABG did not increase the incidence of stroke or impair neuropsychological outcomes. Careful evaluation of the ascending aorta may permit the safe utilization of a partial occlusion clamp in low to moderate risk patients, which may reduce ischemic time without increased risk of postoperative neurological dysfunction.
**Project Title:** METABOLIC CHARACTERIZATION OF THE UNFOLDED PROTEIN RESPONSE IN BRAIN TUMOR CELLS: IMPLICATION FOR THE SECRETOME

**Thematic Area:** Basic Science

**Abstract:** The unfolded protein response (UPR) is an endoplasmic reticulum (ER)-based cytoprotective mechanism activated in response to misfolded proteins. This stress response is frequently active in tumors and has been implicated in the highly invasive nature of certain tumor types, possibly by influencing cell metabolism and the secretome. Additionally, brain tumor-derived exosomes are believed to affect the microenvironment and neighboring cells’ metabolic activity in order to manipulate their surroundings. We wondered what effect UPR activation has on glioma cell metabolism and if exosomes are capable of independently altering tumor cell metabolism. To investigate this, we used human glioblastoma cell line U87 grown in C13 glucose and subsequently treated with dithiothreitol (DTT) to induce the UPR. The metabolic profile of these cells was then analyzed using nuclear magnetic resonance. We also probed cells treated with exosomes—naïve and UPR induced—for key enzymes of glucose and lipid metabolic pathways using western blotting techniques. The resultant data demonstrated an increase in both glycolytic and lipid synthesis pathways with a proportionately larger increase in the latter. These findings suggest that during periods of cell stress, tumor cells increase overall energy metabolism and possibly divert much of this excess energy into lipid synthesis pathways in a cumulative effort to increase a lipid mediated stress response. We hypothesize that the function of this cellular response is to synthesize exosomes that will ultimately influence the tumor microenvironment. The metabolomic profile of stressed tumor cells and their potential ability to transmit the metabolic response via exosomes could be valuable in understanding tumorigenesis and possibly uncovering targets for new therapies and biomarkers.
Project Title: Relationship of Vitamin D Deficiency to Clinical Outcomes in Critically Ill Patients

Thematic Area: Clinical Science

Abstract: Background: Despite the numerous disease conditions associated with vitamin D deficiency in the general population, the relationship of this deficiency to outcome in critically ill patients remains unclear. The objective of this study is to determine the burden of vitamin D deficiency in intensive care unit (ICU) patients and determine if it is associated with poor patient outcomes. Methods: The authors conducted an analysis of samples collected from a prospective study of 196 patients admitted to a medical/surgical ICU in a tertiary care hospital. They measured serum 25-hydroxyvitamin D at admission and up to 10 days following admission and followed patients prospectively for 28-day outcomes. Results: Of analyzable patients, 50 (26%) were deficient (≤30 nmol/L) and 109 (56%) were insufficient (>30 and ≤60 nmol/L). Baseline 25(OH)D levels decreased significantly in all patients after 3 days in the ICU and remained significantly lower through 10 days (P < .001). 25(OH)D status was not significantly associated with 28-day all-cause mortality (hazard ratio [HR], 0.89; 95% confidence interval, [CI] 0.37–2.24). Higher levels of 25(OH)D were associated with a shorter time-to-alive ICU discharge (HR, 2.11; 95% CI, 1.27–3.51). 25(OH)D-deficient patients showed a nonstatistically significant trend toward a higher infection rate (odds ratio [OR], 3.20; 95% CI, 0.784–13.07; P = .11) compared with patients with sufficient levels of 25(OH)D. Conclusions: This study demonstrates significant decreases in vitamin D status over the duration of the patient’s ICU stay. Low levels of vitamin D are associated with longer time to ICU discharge alive and a trend toward increased risk of ICU-acquired infection.
INTRODUCTION Hospice is an underutilized health care resource in the United States. Late enrollment in hospice is common, as over 35% of patients die less than seven days after enrolling in care. In contrast, hospice is a widely utilized resource in countries such as England and Tanzania. The purpose of this project was to observe delivery of hospice care in these three settings and identify cultural themes that facilitate utilization of hospice care. METHODS Observational experiences were arranged in England and Tanzania. In July, 2010, patient care activities at Martletts Hospice in Brighton, England were observed over a two week period. Activities included inpatient care, home visits, and group sessions. In July, 2012, patient care activities at Selian Hospice in Arusha, Tanzania were observed over a four week period. Activities included 22 home visits and four “day hospice” community clinics. These experiences were compared to clinical experiences throughout a four year medical school curriculum in the United States at the University of Colorado. OBSERVATIONS AND DISCUSSION The hospice eligibility criteria in England was much less strict than in the United States. Hospice care in England is deemed appropriate for any patient nearing the end of life (as judged by a physician, and with no caveats about life expectancy) or suffering from a progressively debilitating illness. Consequently, patients who had been enrolled in hospice care for several years were commonly encountered. High hospice literacy was also observed in England, where hospice care has been tightly integrated into public health care for over 60 years. Additionally, the terms “hospice” and “palliative care” were considered synonymous. In Tanzania, hospice care was delivered almost exclusively in the home setting. Patient diagnoses differed greatly from those observed in England and the US, as infectious disease (HIV, tuberculosis) was the primary diagnosis in over half of the patients observed. Most patients were clinically stable and not approaching the end-of-life. Use of opiate medications was rarely observed, and most patients received nutritional and social support services. Community awareness of hospice services was enhanced through the extensive use of trained volunteers throughout Arusha and the surrounding regions that educated community members about hospice and identified patients in need. As in England, there was no conceptual distinction between the terms “hospice” and “palliative care.” CONCLUSIONS Experiences in England and Tanzania highlight two important themes in facilitating timely enrollment in hospice care: heightened community awareness and scope of hospice practice. In both settings, strong community liaisons played an important role in education about hospice services. In England, the presence of resale shops ensures that hospice maintains its traditionally valued role as a health care service. In Tanzania, a large network of locally respected volunteers facilitates hospice education across ethnically diverse region with limited resources. Likewise, in both countries hospice care was broadly defined so as to include palliative care. Because the terms ‘hospice’ and ‘palliative care’ were synonymous, enrolling in ‘hospice’ care did not necessarily imply that a patient was near the end of life. This may reduce a barrier to hospice utilization, suggesting that the rise of palliative care may actually be harmful to hospice in the United States.
**Project Title:** CU’s Advisory College Program: A New Structured Advising Program Developed to Improve Student Advising, Wellness, and Sense of Community

**Thematic Area:** Humanities, Social Science and Education

**Abstract:** Introduction: Institutions that have implemented structured advising programs report increased advising interactions, a higher quality of advising, and an enhanced sense of community. The University of Colorado School of Medicine (CUSOM) does not currently have a structured advising program and instead relies on informal advising and a cohort of designated career advisors. We hypothesized that CUSOM students would benefit from such a program.  

**Methods:** Two surveys of students were used to gather pre-intervention baseline statistics of advising and wellness at CUSOM. A faculty focus group was employed to develop objectives for an advisory college program.  

**Results:** Only 16% of students reported satisfaction with the current advising system, in which, 54% of students endorsed having an advisor. Overall, 70% of students reported symptoms of burnout and 33% screened positive on a validated screening tool which identifies higher likelihood of recent suicidal ideation or serious thoughts of dropping out of medical school. Faculty-developed objectives for a structured advising program included community development, career counseling, and wellness support.  

**Conclusions:** With the results of this survey, CUSOM proceeded in development of an advisory college program to improve student advising, wellness, and sense of community.
Project Title: Advances in Vision Preservation during Brachytherapy for Choroidal Melanoma

Thematic Area: Clinical Science

Abstract: Objective: 1) To demonstrate attenuation of radiation from I-125 to intraocular structures using liquid intravitreous substitutes in a live animal model. 2) To develop a model of acute radiation injury following I-125 plaque brachytherapy. Methods: Six pigs underwent plaque brachytherapy. All eyes underwent plaque implantation and removal, but the right eyes also underwent vitrectomy, air-fluid exchange and silicone oil fill. Thermoluminescent detectors (TLD’s) measured exit radiation doses intraoperatively. These results were then compared with theoretical measurements obtained with Plaque Simulator X technology. The pigs survived for varying amounts of time following plaque removal. Once euthanized, their eyes were sectioned, stained and analyzed. Results: Measured TLD results demonstrated radiation attenuation in live oil-filled vs control eyes. Histopathologic analysis of eyes revealed specific radiation changes in the retina/choroid region. These included outer nuclear layer thinning, choroidal thinning/beading and RPE cell loss and granule dispersement. A correlation with plaque distance was observed as well as a decrease of these findings in oil filled eyes. Conclusions: Radiation attenuation was demonstrated in porcine eyes and a model for acute radiation injury from I-125 was demonstrated for the first time in a living eye. These findings could lead to a novel clinical therapy to significantly reduce the risk of vision loss in the treatment of choroidal melanoma.
Project Title: Documenting Best Practices of Clinical Workflow in the Management of Chronic Diabetes: What Variables Affect HbA1c as a Measure of Clinical Outcomes in a Community Clinic

Thematic Area: Public Health and Epidemiology

Abstract: In clinics across the United States, diabetes mellitus and its complications are seen frequently. This population is growing rapidly, in 2010 an estimated 11.3% of the population had diabetes, and in addition to these 25.6 million people, 1.9 million more were newly diagnosed in 2010. In 2010, diabetes was the seventh leading cause of death in the U.S.; a major contributor to heart disease and stroke; and the leading cause of kidney failure, nontraumatic lower limb amputations, and new cases of blindness among American adults. In this study, we conducted a mixed-methods study of 7 clinical sites within a network of community clinics providing care to underserved populations within the Denver Metro area. Our quantitative analysis found statistically significant differences in the mean HbA1c level of patients being treated at the different clinics when adjusting for demographic variables age, gender and race. Also in this analysis, the race category was statistically significant for just one racial group. The qualitative portion of this study was observational, looking for best practices across sites. While each clinic had a variety of strengths, both in terms of individual providers and the way that the entire team interacted on a day to day basis, there were no clear behaviors that predicted the trends that might be expected when looking at HbA1c data.
**Project Title:** Footwear and Achilles Tendinopathy in Rural Student Athletes

**Thematic Area:** Public Health and Epidemiology

**Abstract:** Objective: To investigate whether offseason footwear correlated with heel pain consistent with Achilles tendinopathy in rural Colorado high school athletes. Background: Achilles tendinopathy is a very common injury to the Achilles tendon. As a repetitive-use injury, it is linked with involvement in activities that place increased strain on the Achilles. The type of footwear an athlete wears affects the stresses placed on the Achilles tendon. Footwear with a raised heel, such as a cowboy boot or work boot, shortens the Achilles and substantially lessens the stress compared to a flat shoe. Design: A four page survey was designed to characterize the footwear worn during the offseason and whether the athlete is experiencing heel pain. Participants: 449 high school athletes from 15 schools in eastern Colorado. Results: The surveys showed 25% of the athletes stated their summer footwear has a raised heel (like a cowboy boot or similar), and the majority of these athletes wore these shoes for more than seven hours per day. At the time of the survey, 27% of the athletes stated they were currently experiencing heel pain. Conclusions: The data is being analyzed but wearing footwear with a raised heel over the summer may contribute to heel pain when the athlete returns to participation.
Project Title: Telemedicine in Nepal: A Needs Assessment of the Current State and Recommendations for Best Practice

Thematic Area: Global Health

Abstract: Telemedicine is an innovative approach to increase access to quality and cost-effective healthcare services in underdeveloped countries through the use of telecommunications and information technologies. The United Nations’ Millenium Development Goal 8 is to develop a global partnership for development. Target 8.F based on the 2010 Millenium Development Goals Report states: “in cooperation with the private sector, make available the benefits of new technologies, especially information and communications.” In Nepal, many different telemedicine systems (both government run and private) are currently being tested with the hope of improving access to care for the country’s immense rural populations that lack sufficient qualified healthcare providers. This study aims to assess the current state of implementation of telemedicine into a variety of central and peripheral hospitals and clinics throughout Nepal and to provide a needs assessment to make recommendations for improvements. For six weeks during June and July of 2010, student researchers from University of Colorado School of Medicine traveled to Nepal to conduct a survey and to become familiar with the daily operations and resources available in Kathmandu Model Hospital and various remote clinics. Furthermore, a permanent link was established between the University of Colorado and Kathmandu Model Hospital in hope of creating a sustainable research tool for improving telemedicine practices on an ongoing basis. The students’ survey data was then combined with data collected via the televideo link between University of Colorado and Kathmandu Model Hospital. The result was a need for establishing best practices for Kathmandu Model Hospital Telemedicine services, strategies for retaining providers, and use of telemedicine for medical education. This report includes recommendations for each of the three aforementioned needs.
Project Title: The Methylenetetrahydrofolate Reductase Polymorphism (MTHFR c.677C>T) Does Not Increase the Risks of Recurrent Thromboembolism or Elevated Plasma Homocysteine Level in a U.S. Pediatric Population

Thematic Area: Clinical Science

Abstract: Objective: Elevated plasma homocysteine (tHcy) and the MTHFR c.677C>T variant have been postulated to increase the risk of venous thromboembolism (VTE), although mechanisms and implications to pediatrics remain incompletely understood. The objectives of this study were to determine the prevalences of elevated tHcy and the c.677C>T variant in a pediatric population with VTE or arterial ischemic stroke (AIS), and to determine associations of tHcy level or MTHFR c.677C>T polymorphism with thrombus outcomes including progression, recurrence or post-thrombotic syndrome. Study Design: Subjects were enrolled in an institution-based prospective cohort of children with VTE or AIS between April 2006 and June 2010. Inclusion criteria consisted of objectively confirmed thrombus, ≤ 21 years at diagnosis, tHcy measured and MTHFR c.677C>T mutation analysis. Clinical and laboratory data were collected. Frequencies for elevated tHcy and MTHFR c.677C>T variant were compared with the NHANES results for healthy US children and also between study groups (VTE vs. AIS, provoked vs. idiopathic) and by age. Results: The prevalences of hyperhomocysteinemia or MTHFR c.677C>T polymorphisms were not increased in comparison to national reference values. tHcy did not differ between those with wild-type MTHFR versus either c.677C>T heterozygotes or homozygotes. There was no association between tHcy or MTHFR c.677C>T genotype and thrombus outcomes. Conclusion: In this cohort of US children with VTE or AIS, neither the prevalence of tHcy > 11 μmol/L nor that of MTHFR c.677C>T was increased in comparison to normal reference values, and adverse thrombus outcomes were not associated with either. While it is important to consider that milder forms of pyridoxine-responsive classical homocystinuria will be detected only by tHcy, we suggest that routine testing of MTHFR c.677C>T genotype as part of a thrombophilia evaluation is not warranted.
Project Title: Homelessness, Health and Art: an Intimate Look at Denver and the Evolving Conversation to End Homelessness

Thematic Area: Humanities, Social Science and Education

Abstract: Title: Homelessness, Health and Art: an Intimate Look at Denver and the Evolving Conversation to End Homelessness  Research Question: What are the true demographics and health disparities faced by homeless individuals and how has art been used as a tool for advocacy and social change around these issues? This paper is the foundation for an art installation and examines homelessness, health disparities, and the use of art in influencing social change. An introduction to each of these topics is discussed, followed by an investigation of visual art and it's contribution to social change around homelessness. The connection between health care practitioners and the potential effects of art on their practices is also discussed.
Project Title: Two-Photon Imaging of Aqueous Outflow Structures in the Intact Mouse Eye

Thematic Area: Basic Science

Abstract: PURPOSE: To image the conventional aqueous outflow pathway and adjacent structures within the intact enucleated mouse eye using a noninvasive microscopy technique. METHODS: Two-photon microscopy (2PM) techniques, including two-photon autofluorescence (2PAF) and second harmonic generation (SHG), were used to obtain images of the trabecular meshwork (TM) region within an intact mouse eye. Cardiac perfusion of fluorescein-conjugated dextran was used to label blood vessels within the eye to serve as an anatomic reference. Eyes were subsequently fixed, paraffin embedded, sectioned, and stained for comparison to the 2PM images. RESULTS: Three-dimensional analyses of multiple 2PM images revealed a well-defined region adjacent to the iris and cornea that is free of SHG signal and consistent with the location of Schlemm's canal. This open region is continuous with smaller tube structures consistent with collector channels. These structures do not label in mice perfused with the vascular probe dextran, supporting the hypothesis that the enclosed spaces are filled with aqueous humor rather than circulating blood. The TM region in the mouse eye was also visible, with a clear SHG signal representing collagen fibers. CONCLUSIONS: These results support the hypothesis that 2PM may be useful for noninvasively imaging the conventional aqueous outflow pathway in mouse models of glaucoma. Studies are ongoing to validate our methodology in live animals.
Project Title: Biomechanical Evaluation of the Effect of Coracoid Tunnel Size on Load to Failure of Fixation during Coracoclavicular Ligament Reconstruction

Thematic Area: Basic Science

Abstract: Purpose: The purpose of our study was to compare tunnel diameter as an independent risk factor for fixation failure from the coracoid following transcoracoid acromioclavicular reconstruction. The effect of variation in coracoid size and scapular bone density on failure was also investigated. Methods: Thirty-two cadaveric scapulae were randomized into one of four groups: a control group with no coracoid hole, a 4mm transcoracoid tunnel, a 6mm transcoracoid tunnel, and a socket technique using a 6mm hole superiorly with a 4mm hole inferiorly. Bone density measures for all specimens were performed. Coracoid dimensions were quantified. Using a BioMet ToggleLoc cortical button device, all specimens were loaded to failure using an Instron servo-hydraulic test machine. Results: All drilled specimens failed by button pullout while all controls failed by coracoid fracture. Average pullout strength for each tunnel subgroup was as follows: 4mm 324.5N, 6mm 141.7N, 6-4 socket 250.5N, control 762.9N. No significant difference in load to failure was found between the 4mm, 6mm, and 6-4 socket groups. The load to failure for the control group was significantly higher than the other three techniques. No difference was found with respect to tunnel subgroups in base height (p=.76) or bone density (p=.41). Conclusions: Our results indicate that when employing a transcoracoid reconstruction technique, there is no significant difference in load to failure between 4mm, 6mm, and 6-4mm tunnel sizes. None of the coracoids drilled with the various tunnels approached the strength of the native coracoid controls using a looped wire technique.
**Project Title:** Telemedicine in Nepal: A Needs Assessment of the Current State and Recommendations for Best Practice

**Thematic Area:** Global Health

**Abstract:** Telemedicine is an innovative approach to increase access to quality and cost-effective healthcare services in underdeveloped countries through the use of telecommunications and information technologies. The United Nations’ Millenium Development Goal 8 is to develop a global partnership for development. Target 8.F based on the 2010 Millennium Development Goals Report states: “in cooperation with the private sector, make available the benefits of new technologies, especially information and communications.” In Nepal, many different telemedicine systems (both government run and private) are currently being tested with the hope of improving access to care for the country’s immense rural populations that lack sufficient qualified healthcare providers. This study aims to assess the current state of implementation of telemedicine into a variety of central and peripheral hospitals and clinics throughout Nepal and to provide a needs assessment to make recommendations for improvements. For six weeks during June and July of 2010, student researchers from University of Colorado School of Medicine traveled to Nepal to conduct a survey and to become familiar with the daily operations and resources available in Kathmandu Model Hospital and various remote clinics. Furthermore, a permanent link was established between the University of Colorado and Kathmandu Model Hospital in hope of creating a sustainable research tool for improving telemedicine practices on an ongoing basis. The students’ survey data was then combined with data collected via the televideo link between University of Colorado and Kathmandu Model Hospital. The result was a need for establishing best practices for Kathmandu Model Hospital Telemedicine services, strategies for retaining providers, and use of telemedicine for medical education. This report includes recommendations for each of the three aforementioned needs.
**Project Title:** Sirolimus Reduces the Risk of Significant Hepatic Fibrosis After Liver Transplantation for Hepatitis C Virus: a Single Center Experience

**Thematic Area:** Clinical Science

**Abstract:** Abstract: Sirolimus reduces the risk of significant hepatic fibrosis after liver transplantation for hepatitis C virus: a single center experience. Introduction: Hepatitis C virus (HCV) recurrence following orthotopic liver transplant is an expected outcome in all patients transplanted for a primary diagnosis of HCV. HCV recurrence has been shown to be associated with graft fibrosis and graft loss. Recent studies suggest that Sirolimus therapy may slow or inhibit hepatic fibrosis following liver transplant in patients positive for HCV at the time of transplant. Methods: At the University of Colorado Transplant Center, 313 patients underwent orthotopic liver transplant for Hepatitis C virus between 2000 and 2009. Of those individuals 251 patients qualified for inclusion in the study. Per protocol liver biopsies were performed on all patients at one year following liver transplant and or at time of clinical diagnosis of HCV recurrence with adequate compliance in both groups. Biopsies were scored for fibrosis using the Batts-Ludwig staging system (0-4) with significant fibrosis defined as fibrosis $³$ stage 2. Results: Overall, there was no detectable difference of overall survival and graft loss in the SRL group compared to the control group. Multivariate analysis revealed that SRL therapy was associated with statistically significant decreased odds of significant hepatic fibrosis at year 1 post-operatively and statistically significant lower risk of significant hepatic fibrosis during the study duration. Conclusions: In this retrospective, single center study we found that Sirolimus based immunosuppression was associated with lower risk of significant graft fibrosis, both at year 1 and throughout the study period, following liver transplant in HCV infected recipients.
**Project Title:** Crisis Intervention Psychotherapy: A Review and Step-by-Step Guide

**Thematic Area:** Humanities, Social Science and Education

**Abstract:** Patients in crisis frequently look to health care providers in a variety of specialties for guidance, so it is critical for providers to be prepared to help patients during these times. Providers familiar with techniques such as crisis intervention psychotherapy can guide patients through specific steps to help facilitate recovery. The primary objectives of this review article are to define crisis intervention, discuss the existing literature on crisis intervention, review notable founders of crisis intervention theory, explain how to perform this particular type of psychotherapy, and also lay the groundwork for future clinical studies on its efficacy and indications. This information will be presented in a step-by-step, guideline-style format to help readers implement crisis intervention psychotherapy techniques.
**Project Title:** Pregnancy Associated Breast Cancer: What Can PD-L1 Teach Us About the Immune Environment?

**Thematic Area:** Basic Science

**Abstract:** Pregnancy Associated Breast Cancer (PABC) is an aggressive form of cancer in young women. It is often defined as cancer that is detected within five years after the end of pregnancy. PABC is more common in women who delay childbearing, so we will likely see more PABC diagnosed in the coming years as women wait longer to begin to have children. Following pregnancy and lactation, the mammary gland undergoes the process of involution to return to a non-milk-producing state. The immune environment of involution is likely tumor-promotional. In order to understand the unique tumorigenic environment of involution, we studied Programmed Death Ligand 1 (PD-L1) because it protects cells from attack by the immune system, and thus, promotes cancer cells by allowing them to evade the immune system. This paper reviews the clinical features of PABC and background about self-tolerance, specifically pertaining to the protein Programmed Death Ligand 1 (PD-L1). It also contains the results of immunohistochemical (IHC) staining for PD-L1 in mouse spleens, and PD-L1 western blotting across involution and between different organs during pregnancy and involution.
**Project Title:** Healthcare Service Utilization, Behaviors, and Attitudes Among Active Injection Drug Users

**Thematic Area:** Public Health and Epidemiology

**Abstract:** Purpose: The purpose of this study was to characterize the utilization of healthcare services available in a mid-sized metropolitan city, and to describe injection drug users’ attitudes and beliefs toward medical providers. Methods: Recruitment took place at a local outreach facility for IDUs in Denver with 125 active injection drug users agreeing to participate. Subjects completed a piloted self-report survey. Statistical analysis included frequency and means tables, Chronbach’s alpha statistics, correlation statistics, factor analyses, chi-square association tests, Fisher’s exact association test, and t-tests. Results: The majority of respondents in this study (88%) indicated that they had been to a local medical center within the last year to receive healthcare. Those who had scheduled one or more yearly exams were significantly more likely in general to access the healthcare system than those who did not schedule annual appointments. Three general themes were determined relating to IDU attitudes and behaviors: 1. if they were known IV drug users, providers treated them differently and with substandard care; 2. they were satisfied with general accessibility to medical services; 3. they reported not having a provider they trusted. Conclusion: It appears that access to healthcare services is not a major barrier to IDUs seeking out medical treatment in emergent and non-emergent cases in this sample of IV drug users. In our study, the injection drug user’s perspective of the patient-provider relationship appears to be a more important determinant of healthcare utilization. The majority of participants reported being treated differently, judged and uncomfortable with providers when they were known IV drug users. These factors likely play a role in the lack of consistent medical treatment and primary care providers for these patients.
Project Title: A unique case: Results of the implementation of IMCI strategies in Peru and implications for future efforts.

Thematic Area: Global Health

Abstract: The Integrated Management of Childhood Illness (IMCI) strategy was developed by the World Health Organization in the mid-1990s to address many of the systemic issues that contribute to the high rate of Under-Five Mortality in much of the developing world. As this strategy was being implemented, several “model” countries were selected for observation and data collection in the IMCI Multi Country Evaluation (MCE). While many of the MCE study countries showed promising results when the data was published in 2005, Peru demonstrated very little progress attributable to the IMCI program. In this literature review, the author seeks to identify both the bright spots in the Peruvian IMCI-MCE results and the theories behind why the implementation there failed. Future directions and modifications are discussed.
Kopp, Whitney

**Project Title:** The Implementation of Positive Deviance Model/Hearth in Cap-Haitien with Identified Endemic Malnutrition

**Thematic Area:** Global Health

**Abstract:** Childhood malnutrition is a significant problem for Haiti, severe malnutrition being as high as 2.5% in some urban areas. Global health researchers and workers are recognizing more and more that sustainable projects are the key to long-term improvement in health determinants in the poorest countries. With this in mind we set out to develop a Positive Deviance/Hearth model in Cap-Haitien, Haiti to help address under-five malnutrition in the area. Positive Deviance theory screens a community to identify families who struggle with malnutrition and those mothers in the same community who are able to healthy weighted children. These later mothers are termed ‘positive deviants’, an inquiry into their practices was done then these, along with other nutrition and hygiene lessons are taught in hearth sessions, or daily communally prepared meals, with those mothers with malnourished children. The following is an anecdotal description of our efforts in establishing a Positive Deviance/Hearth model and some of the challenges we faced doing so.
**Project Title:** Mental Health Disease in a Cohort of Women Receiving Prenatal Care at the University of Colorado Hospital

**Thematic Area:** Public Health and Epidemiology

**Abstract:** Objective: Perinatal depression is diagnosed in 6.5-15.4% of pregnancies with as many as 37% of pregnant women reporting depressive symptoms with prior mental health disease being a significant risk factor. The objectives of this study were 1) Determine the prevalence of women with a history of mental health disease 2) Estimate the prevalence of positive depression screening using the Patient Health Questionnaire 2 (PHQ-2) and 3) Assess the relationship between select risk with a history of maternal mental health disease. Methods: From the Baby Blanket program we analyzed the first 575 mothers to determine the prevalence of a history of mental health disease and identify risk factors such as maternal age, parity, cigarette use and any pregnancy loss. From this cohort, 178 women were administered the PHQ-2 depression screening form. The data were analyzed using univariable analysis to generate descriptive statistics for the cohort. Differences between categorical variables were examined using chi-square and t-tests for continuous variables (P < 0.05). The relative risk was used as a measure of association between dichotomous variables. Results: Of the 575 included women, 32% were found to have a history of any mental health disease. Women that were younger, had increased BMIs, preterm birth, cigarette smoking and notably any history of any pregnancy loss or termination, were statistically significantly more likely to have a history of prior mental health disease. Of the subcohort of women administered the PHQ-2, 11.2% had a positive screen for depression with 60% of those reporting a prior history of any mental health disease. Conclusion: Women in the Baby Blanket program reported a higher prevalence of prior mental health disease compared with national data. Those with a history of history of mental health disease as well as women with any pregnancy loss or termination were statistically more likely to report higher scores on the PHQ-2.
Project Title: Etonogestrel Implant Failure After 25-months of Use in a Woman Taking Carbamazepine

Thematic Area: Clinical Science

Abstract: BACKGROUND: Antiepileptic drugs decrease the efficacy of hormonal contraceptives due to their effect on CYP450 liver metabolism. Unlike OCPs, very little is known about current etonogestrel implant failures with these medications, or pregnancy outcome when failure occurs. CASE: A young patient with long standing seizure disorder treated with carbamazepine for 9 years became pregnant after 25-months of etonogestrel implant use. CONCLUSION: Physicians and patients must be aware of interactions between hepatic inducing drugs and hormonal contraception. Proper counseling is necessary when discussing contraceptive methods in these patients.
Project Title: Cavity Free at Three - A Training Module for Healthcare Providers

Thematic Area: Public Health and Epidemiology

Abstract: N/A
Project Title: Assessing the effectiveness of using lay healthcare providers to DOTS therapy in Delhi, India: A Cohort Study

Thematic Area: Global Health

Abstract: Background: Tuberculosis (TB) is one of the world’s most prevalent diseases infecting more than 8 million new individuals per year and causing approximately 1.8 million deaths per year globally. Twenty percent of the world’s tuberculosis burden is contained in India, where incidence has been stable over the last 17 years. Operation ASHA uses a 14-Point tuberculosis treatment protocol that utilizes community leaders to distribute DOTS treatment on a community level. This study compares Operation ASHA’s outcomes in the year 2008 to the Indian government’s Revised National Tuberculosis Control Programme (RNTCP.) Methods: The study is a retrospective chart review of 1206 individuals that includes all patients treated at one of eighteen (18) Operation ASHA treatment centers in the Delhi area. All patients were over the age of 18, excluding pregnant women and prisoners. All patient received treatment for TB through the 14-point tuberculosis treatment program during the year 2008. This data was compared by chi-square analysis to the RNTCP’s data over the same time period in a geographically similar area. Results: On chi-square analysis Operation ASHA’s treatment success was on par with India’s RNTCP. Operation ASHA did have a statistically higher rate of default among new, smear positive patients when compared to the RNTCP. Data comparison of New, Extra-Pulmonary, Smear Negative patients between Operation ASHA and the RNTCP revealed that Operation ASHA had statistically significant higher rates of treatment completion and lower rates of treatment default. Discussion: Operation ASHA represents an example of unique and cost effective programming that utilizes lay healthcare workers to impact positive change in their own communities and their ability to expand access to essential healthcare and disease treatments with outcomes statistically similar to those of India’s RNTCP.
**Project Title:** Medical marijuana diversion and associated problems in adolescent substance treatment.

**Thematic Area:** Public Health and Epidemiology

**Abstract:** Background: The prevalence of medical marijuana diversion among adolescents in substance treatment and the relationship between medical marijuana diversion and marijuana attitudes, availability, peer disapproval, frequency of use and substance-related problems are not known. Methods: 80 adolescents (15–19 years) in outpatient substance treatment in Denver, Colorado, completed an anonymous questionnaire developed for the study and the Drug Use Screening Inventory-Revised (DUSI-R). The proportion ever obtaining marijuana from someone with a medical marijuana license was calculated. Those ever obtaining marijuana from someone with a medical marijuana license were compared to those never obtaining medical marijuana with respect to marijuana attitudes, availability, peer disapproval, frequency of use, DUSI-R substance use problem and overall problem score using Chi-Square analyses and independent t-tests. Results: 39 (48.8%) reported ever obtaining marijuana from someone with a medical marijuana license. A significantly greater proportion of those reporting medical marijuana diversion, compared to those who did not, reported very easy marijuana availability, no friend disapproval of regular marijuana use and greater than 20 times of marijuana use per month over the last year. The diversion group compared to the no diversion group also reported more substance use problems and overall problems on the DUSI-R. Conclusions: Diversion of medical marijuana is common among adolescents in substance treatment. These data support a relationship between medical marijuana exposure and marijuana availability, social norms, frequency of use, substance-related problems and general problems among teens in substance treatment. Adolescent substance treatment should address the impact of medical marijuana on treatment outcomes.
**Project Title:** Evaluation and Modification of the Spurling Maneuver for Expanded Application in Diagnosis of Cervical Radiculopathy: A Feasibility Study.

**Thematic Area:** Clinical Science

**Abstract:** Specific Aim: To better quantify the clinically important aspects of the spurling maneuver via C-arm fluoroscopic imaging and expand its application to the distal C-spine. Evaluation to include imaging of a modified stepped spurling maneuver for quantifiable effect of each step, as well as the application of a novel S-bend manipulation of the C-spine. Background: Prior evaluation of the Spurling maneuver has been accomplished using fMRI on live subjects but only the classic maneuver was tested and variability only applied to the axial load. Methods: A single cadaveric subject was studied under fluoroscopy for the modified stepped spurling maneuver as well as the novel S-Bend manipulation. Discussion: Challenges presented as to inability to standardize C-arm images for measure and statistical analysis and positioning of the cadaveric specimen. Study was then modified to a single subject feasibility study. This study proved that cervical spinal confrontational changes can be acquired according to both the modified stepped Spurling maneuver as well as the S-bend manipulation. This study also proved that choice of subject type, as well as, imaging modality were not adequate for primary applicable research on the subject. Conclusion: Future studies should use the same guidelines and step-wise application of the modified Spurling maneuver and S-bend manipulation as outlined in this study but imaging should be accomplished using fMRI on live subjects after all appropriate licensing and approvals.
Project Title: “the unfathomable ground where we walk daily…”: Physicians, The Illness Renarrative, and the Poetry of Williams Carlos Williams and Rafael Campo

Thematic Area: Humanities, Social Science and Education

Abstract: Aside from being an indispensable element of clinical care, the illness narrative has become its own literary genre that is critically analyzed and acclaimed. From Margaret Edson’s Wit: A Play (1999) to The Friday Night Knitting Club (2007) to A Whole New Life: An Illness and a Healing (2003), illness narratives are ubiquitous in contemporary culture. A subset of the illness narrative genre is occupied by the physician author/poet. Medicine is a common subject from physician-writers and they often tell the stories of their patients. The exact nature of the link between the physician-poet and the illness narrative is less clear. Are the stories of illness told from the physician’s viewpoint still illness narratives? How should readers approach these works? Using critical analysis of the work of William Carlos Williams, a well-known physician-poet from the early 20th century, as well as Rafael Campo, a contemporary poet and internist, I will establish the relationship of the physician illness narrative, which I will call the illness renarrative, with the genre as a whole. I will also illustrate the importance of the illness renarrative in the lives of physicians.
Project Title: Text messaging hotlines: An innovative way to educate teens about sexual health

Thematic Area: Public Health and Epidemiology

Abstract: Purpose: Text messaging is the most utilized form of communication among teens. Many teens lack access to reliable information about sexual health. The purpose of this project was to create a texting hotline to provide accurate sexual health information to teenagers and to examine its use in Colorado. Methods: The authors created In Case You’re Curious (ICYC), which provides evidence-based responses to sexual health questions via text messaging. The program used a web-based tool to track data regarding the text messages. The authors then analyzed the data from the program collected from September 2010 – October 2012. This included the total number of text messages received, the number of text messages per month, the number of repeat users, the average number of text messages per user, and the categories of questions asked. Results: From September 2010 – October 2012, ICYC received 3,777 text messages from 1,121 users. The number of text messages more than doubled between the program’s first and second years. Fifty-seven percent of the questions in the first year were about sexual acts, sexually transmitted diseases, birth control, or pregnancy. Conclusions: ICYC has grown steadily in its first two years of existence and has attracted many repeat users. Texting hotlines can effectively engage teenagers about health issues.
Project Title: The Implementation of Positive Deviance Model/Hearth in Cap-Haitien with Identified Endemic Malnutrition

Thematic Area: Global Health

Abstract: Childhood malnutrition is a significant problem in Haiti, severe malnutrition being as high as 2.5% in some urban areas. Global health researchers and workers are recognizing more and more that sustainable projects are the key to long-term improvement in health determinants in the poorest countries. With this in mind we set out to develop a Positive Deviance/Hearth model in Cap-Haitien, Haiti to help address under-five malnutrition in the area. The Positive Deviance theory screens a community to identify families who struggle with malnutrition and those mothers in the same with children at a healthy weight. These latter mothers are termed positive deviants. An inquiry is made into their practices and these findings are taught as lessons, along with other nutrition and hygiene information in hearth sessions, or daily communally prepared meals composed of the mothers with malnourished children. The following is an anecdotal description of our efforts in establishing a Positive Deviance/Hearth model and some of the challenges we faced doing so.
Project Title: Use of a Hanging Weight System for Isolated Renal Artery Occlusion

Thematic Area: Basic Science

Abstract: In hospitalized patients, over 50% of cases of acute kidney injury (AKI) are caused by renal ischemia 1-3. A recent study of hospitalized patients revealed that only a mild increase in serum creatinine levels (0.3 to 0.4 mg/dl) is associated with a 70% greater risk of death than in persons without any increase 1. Along these lines, surgical procedures requiring cross-clamping of the aorta and renal vessels are associated with a renal failure rates of up to 30% 4. Similarly, AKI after cardiac surgery occurs in over 10% of patients under normal circumstances and is associated with dramatic increases in mortality. AKI are also common complications after liver transplantation. At least 8-17% of patients end up requiring renal replacement therapy 5. Moreover, delayed graft function due to tubule cell injury during kidney transplantation is frequently related to ischemia-associated AKI 6. Moreover, AKI occurs in approximately 20% of patients suffering from sepsis 6. The occurrence of AKI is associated with dramatic increases of morbidity and mortality 1. Therapeutic approaches are very limited and the majority of interventional trials in AKI have failed in humans. Therefore, additional therapeutic modalities to prevent renal injury from ischemia are urgently needed 3, 7-9. To elucidate mechanisms of renal injury due to ischemia and possible therapeutic strategies murine models are intensively required 7-13. Mouse models provide the possibility of utilizing different genetic models including gene-targeted mice and tissue specific gene-targeted mice (cre-flox system). However, murine renal ischemia is technically challenging and experimental details significantly influence results. We performed a systematic evaluation of a novel model for isolated renal artery occlusion in mice, which specifically avoids the use of clamping or suturing the renal pedicle 14. This model requires a nephrectomy of the right kidney since ischemia can be only performed in one kidney due to the experimental setting. In fact, by using a hanging-weight system, the renal artery is only instrumented once throughout the surgical procedure. In addition, no venous or urethral obstruction occurs with this technique. We could demonstrate time-dose-dependent and highly reproducible renal injury with ischemia by measuring serum creatinine. Moreover, when comparing this new model with conventional clamping of the whole pedicle, renal protection by ischemic preconditioning is more profound and more reliable. Therefore his new technique might be useful for other researchers who are working in the field of acute kidney injury.
**Project Title: Procalcitonin in Kawasaki Disease**

**Thematic Area:** Clinical Science

**Abstract:** Kawasaki Disease (KD), also known as acute, febrile, mucocutaneous lymph-node syndrome, is a self-limited vasculitis that predominantly affects children aged less than 5 years old. Prompt diagnosis of the disease is essential as early intervention and treatment decrease the patient’s risk of developing potentially fatal coronary artery aneurysms. Many laboratory markers, including C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR), can be helpful in differentiating Kawasaki Disease from other infectious pathologies. Procalcitonin (PCT) has recently become a popular laboratory marker due to its utility in differentiating potentially serious bacterial infections from usually less serious viral infections. Currently, it is not clear what the diagnostic utility of Procalcitonin is in patients with Kawasaki Disease. The literature on the subject has utilized small and often homogenous patient populations with subsequently conflicting results. Additionally, prior studies have not addressed nor corrected for the “day of illness” on which said procalcitonin levels were measured. The primary aim of this ongoing study is to measure procalcitonin levels in serum and plasma samples taken from previous Kawasaki Disease patients at Children’s Hospital of Colorado from 2009 to 2012 to determine the diagnostic utility of PCT in patients being evaluated for KD. Using numerous viral and bacterial controls, we aim to determine the PCT profiles of KD patients while paying specific attention to the day of illness (as determined by days since fever began). Additionally, we will compare the sensitivity and specificity of PCT to CRP and ESR. We will also attempt to determine the how PCT levels change as their clinical course progresses. Lastly, we aim to determine if PCT can be used to predict KD severity, future development of coronary artery abnormalities, and to determine if KD patients will respond to conventional IVIG treatment.
**Project Title:** Prevalence of Cervical Dysplasia Among Women in Rural Guatemala

**Thematic Area:** Global Health

**Abstract:** Objectives: To determine the prevalence of cervical dysplasia as detected by visual inspection of the cervix with acetic acid (VIA) among women in rural Guatemala. Methods: A retrospective chart review of data from 9,094 women who met inclusion criteria and attended screening clinics from January 2008 through June 2010. Results: The combined prevalence of an abnormal VIA was 1.6% across 11 regional departments of Guatemala. Only age correlated with abnormal VIA (mean age 31.7 years vs 35.5 years; p
**Project Title:** Operation ASHA Tuberculosis Treatment Using DOTS Protocol and Community Involvement: A Retrospective Chart Review

**Thematic Area:** Global Health

**Abstract:** Tuberculosis (TB) is one of the world’s most prevalent diseases infecting approximately 8.7 million new individuals per year and causing approximately 1.4 million deaths per year globally (as of 2011). In fact, in 2007, TB had a global prevalence of 217 individuals per 100,000 people worldwide and it continues to be the leading cause of death among people with HIV. Nearly 20% of those affected with TB reside in India, where treatment has been dictated by the WHO’s directly observed therapy, short-course (DOTS) program, part of India’s Revised National Tuberculosis Control Program (RNTCP) since 1993. The DOTS protocol has been successful at lowering the prevalence of TB in India by almost half in 17 years, but the TB incidence has remained constant during this time period, indicating a need to better analyze the standards of treatment and understand possible reasons for the significant TB incidence in India. For those infected with TB, completing treatment is one of the largest barriers to recovery. Operation ASHA (OpASHA) is an NGO serving the Delhi city center to improve the outcomes of TB treatment utilizing a unique 14-point treatment protocol. Our 2010 retrospective analysis of the outcomes of OpASHA and RNTCP treatment protocols showed that OpASHA cure rates and success rates were consistently over the 85% prescribed by the WHO. However, default rates were higher than RNTCP figures in certain categories, like patients retreated after default or relapse. The results indicate a need for better access to multidrug resistant (MDR) treatment and for re-evaluation of TB treatment in India and other high-burden regions around the world.
Project Title: Student-Created Wiki for Collaborative Medical Education

Thematic Area: Humanities, Social Science and Education

Abstract: Objective Describe the history and current use of wikis in medical education, and the UCDSOM Wiki in particular, and evaluate student opinions of the UCDSOM Wiki. Materials and Methods The UCDSOM Wiki was created in Fall 2009 to serve as a study tool repository for the University of Colorado, Denver School of Medicine. We evaluated the site using an anonymous online survey distributed to the four school of medicine class years, along with Google Analytics website traffic data. Results Website traffic data shows a high amount of use, averaging over 300 pages viewed per day during the past year and nearly 70,000 total visits. The survey received 164 responses, 88% of whom were aware of the UCDSOM Wiki prior to taking the survey. On average, respondents felt that the Wiki was more useful in the pre-clinical years (2.73 out of 5) that in the clinical years (1.875 out of 5). Perceived usefulness correlated with the percent of studying for which the respondent used electronic resources. Among users who did not intend to contribute, frequently cited reasons included technical difficulty, lack of perceived benefit, lack of time, and lack of confidence in their own ability to contribute useful content. Discussion The Wiki is a well-used though unofficial part of the School of Medicine curriculum, and like many educational resources it is highly valuable to some students but not useful to others. Based on the results, future improvements to the Wiki may include creation of an editing “cheat sheet,” transition to an on-campus server, and improved page templates to make content more accessible.
**Project Title:** Diagnostic Errors Resulting in Patient Harm: Identification, Assessment, and Prevention

**Thematic Area:** Public Health and Epidemiology

**Abstract:** Background: Diagnostic errors represent a significant proportion of medical errors and are a leading cause of medical malpractice litigation. Settlement of claims involving diagnostic error occurs more often and incurs greater cost than claims not involving diagnostic error. Among adverse events caused by physician error, serious disability suffered by patients is most frequently caused by diagnostic error. More information is needed regarding diagnostic errors that lead to sub-optimal patient care and subsequent malpractice claims. Better understanding of the factors that contribute to diagnostic error has the potential to improve patient care and reduce the rate of malpractice claims filed against medical professionals. Strategies to reduce diagnostic error are also needed. Diagnosis suggestion systems have been proposed as a way to reduce errors. Such systems operate on the principle that an incomplete list of possible diagnoses in the “practitioner memory workspace” is an important cause of diagnostic mistakes. Diagnosis suggestion systems address this by presenting diagnostic possibilities, sometimes generated by computational techniques, with or without an effort at probability ranking. However, it is not clear what proportion of diagnostic mistakes this strategy might actually prevent. Purpose for study: To describe the factors that lead to diagnostic error resulting in malpractice litigation and to assess the potential of a diagnosis suggestion system to prevent diagnosis error. Methods: COPIC Insurance Co. provides professional liability insurance to approximately 8,000 physicians in Colorado and Nebraska. COPIC captures data on malpractice claims for covered providers – as well as reports of occurrences that might give rise to claims – in a structured database. Events are coded using COPIC’s “Taxonomy of Medical Errors.” We identified claims in which “Wrong or Delayed Diagnosis” was a factor. Two experienced clinicians reviewed brief, nurse-generated narratives for each claim. They sorted wrong diagnosis claims into six broadly defined categories: 1) clinician error, 2) patient care delivery system error, 3) error due to patient non-adherence, 4) unavoidable procedural complication, 5) no apparent error occurred, and 6) further chart reviewed needed. Reviewers additionally analyzed the hypothetical preventability of each claim had a diagnosis suggestion system been available at the time of initial diagnosis. When examining the potential usefulness of such a systems, reviewers considered three distinct outcomes: a) claims potentially prevented if the practitioner had been prompted with a list that included the correct diagnosis; b) claims where a diagnosis decision support system would not have made a difference (e.g., lost lab report); and c) claims where a determination could not be made. Results: Out of 33,189 reports (claims and occurrences) collected from 2002-2010, 4,141 events (12%) were coded as involving diagnostic error; of which 1,295 (31%, 4% of the total) were claims. After removing duplicate records in cases with multiple claims, 785 claims were reviewed. Clinician error was judged to have more frequently occurred among reviewed malpractice claims (286, 36% of total). Most common examples of clinician errors were misinterpretation of medical imaging and failure to diagnose. Breakdowns in the delivery of patient care (failure to follow-up on abnormal labs or imaging, as well as procedural delays) accounted for 143 claims (18%); 19 claims (2.4%) were judged secondary to patient non-adherence. No apparent diagnostic error was identified in 23 claims (2.9%). 257 claim narratives (32%) did not contain sufficient information for immediate review and warrant further chart review.
Regarding error prevention using a diagnosis support system, reviewers agreed on 85 claims (10.8%) in which the error might have been prevented if the practitioner had been presented with a list of suggestions that included the correct diagnosis. They agreed that in 379 claims (48.3%), the error would not have been affected by diagnostic suggestions. Lastly, reviewers agreed that in 25 claims (3.2%) the information provided did not permit a decision. Conclusion: In malpractice claims involving a wrong or delayed diagnosis, clinician error appears to be the most frequent contributing factor. Errors in patient care delivery systems were the second most frequent contributing cause leading to diagnostic error. Fully understanding the root of such errors might be valuable to decreasing future malpractice claims and improving patient care. One limitation of this study is the inherent difficulty in tracing the diagnostic steps taken during clinical workup, as well as determining how much each factor may contribute to the development of a diagnostic error. Additionally, this study did not analyze the frequency with which distinct error categories occur simultaneously in individual claims. When assessing the preventability of error, we determined that more complete diagnostic suggestions might be useful in averting the error in a small but significant number of cases. However, the majority of events in this series would not have been amenable to correction by diagnosis suggestion systems. Because of disagreement between reviewers, this study should be repeated with a strict definition of cases amenable to diagnostic suggestion and more reviewers, data sets, and care delivery settings.
Project Title: Prevalence of Cervical Dysplasia Among Women in Rural Guatemala

Thematic Area: Global Health

Abstract: Objectives: To determine the prevalence of cervical dysplasia as detected by visual inspection of the cervix with acetic acid (VIA) among women in rural Guatemala. Methods: A retrospective chart review of data from 9,094 women who met inclusion criteria and attended screening clinics from January 2008 through June 2010. Results: The combined prevalence of an abnormal VIA was 1.6% across 11 regional departments of Guatemala. Only age correlated with abnormal VIA (mean age 31.7 years vs 35.5 years; p...
Project Title: Care Transition Metrics: A Colorado Inventory. Review of the Landscape and Considerations for Reform

Thematic Area: Public Health and Epidemiology

Abstract: Preventable hospital readmissions are difficult for patients and their families, a sign of deficits in quality of care, and incredibly expensive, costing hospitals more than $44 billion annually. To address this alarming problem, multiple initiatives have been implemented in Colorado to improve care transitions. In parallel, however, with the development of these initiatives, a new problem has become evident: the appropriate measurement of the quality of care transitions. Measures used to date have fallen short due to methodological challenges and misplaced application, making public reporting of quality data impossibly complex and application of financial penalties unfair. Moreover, these measurement flaws restrain quality improvement efforts and, until these methodological challenges are addressed and resolved, dramatic improvement in care transitions will remain elusive. To assess the current state of care transition metrics in Colorado, leaders of major care transition initiatives were interviewed on their measurement and assessment strategies, use of specific measure methodologies, and any potential barriers to assessment or data collection. Data showed that selection of metrics and the level of sophistication in measurement strategies varies widely. Several initiatives are using innovative and unique metrics, and several technological and other barriers are commonly reported. The data collected underscores two approaches ripe for action and relevant for the immediate future of care transitions in Colorado: (1) Consider the utility of selecting a universal, common metric to measure care transitions, including using the powerful population-based metrics developed by CFMC, considering a short—5- or 7-day—readmission metric for hospitals, and developing recommendations on reporting care transition data via the All-Payer Claims Database (APCD). (2) Consider developing a comprehensive, innovative framework for measuring care transitions, including developing a task force to undertake this challenge, establishing a framework that addresses multiple care settings and overcomes fragmentation, using “sender-receiver” metrics, and addressing technological barriers but do not allow them the hinder progress and innovation. In conclusion, care transitions are highly complex, requiring cooperation between multiple health care providers and/or facilities that have been designed to function largely within a deeply fragmented system. The complexity of improving care transitions within such a highly-fragmented system creates complementary problems in the reliable assessment of efforts in quality improvement. In Colorado, measurement of care transitions is complex and currently inadequate. However, this inventory of initiatives has revealed that Colorado has the expertise, desire, structural framework, and a multitude of other resources to overcome these challenges and tackle this problem. The development of improved, meaningful measurement strategies is ripe for action and necessary to spur widespread improvement in patient care.
**Project Title:** Adverse Drug Events in a Pediatric Outpatient Antibiotic Therapy (OPAT) Program

**Thematic Area:** Clinical Science

**Abstract:** For patients managed through the Children’s Hospital Colorado Outpatient Parenteral Antimicrobial Therapy (OPAT) clinic, a variety of side effects and adverse drug events are frequently observed but are not well described in the literature. Information about these side effects, for example, in whom they occur, when they occur, with which antibiotics they occur, and with which administration route, will help clinicians make optimal choices for patients. The data obtained through this study should help to inform practice regarding the safety and side effects of long term antibiotic use in pediatric patients. The goal of this study is facilitate prompt interventions that increase antibiotic stewardship, decrease side effects by indentifying factors that are common to those who experience significant adverse drug events (ADE) and improve the overall treatment outcomes for pediatric OPAT patients.
Project Title: Heart Failure and Hospice: A Qualitative Assessment

Thematic Area: Clinical Science

Abstract: The purpose of this study is to describe the modern experiences, challenges and direction of care associated with heart failure patients in hospice programs across the country. The use of qualitative study provides a rich format in which to explore this pressing issue. This study consisted of 15 qualitative interviews conducted via telephone from November 2012 through January 2013. Potential interviewees were selected from a list of hospice and palliative care providers maintained through PoPCRN, a University of Colorado-sponsored palliative network. Interviews lasted approximately 15 minutes and were loosely based on formatted script, although participants were allowed to share unique perspectives and experiences specific to heart failure patients. From the collection of quotes, the researchers derived and organized recurrent themes. The care of heart failure patients in hospice programs faces many modern challenges, many of which seem to stem from a missing link between two ends of the medical care spectrum, previous medical environment and present health care efforts. This gap is seen specifically in primary physician involvement, interventional efforts, clinical protocols, and patient attitudes. At the core of building this link is establishing patient feelings of trust and acceptance. Improving hospice efforts for these patients consists of bridging the gap between past and present health efforts by establishing trust that is specific to the unique needs of heart failure patients.
Project Title: Attending Rounds in the Current Era: What is Not Happening

Thematic Area: Humanities, Social Science and Education

Abstract: Background: Medicine attending rounds serve as the foundation for patient care and education in teaching hospitals. The detailed activities of these rounds in the current era are not well characterized. Therefore, we conducted a prospective observational study to describe the characteristics of internal medicine inpatient attending rounds at a large teaching hospital system.

Methods: A cross-sectional observational study of internal medicine attending rounds was conducted at four teaching hospitals associated with a large, public medical school. Duration, location, participants engaged in rounds and the frequency of 19 potential rounding activities were directly observed by research assistants. Results: Ninety rounding days were observed, which included 56 internal medicine attendings, 279 trainees, and 808 general medicine inpatients. A “typical” rounding day consisted of one attending with three trainees rounding on a median of 9 patients (range 2 – 18 patients, SD 3.0 patients) for a median of 2.0 hours (range 25 – 241 mins, SD 2.7 min). On rounds, teams most frequently discussed the patient care plan (97% of patients), reviewed diagnostic studies (91%), communicated with patients (73%) and discussed the medication list (69%). Teams infrequently discussed invasive lines or tubes (9%), or nursing notes (6%), and rarely communicated with nursing (12%), or taught about physical examination (11%), evidence-based medicine topics (7%), and learner-identified topics (3%). Among commonly performed activities, most occurred infrequently at the bedside. Conclusions: Most activities on attending rounds take place at the bedside infrequently. The teams discuss patient care plans and test results the majority of the time, but fail to include many items that may be of significant value including specific aspects of patient care, interprofessional communication and learner-centered education.
Project Title: Altered insula response to sweet taste processing after recovery from anorexia and bulimia nervosa

Thematic Area: Clinical Science

Abstract: Purpose: Recent studies suggest that altered function of higher-order appetitive neural circuitry may contribute to restricted eating in anorexia nervosa and overeating in bulimia nervosa. This study used sweet tastes to interrogate gustatory neurocircuitry involving the anterior insula and related regions that modulate sensory interoceptive reward signals in response to palatable foods. Methods: Recovered anorexic and recovered bulimic subjects were studied to avoid confounding effects of altered nutritional state. Functional magnetic resonance imaging measured higher-order brain response to repeated tastes of sucrose and sucralose (Splenda®) in order to disentangle neural processing of caloric and non-caloric sweet tastes. A whole-brain functional analysis was constrained to the anatomical regions of interest. Results: Compared to matched control women (CW, n=14), women recovered from anorexia (RAN, n=14) had diminished (F[1,27]=7.79, p=0.01) and women recovered from bulimia (RBN, n=14) had exaggerated (F[1,27]=6.12, p=0.02) right hemodynamic anterior insula response to tastes of sucrose. Furthermore, the anterior insula and caudate findings for the recovered subjects were more exaggerated in response to sucrose (lower in RAN and higher in RBN) in contrast to sucralose. Conclusions: The anterior insula and related regions integrate sensory/reward aspects of taste and interocetive awareness in the service of homeostasis. These data support the possibility that restricted eating and weight loss occurs in anorexia nervosa because feeding elicits diminished insula homeostatic response to hunger, whereas overeating in bulimia nervosa is related to exaggerated hunger signal. This response may reflect the integration of signals related to sweet taste as well as the caloric content of food.
**Project Title:** Faculty Development Needs Assessment Survey

**Thematic Area:** Humanities, Social Science and Education

**Abstract:** Objective: To further evaluate the faculty development needs of the faculty at the University of Colorado School of Medicine by surveying self-perceived level of function in certain competencies and level of interest in further training in each competency. Also to determine the most desired modality for further education and how these results are related to faculty rank and department. Methodology: All of the faculty at the University of Colorado were sent a survey to their university email addresses. The survey was conducted through an online survey service, Survey Monkey. No identifiable information was obtained, and neither the faculty’s email nor IP addresses were tracked. The results were then assessed and reported. Results: Conclusions: There are no conflicts of interest to report.
Project Title: Creation of a Children’s Book Addressing Weight Management and Lifestyle Changes

Thematic Area: Humanities, Social Science and Education

Abstract: The aim of this project was the original, creative production of a children’s book. Drawing on the author’s personal background in obesity research, childhood obesity was chosen as a broad topic for the book. The research component of the project focused on identifying risk factors shown to contribute to childhood obesity and the selection of a single factor as the theme for the book’s storyline. The risk factor and subsequent theme chosen was the loss of shared family meals and the impact on childhood weight and nutrition status. Alongside the investigation of identified obesity risk factors, the use and evaluation of children’s literature in various counseling and therapeutic settings, termed ‘bibliotherapy’, was reviewed. Evaluation of this particular creative production for use in a clinical setting as an adjunct to in-office weight counseling, while outside the scope of this project, would be an exciting future endeavor.
Project Title: Role of TLR-4 in the Pathogenesis of Abdominal Aortic Aneurysms using a Murine CaCl2 model and Ultrasound

Thematic Area: Basic Science

Abstract: Introduction: Abdominal Aortic Aneurysms (AAA) continue to have a high rate of mortality, with 25% of patients surviving rupture. AAA’s are known to form through an inflammatory process, the initiating factors of which are still highly debated. It is known that cytokines regulate lymphocytes and macrophages which release metalloproteinases 2 and 9 which subsequently breakdown the aorta wall. TLR-4 has been associated with the movement of macrophages and leukocytes in inflammatory responses and thus the aim was to investigate the role of TLR-4 in development of AAA’s using a well established CaCl2 inducing AAA murine model and following development with ultrasound. Methods: C57/B6L mice were used in a pilot study to examine use of ultrasound in following AAA development, n=6. 0.25M CaCl2 was applied surgically to aorta for 15 minutes, and aorta diameter measured monthly for 18 weeks. Subsequently 9 C3H/HeN (TLR-4 wild type) and 9 C3H/HeJ (TLR-4 mutant) underwent a similar procedure and were followed with monthly ultrasounds. Results: Pilot study of C57/B6L mice showed a 32% increase in the size of the abdominal aorta after 18 weeks with p < 0.05 vs. 0 and 4 week time points, and TLR4 study mice showed C3H/HeN had 6.45%, and 4.9% aorta increases at 6 and 20 weeks with p values of 0.371, and 0.516 respectively, however inaccurate and in correctable errors were noted in the TLR-4 ultrasound measurements making any certainty hard to establish. Conclusion: It is possible to follow and show significant AAA development in C57/B6L mice using ultrasound and the CaCl2 AAA model, however, given noted abnormalities in ultrasound measurements it is hard to make any firm conclusions on the role of TLR-4 in the pathogenesis of AAA’s and further study is warranted.
Project Title: Benchmarking US Department of Veterans Affairs dermatologic services: Results from a national survey

Thematic Area: Public Health and Epidemiology

Abstract: Background: How well Department of Veterans Affairs (VA) dermatology services provide clinical care, medical education, and innovative research is a largely unexplored topic in the literature. Objective: We sought to benchmark VA dermatology services by surveying VA dermatologists about their environment, resources, and the pros and cons of working in the VA. Methods: Printed surveys were mailed to VA dermatologists and responses were compiled and analyzed. Results: Of 105 dermatology services surveyed, 48% returned surveys completed by board-certified dermatologists (n = 50); 20 surveys completed by nondermatologists were excluded from the analysis. Most services trained dermatology residents (72%) and medical students (80%). One third of services reported significant research involvement. Qualitative analysis revealed the academic environment, patient population, and decreased business management responsibilities as the 3 most commonly cited advantages to VA employment. The most commonly listed disadvantages included low salaries, bureaucracy, and lack of resources. Limitations: The survey data were self-reported and not independently verified. Not all services returned the survey. Conclusions: Outpatient VA dermatology services accomplish significant primary care and preventive services (eg, sun safety counseling, skin cancer screening, and treatment). However, the small number of dedicated dermatology services, their irregular geographic distribution, and the lack of staffing and resources may adversely affect optimal patient care. Dermatologist responses regarding the positive and negative aspects of working in the VA system may lead to improved management strategies to better retain and recruit dermatologists to provide patient care, medical education, and medical research despite dramatically lower dermatologist salaries within the VA system compared with private practice. (J Am Acad Dermatol 2012;66:e103-7.)
Project Title: Effectiveness of community-based adolescent HIV risk reduction programs in the United States

Thematic Area: Public Health and Epidemiology

Abstract: Currently, the Centers for Disease Control (CDC) in Atlanta estimates more than 1 million Americans are living with HIV, with as many as 21 percent unaware that they are even infected. Unfortunately, the incidence has disproportionately affected young adults and minorities. According to CDC, young adults age 13-29 accounted for approximately 39 percent of new HIV diagnoses in 2009, despite comprising just 21 percent of the total population of the United States in that year. These numbers underscore the disconnect between awareness of HIV and actual working knowledge of health promotion and prevention regarding the disease. This is a systematic review of literature of community-based HIV prevention studies done in the United States from 2000-2013 targeting individuals aged 10-19. Intervention models that incorporate increased family communication and skills-building sessions - including how to properly use a condom, negotiating condom use and/or saying "no" with partner - are more effective at reducing high-risk behavior in adolescent groups. Older adolescent males are less likely to be impacted, therefore working with pre-adolescent or youth prior to sexual initiation should be models for large scale intervention. In addition to the school-based risk reduction models, utilizing culturally-appropriate community models can help, not only reduce high-risk HIV behavior but can also provide youth with structure to make better decisions.
**Project Title:** The Role of the Anganwadi Worker in Polio Eradication in Bihar: From Awareness Generation to Service Delivery

**Thematic Area:** Global Health

**Abstract:** Bihar is one of only a few regions in the world where wild poliovirus (WPV) transmission remains endemic. Here as many as 20 million children under five are vaccinated every month under the Polio Eradication Initiative (PEI). Such intensive activity relies heavily on the efforts of Anganwadi Workers (AWWs), both in mobilizing caregivers to vaccinate their children against this disease (raising awareness) and in directly administering the oral polio vaccine (OPV)2 (service delivery). AWWs are women primarily employed to deliver community-level nutrition and preschool education provisions (for children in the age group of 3–6 years) as part of the Government of India’s (GOI’s) Integrated Child Development Services (ICDS) scheme. As such, AWWs balance a focus on ‘holistic child development’ in their ICDS duties with the intensity of the ‘vertical’ polio programme. As frontline community workers, AWWs both shape and are shaped by ‘capacity development processes’: they actively strengthen community relationships and provide valuable services to those who need them. For this work, they benefit from the efforts of government departments and UNICEF in enhancing their skills and competencies. This case study examines how AWWs’ involvement in PEI has affected their lives, their communities, and the broader systems in which they work. It also investigates the capacity development strategies of PEI by looking at: how AWWs’ relationships and capabilities have been enhanced or limited by being involved in PEI whether the intervention has strengthened government structures and influenced ownership within PEI the ways in which the intervention seeks to encourage ownership and increase resilience within communities, and what changes communities experience as a result. The team conducted fieldwork in eight villages across two blocks of Khagaria district, Alauli and Gogri. Both blocks have had persistent transmission of polio and have access-compromised areas (ACAs) (especially due to severe annual flooding). In each village, we held in-depth interviews with the AWW and conducted focus group discussion (FGD) with mothers of children in the age group of 0–5 years. We also gathered quantitative data from 80 mothers and interviewed AWW supervisors and trainers. In addition to our core participants, we spoke to a variety of key players active in PEI at different levels, including WHO [World Health Organization]-supported supervisors, UNICEF-supported coordinators, volunteer vaccinators (vaccinators are not volunteer, and they are paid), and other community-level health staff. Our case study illustrates that as a result of capacity development processes, relationships between AWWs and their communities have been strengthened. This has resulted in (i) increased levels of community awareness regarding the risk of polio; (ii) decreased numbers of OPV ‘refusal’ cases; and (iii) some degree of change in behaviour regarding hygiene and sanitation practices. High-quality Information Education Communication (IEC) tools such as the hand-held illustrated polio flipbook were seen to play a crucial role in these processes. AWW involvement in PEI has also resulted in a keener awareness among community members of their health-related entitlements, whilst the government network of Anganwadi Centres (AWCs) now benefits from increased recognition from and contact with its target groups. This process has been strengthened through the facilitation of the Social Mobilization Network (SMNet), a UNICEF-supported initiative. Our study concludes with recommendations that urge
innovation in AWW training, monitored use of collaborative resources such as mothers’ meetings, and the tailoring of communication to local requirements.
Project Title: Is Antagonist Muscle Training of the Elbow and Shoulder Associated with Reduced Prevalence of Elbow and Shoulder Pain in Rock Climbers?

Thematic Area: Public Health and Epidemiology

Abstract: Background: The current literature advises regular exercises of forearm and shoulder muscles as preventative steps climbers can take to avoid elbow and shoulder pain. These suggestions, although based on logical physiological principles, are not supported by scientific research. Objective: To determine if antagonist muscle training of the forearm and shoulder is associated with reduced prevalence of elbow and shoulder pain in rock climbers. Methods: A retrospective, cross-sectional survey was performed sampling climbers at rock climbing gyms in Boulder, Colorado. Climbers were assessed for elbow and shoulder pain related to rock climbing. Survey questions were directed toward the performance of the following antagonist muscle exercises: wrist extensions, forearm pronation exercises, shoulder press, pushups, and shoulder rotation exercises. Logistic regression was used to estimate odds ratios and 95% confidence intervals. Results: 183 surveys were collected. 26 climbers (14%) reported elbow pain from climbing. There was no significant difference in the prevalence of elbow pain between climbers who regularly perform forearm antagonist training and those who do not. 32 respondents (17%) reported shoulder pain from climbing. There was no significant difference in the prevalence of shoulder pain between climbers who regularly perform shoulder antagonist training and those who do not. Conclusions: Performance of wrist extension and forearm pronation exercises is not associated with reduced prevalence of elbow pain in rock climbers. Performance of pushups, shoulder press, and shoulder rotation exercises is not associated with reduced prevalence of shoulder pain in climbers. More research is needed to determine if regular performance of antagonist muscle training can prevent chronic elbow and shoulder pain in climbers.
**Project Title:** Prevalence of Cervical Dysplasia Among Women in Rural Guatemala

**Thematic Area:** Global Health

**Abstract:**

Objectives: To determine the prevalence of cervical dysplasia as detected by visual inspection of the cervix with acetic acid (VIA) among women in rural Guatemala. Methods: A retrospective chart review of data from 9,094 women who met inclusion criteria and attended screening clinics from January 2008 through June 2010. Results: The combined prevalence of an abnormal VIA was 1.6% across 11 regional departments of Guatemala. Only age correlated with abnormal VIA (mean age 31.7 years vs 35.5 years; p
Project Title: CU Peru 5 year Strategic Plan: Building organizational stability and sustainability while developing community health advocates in the Loreto region of Peru.

Thematic Area: Global Health

Abstract: CU Peru is a nonprofit organization that was founded in 2010 by a group of medical students and has grown into an ongoing interdisciplinary global health project. This strategic plan was drafted to guide our organization for the next five years, focusing on increasing our organizational capacity and stability, educating community health workers and helping them to affect change in their communities, and assessing and sharing the impacts of our programming. Our plan to achieve these goals is detailed in a series of SMART outcomes (Specific, Measurable, Achievable, Relevant, and Timely), which provides us with a very specific metric to follow through the years.
**Project Title:** Clinicians rarely make changes in treatment following monitoring densitometry in women on therapy for low bone mineral density

**Thematic Area:** Public Health and Epidemiology

**Abstract:**

Background: Approximately 98% of patients on bisphosphonates experience an increase in bone mineral density (BMD) suggesting that monitoring treatment with densitometry may be unnecessary. We explored clinician rationale for ordering monitoring dual-energy X-ray absorptiometry (DXA) and management changes that followed. Methods: We reviewed charts of 92 randomly selected women who had at least one DXA during the study period, medication for low BMD, and no medications or conditions known to cause low BMD. We recorded clinician rationale for ordering monitoring DXA and the management changes that followed. Results: Our population received 196 monitoring DXA. Clinicians ordered scans out of a sense that they were “due” 90% of the time. Most scans (n=165, 84%) resulted in no change in management. There were 16 changes due to DXA (8%). Thirty-six scans showed a significant decrease in BMD and most (n=26, 72%) led to no change in therapy. Of the 10 changes that occurred when BMD decreased, half were not due to DXA. Conclusions: Our data indicate that clinicians frequently order monitoring DXA scans out of a sense they are “due” and rarely make changes in treatment based on the results. Approximately half of the treatment changes were not due to DXA and thus could have been made without additional testing. Even when BMD decreased significantly, changes were uncommon. Monitoring DXA scans could be done less often. Additional research is needed to establish useful intervals for monitoring densitometry.
Project Title: Review Of Cultural Competency In Regards To Mental Health Disparities Among The LGBT Population

Thematic Area: Public Health and Epidemiology

Abstract: There are known mental health disparities in the LGBT community, including increased prevalence of anxiety, depression, suicide, and substance abuse, among others. This is likely due to a history of discrimination against LGBT patients in health care as well as a lack of high-quality provider education on LGBT specific mental health topics and ways to minimize disparities in mental health care settings. One of the suggested ways to move towards eliminating these disparities is by teaching providers how to provide culturally competent care. This review serves as a formal literature review regarding the history of this discrimination, theories behind the disparities, and a thorough analysis of current cultural competency programs to provide an overview of the topic and serve as a starting point for further research and training in culturally competent mental health care for LGBT patients.
Reidy, Rosemary

**Project Title:** Theory of Mind Development is Impaired in 4-year-old Children with Prenatal Exposure to Maternal Tobacco Smoking

**Thematic Area:** Clinical Science

**Abstract:** Background: Theory of Mind (ToM) is an important component of social cognition. Deficits are found in various neurodevelopmental disorders and social and environmental factors have been found to influence ToM development. Little previous research has focused on effects of exposure to toxins. This report examines the impact of tobacco. Methods: 101 children, 18 with prenatal exposure to tobacco, underwent ToM testing at 40 (n=89) and 48 (n=77) months of age. Test questions received dichotomous pass/fail scores and percentage of correct responses was utilized as the primary dependent variable. Results: At 40 months of age children were rarely able to correctly answer false belief questions and there were no significant differences according to prenatal tobacco exposure. At 48 months of age, there was a significant effect of prenatal tobacco exposure with non-exposed 48-month-old infants correctly answering 45+40.6% of content false belief questions correctly, compared to 13.9+25.3% for 48-month-old infants with prenatal tobacco exposure, F=4.79, p=.032. Conclusions: ToM abilities are rapidly developing between 40 and 48 months of age. Prenatal exposure to tobacco is associated with delayed development. This finding supports consideration of nicotinic mechanisms as contributors to early development of social cognition.
Project Title: Esophageal human beta-defensin expression in eosinophilic esophagitis

Thematic Area: Clinical Science

Abstract: Background: Defensins are antimicrobial peptides expressed on mucosal surfaces that contribute to maintaining intestinal homeostasis by providing innate defense mechanisms for the epithelia. Defensin expression is altered in a number of diseases that affect mucosal surfaces, such as atopic dermatitis, allergic rhinitis, and inflammatory bowel disease. Similar to atopic dermatitis, eosinophilic esophagitis (EoE) is a chronic disease in which the squamous epithelial surface is affected by a similar TH2 microenvironment and eosinophil predominant inflammation. Therefore, we hypothesized defensin expression would be decreased in EoE. Methods: To address this, we measured defensin expression in vitro in cell lines derived from patients with EoE (EoE1-T) or gastroesophageal reflux disease (GERD) (NES-G4T cells), and ex vivo in esophageal mucosal biopsy samples from children with EoE, GERD, and control children without esophageal disease. Results: IL-5 induced a decrease in human beta-defensin 1 (hBD1) and human beta-defensin 3 (hBD3) expression in EoE1-T but not in NES-G4T cells. Compared to esophageal biopsy specimens from GERD and control children, specimens from EoE pediatric patients revealed significant decrease in mRNA and protein expression for hBD1 and hBD3. Conclusion: Diminished expression of hBD1 and hBD3 may make the esophageal epithelium more susceptible to the development and/or perpetuation of EoE.
**Project Title:** Post-abortion contraception: who chooses immediate long-acting methods; and continuation and satisfaction at 6 weeks

**Thematic Area:** Clinical Science

**Abstract:** Objective: To compare women who choose affordable LARC after elective first trimester abortion with those who don't, and to compare method continuation and satisfaction. Methods: Women ages 18 and older undergoing elective first trimester terminations were offered affordable IUDs or subdermal implants. Patients were consented to be contacted regarding method continuation and satisfaction, and were followed at 6 weeks. Women who chose LARC were then compared to those who did not. Results: 941 patients between November 2010 and June 2012 received elective first trimester terminations. 74% of patients chose immediate LARC placement and 26% chose non-LARC methods. Mirena was the most popular method, acquired by 54.2% of women. Implanon was the second most acquired method with 13.7% of subjects. LARC patients tended to be younger, and smokers were more likely to choose LARC. Predictors of choosing a non-LARC method were age 30 or older, and history of an ectopic pregnancy. At six weeks, 96% of LARC patients had their birth control method in place. LARC patients were more likely to recommend their form of birth control to a friend than non-LARC women. Conclusion: LARC placement immediately following termination of pregnancy is popular, and rates of continuation and satisfaction are high.
Project Title: Developmental Disability Training for First Responders

Thematic Area: Public Health and Epidemiology

Abstract: We wanted to evaluate current offerings of training for first responders (fire fighters, emergency medical services/EMS and police officers) in Colorado regarding developmental disabilities and autism spectrum disorders in particular. Findings of the Report of the Colorado Autism Commission in 2008 described an increased need for training of first responders when dealing with individuals with autism spectrum disorders. This was a sentiment we found mirrored by many of the local advocacy groups we contacted as well other contacts nation-wide. What we found in the front range was a few individuals offering training on a volunteer basis without any large-scale support or standardization. Unfortunately, the vast majority of the first responder communities in Colorado are operating without any training specific to developmental disabilities or autism. Police officers in Denver may participate in Crisis Intervention Training (CIT) which offers excellent training on acquired disabilities such as alcoholism, but again neglects organic disabilities such as ASD or Down's Syndrome. Across the nation there is a growing push for this type of increased education for first responders. There are also some well put together training programs in place, but again they are often sporadic offerings of individuals. Once we had established the need for this type of education in Colorado we set about to review all the available data and find which courses might be used here. Throughout this process we made numerous fruitful partnerships with advocacy groups, first responders, and educational institutions. Notably collaboration with JFK Partners, the LEADS program at the CU School of Medicine, the Autism Society of Colorado and Autism Society of Boulder County, Rutgers University, University of Colorado Hospital, New Jersey Office of Emergency Medical Services and local EMS educators provided an outstanding network of information, resources and motivated individuals to assist with the project. Through these partnerships we were able to come up with many resources both for first responders and caregivers of those with developmental disabilities. Our most notable contributions are two courses now available free of charge. The first, Autism Spectrum Disorders & EMS: The Essentials, is a short Power-Point based class to be taught in EMT classes by any instructor regardless of prior knowledge of ASD. This class was suggested by a local EMS instructor as a "class in box" and was exhaustively reviewed by EMS professionals, clinicians, advocacy groups and parents of those with autism. It has been presented both to EMT classes as well as the Colorado State EMS Conference in 2011. Thanks to support from JFK Partners it has been distributed both locally and nationally on CD and is available for download from their website. The second major deliverable is the online course, Developmental Disability Awareness Training for First Responders. This course was adapted from one the State of New Jersey requires all of its first responders to take. Again, with generous support from JFK Partners and the ASBC we were able to modify the course and house it online through the University of Colorado Hospital's EMS education network. It is good for one hour of continuing education credit for any registered EMT or Paramedic in Colorado. These resources and others are available to any interested parties through jfkpartners.org. We are working on increasing the distribution both locally and nationally through several channels. Tracking the usage of the course ASD & EMS: The Essentials has proven difficult, but we continue to work on that aspect of the project as well. It is our hope that these
resources will continue to be of use to these communities long after we have concluded our active involvement.
**Project Title:**  HUMANITIES, ADVOCACY AND PUBLIC POLICY: Vehicles to Change the Medical Landscape

**Thematic Area:** Humanities, Social Science and Education

**Abstract:** Despite tremendous advances in medical technology, treatment modalities, and preventive strategies, medicine remains a limited resource. By nature of this fact, we as a society are tasked with rationing and allocating medical services and goods. An inherent risk of this reality is the alienation of certain patient populations, especially those coming from resource-limited setting. It is the responsibility and obligation of physicians to advocate for these patient populations to ensure that they are not overlooked in this way by the medical-industrial complex. This presentation will show how through essays, editorials and legislative resolutions, physicians and students can influence the narrative of resource allocation and shape the global medical landscape. Specifically, the allocation of anti-retroviral therapy to HIV-positive mothers, ensuring food for the food-insecure, creative ways to tackle medical student debt, the treatment of prison inmates, and the creation of a global health service corps, will all be briefly presented and explored.
**Project Title:** Telemedicine in Nepal: A Needs Assessment of the Current State and Recommendations for Best Practices

**Thematic Area:** Global Health

**Abstract:** Telemedicine is an innovative approach to increase access to quality and cost-effective healthcare services in underdeveloped countries through the use of telecommunications and information technologies. The United Nations’ Millenium Development Goal 8 is to develop a global partnership for development. Target 8.F based on the 2010 Millenium Development Goals Report states: “in cooperation with the private sector, make available the benefits of new technologies, especially information and communications.” In Nepal, many different telemedicine systems (both government run and private) are currently being tested with the hope of improving access to care for the country’s immense rural populations that lack sufficient qualified healthcare providers. This study aims to assess the current state of implementation of telemedicine into a variety of central and peripheral hospitals and clinics throughout Nepal and to provide a needs assessment to make recommendations for improvements. For six weeks during June and July of 2010, student researchers from University of Colorado School of Medicine traveled to Nepal to conduct a survey and to become familiar with the daily operations and resources available in Kathmandu Model Hospital and various remote clinics. Furthermore, a permanent link was established between the University of Colorado and Kathmandu Model Hospital in hope of creating a sustainable research tool for improving telemedicine practices on an ongoing basis. The students’ survey data was then combined with data collected via the televideo link between University of Colorado and Kathmandu Model Hospital. The result was a need for establishing best practices for Kathmandu Model Hospital Telemedicine services, strategies for retaining providers, and use of telemedicine for medical education. This report includes recommendations for each of the three aforementioned needs.
**Project Title:** Telemedicine in Nepal: Its Current State and its Use as a Means of Improving Provider Retention and Medical Education

**Thematic Area:** Global Health

**Abstract:** Telemedicine is an innovative approach to increase access to quality and cost-effective healthcare services in underdeveloped countries through the use of telecommunications and information technologies. The United Nations’ Millenium Development Goal 8 is to develop a global partnership for development. Target 8.F based on the 2010 Millenium Development Goals Report states: “in cooperation with the private sector, make available the benefits of new technologies, especially information and communications.” In Nepal, many different telemedicine systems (both government run and private) are currently being tested with the hope of improving access to care for the country’s immense rural populations that lack sufficient qualified healthcare providers. This study aims to assess the current state of implementation of telemedicine into a variety of central and peripheral hospitals and clinics throughout Nepal and to provide a needs assessment to make recommendations for improvements. For six weeks during June and July of 2010, student researchers from University of Colorado School of Medicine traveled to Nepal to conduct a survey and to become familiar with the daily operations and resources available in Kathmandu Model Hospital and various remote clinics. Furthermore, a permanent link was established between the University of Colorado and Kathmandu Model Hospital in hope of creating a sustainable research tool for improving telemedicine practices on an ongoing basis. The students’ survey data was then combined with data collected via the televideo link between University of Colorado and Kathmandu Model Hospital. The result was a need for establishing best practices for Kathmandu Model Hospital Telemedicine services, strategies for retaining providers, and use of telemedicine for medical education. This report includes recommendations for each of the three aforementioned needs.
**Project Title:** Review of magnetoencephalography and an examination of test-retest reliability of the auditory evoked gamma-band response across multiple analytical techniques

**Thematic Area:** Basic Science

**Abstract:** Background: Oscillatory neuronal electrical activity in the range of 30-50 Hz (the gamma-band oscillation) has been proposed to involve feature binding or inter-regional communication within the brain and is critically dependent on inhibitory neurotransmission within the cerebral cortex. Gamma-band oscillatory power has been reported to be impaired in persons with schizophrenia and autism. Electroencephalography (EEG) technologies have repeatedly shown subjects with schizophrenia and autism to have a low gamma-band evoked power in response to auditory stimuli. This makes the measure an exciting potential tool that could be useful to other researchers, but test-retest measurements in the same group of subjects have not been fully investigated. No study looking at the measurement reliability of the gamma-band metrics have been reported. This study is a necessity before such data can be used in large-scale projects such as genetic linkage analyses or as biomarkers in clinical trials. This study assessed the consistency of the auditory evoked gamma-band response across sessions. Given the multitude of methods used to analyze the gamma-band response, gamma-band reliability from four different analytical methods were compared. Methods: Nineteen healthy and normal hearing adults screened for personal and family history of mental illness and neurological disorders were recruited. The subjects were recorded in an auditory steady state response (ASSR) paradigm while having a 64-channel EEG recording. One week later, they returned and repeated the same procedure. We compared two stimuli in the EEG run – amplitude modulated white noise and click trains, binaurally presented at 75 dB SPL. Both produce strong 40 Hz responses. Correlation between sessions was assessed following four separate analytical techniques: sensor-level with all sensors, sensor-level with peak gamma sensors, signal-space projection, and source-space projection. Results: Overall, the auditory evoked gamma-band response was significantly correlated between sessions 1 and 2, p < .05 (FDR for multiple comparison correction). The consistency of the response was qualitatively different between analytical methods. Conclusions: Between-session correlations suggest good test-retest reliability. Signal- and source-space projection appeared to be the most effective analysis methods, likely due to the high signal-to-noise ratio this method offers. This is an important finding demonstrating that measuring gamma-band response with electroencephalography is a reliable tool in healthy adults.
**Project Title:** A Pilot of Text Message Reminders for Early Childhood Immunization Recall at a Safety-Net Community Clinic

**Thematic Area:** Public Health and Epidemiology

**Abstract:** Early childhood immunizations are one of the most important healthcare interventions available today. However, many communities have immunization rates insufficient to provide herd immunity. The Montbello Family Health Center has lower early childhood immunization rates compared to other Denver Health clinics. A quality improvement study utilizing text messages to remind the parents of children late on these vaccine series to make an appointment was designed. Between November 2012 and January 2013, a monthly text message reminder was sent to all families with children who were late on the vaccine series with a cell phone listed in the electronic health record. The primary outcome was the overall immunization rate of the clinic, which was calculated on January 1, 2013. The one-year-old immunization rate decreased from 81% in October 2012 to 79% while the two-year-old rate increased from 77% to 78%. These rates suggest the intervention did not have a significant effect. However, the text message intervention group, when compared to families that listed a landline as a contact number, was more likely to receive an immunization in the following month. Further study will elucidate the role of text messages for immunization recall in this community.
Project Title: Targeted Focal Therapy Used in Conjunction with Three-Dimensional Mapping Biopsies in the Treatment of Low-Risk Prostate Cancer: a 5-Year Study.

Thematic Area: Clinical Science

Abstract: Prostate cancer is the second most prevalent cancer among men. This has largely resulted from the use of prostate-specific antigen (PSA) serum test as a screening test for the disease. As diagnosis continues to increase, though, mortality rates no longer decline. Many men, however, routinely opt for aggressive treatment. These men are thus burdened with side effects of these treatments, notably sexual dysfunction and urinary incontinence, without benefit. Our study sought to use a less invasive treatment, targeted focal therapy, in conjunction with a three-dimensional mapping biopsy procedure. We hope to provide a treatment alternative to men with low-risk disease without the side effects seen with the more aggressive modalities. The primary outcome in this study was a follow-up biopsy at one year. Secondary outcomes include: serial PSA measurements to assess biochemical failure, as well as quantified assessments of sexual function and urinary continence. We are currently in the process of compiling data from this 5-year study that should be analyzed within the next few months.
Project Title: Psychosocial Mediators to Physical Activity During the Perinatal Period: A Review of the Literature

Thematic Area: Public Health and Epidemiology

Abstract: Background: Prenatal physical activity is associated with numerous maternal and child health outcomes. Unfortunately more than half of US women fail to engage in regular exercise during pregnancy. Thus there is a clear need for effective intervention strategies aimed at increasing physical activity among pregnant women. In order to meet this need, the present study provides a systematic review of prospective and intervention studies to identify potential mediators of physical activity during pregnancy. Methods: A systematic review was conducted searching PubMed, MEDLINE, CINAHL, and PsychINFO for prospective studies published from 1995 through 2012 that examined potential mediators to physical activity as well as any intervention studies that sought to increase physical activity levels during pregnancy. Eleven prospective studies that examined potential mediators to physical activity and 3 intervention studies that aimed to increase physical activity during pregnancy were selected that met the inclusion criteria of this review. Articles were reviewed and discussed according to the population, study design, mediators examined (e.g. beliefs pertaining to perceived benefits, barriers, severity and self-efficacy as well as social support, behavioral skills, subjective norms, and behavioral intention), measured outcomes, results, and conclusions of the studies. Results: The review identified several significant mediators of perinatal physical activity such as beliefs (e.g. perceived benefits, barriers, severity and self-efficacy toward physical activity), attitudes, social support, and perceived stress, among others. Conclusions: This review highlights psychosocial mediators that show promise in influencing physical activity behavior. Given that there are very few intervention studies that target these psychosocial mediators more research is warranted in this area.
**Project Title:** Genetics of Idiopathic Scoliosis: Investigating SFI1 in Cohort of Adolescent Males with Severe Curvatures

**Thematic Area:** Basic Science

**Abstract:** Purpose of Study: Idiopathic Scoliosis (IS) is a structural lateral curvature of the spine ≥10 degrees that occurs in 2-3% of individuals of which approximately 10% require active treatment. Genetic studies suggest that IS is a complex genetic disorder, with multiple genes and genetic variations contributing to its expression. Genomic screening and subsequent fine mapping has resulted in significant association between a subgroup of families characterized by a male having a ≥30 degree curvature and an area on chromosome 22 inclusive of the SFI1, SF3A1 and LARGE genes. The goal of this study is to examine further this association through sequencing analysis of the SFI1 gene within this subpopulation. Methods Used: DNA was extracted from blood samples of families with two or more individuals affected by IS (202 families: 1198 individuals). A subgroup of trios comprised of parents, regardless of curvature status, and affected son(s) (18 families, 56 individuals) with curvatures ≥30 degrees were identified for sequencing. Curvature status of parents and son(s) was confirmed by X-ray and noted for analysis. Primers were designed using Primer Express® software to amplify and sequence the 32 coding exons, 1 noncoding exon, and 1 intron containing previously statistically significant SNP of SFI1. Standard Sanger sequencing methods were used with read lengths of ~900 nucleotides. Summary of Results: PCR products of 27 of the 34 regions were successfully amplified with 60-98% of those samples yielding quality sequence data. Amplifications of 7 of the 34 regions are still in progress with follow-up troubleshooting of samples which did not successfully amplify after initial attempts. Preliminary analysis to date of the quality sequencing data has not identified any polymorphisms as significantly segregating with the disease phenotype, however analysis remains ongoing. Conclusions: The current work is an extension of previous data indicating a significant association between the SFI1 gene and a phenotypic subset of families with IS. Although preliminary analysis does not identify polymorphisms segregating with the disease phenotype in 27 of the 34 regions of interest, the use of previously unavailable technology may be necessary to locate a specific etiology in the vast region of interest identified during fine mapping. The continued use of clinical criteria to further characterize the scoliosis phenotype may aid in decreasing the heterogeneity of any one large study population, and enhance the successful identification of specific genes responsible for this disorder. The identification of a genetic locus is of major clinical and therapeutic interest and may allow for a deeper understanding of spinal growth and stability.
Project Title: Characterization of 5 Genes Implicated in the Establishment of C.elegans Eggshell Permeability: Biochemistry Tools

Thematic Area: Basic Science

Abstract: The impermeability of the metazoan embryo egg shell is an important barrier in fighting the spread of parasitic infections. While an adult worm can be targeted by drugs, the egg shell protects worm embryos from most harmful substances. Following fertilization of an embryo, a trilaminar structure forms around the worm that later becomes part of the egg shell while permeability barrier is established separately. Understanding the structure and function of the proteins involved in establishing this permeability barrier can lead to the discovery of effective anti-parasitic drugs. The scope of my project involves the characterization of five newly identified proteins hypothesized to function in establishing the structural integrity and impermeability of the C.elegans embryo egg shell. Preliminary data showed increased permeability to dye upon depletion of these proteins by RNAi. Bioinformatics tool was used to identify potential functional domains of each protein. Constructs containing domains of interest were cloned into 6-His tag commercial E.coli vectors and used to prepare 200 amino acid fragments which were subsequently purified on Nickel resin. These proteins were used to create a polyclonal antibody which can be used in immunofluorescence and light microscopy for determination of localization during formation of the egg shell and the role in establishment of the permeability barrier.
Project Title: Pulmonary Fibrosis is Associated with an Elevated Risk of Thromboembolic Disease

Thematic Area: Public Health and Epidemiology

Abstract: Recent epidemiological studies have suggested an increased risk of venous thromboembolism (VTE) in lung fibrosis. Large-scale epidemiological data regarding the risk of VTE in pulmonary fibrosis-associated mortality have not been published. Using data from the National Center for Health Statistics from 1988–2007, we determined the risk of VTE in decedents with pulmonary fibrosis in the USA. We analysed 46,450,489 records, of which 218,991 met our criteria for idiopathic pulmonary fibrosis. Among these, 3,815 (1.74%) records also contained a diagnostic code for VTE. The risk of VTE in pulmonary fibrosis decedents was 34% higher than in the background population, and 44% and 54% greater than among decedents with chronic obstructive pulmonary disease and lung cancer, respectively. Those with VTE and pulmonary fibrosis died at a younger age than those with pulmonary fibrosis alone (females: 74.3 versus 77.4 yrs (p<0.0001); males: 72.0 versus 74.4 yrs (p<0.0001)). Decedents with pulmonary fibrosis had a significantly greater risk of VTE. Those with VTE and pulmonary fibrosis died at a younger age than those with pulmonary fibrosis alone. These data suggest a link between a pro-fibrotic and a pro-coagulant state.
Project Title: Refugee Health curriculum

Thematic Area: Humanities, Social Science and Education

Abstract: Course Description: World disasters, conflicts and persecutions have resulted in a growing refugee population worldwide. According to the Colorado Department of Human Services, the U.S. admitted 80,000 refugees in 2011, 2534 of which were anticipated to resettle in Colorado. In 2008, Florida received the largest number of arrivals, followed by California, Texas, New York, Michigan, and Arizona. Future medical professionals will need to be trained to provide culturally effective care to this population. This curriculum is designed to introduce medical and other health professions students to the common medical, dental, and psychosocial issues faced by refugees in the United States. Each of the eight topics is presented in a one-hour session, in either a lecture or a panel presentation format. At the University of Colorado School of Medicine, this elective was originally offered to first- and second-year medical students. However, all health professions students would benefit in some way from the topics presented. Speakers were recruited from local clinics, resettlement agencies, and refugee populations to present their respective topics. Each had a presentation or case from their personal experience with refugees; the panelists discussed their work and obstacles in providing optimal care. The refugees themselves described their backgrounds to the extent they felt comfortable with, and relayed their experiences with healthcare in the US.
**Project Title:** Posterior Sternoclavicular Joint Injuries in the Adolescent Population: A Systematic Review and Case Series

**Thematic Area:** Clinical Science

**Abstract:**

Abstract: Posterior Sternoclavicular Joint Injuries in the Adolescent Population: A Systematic Review  
Purpose: Posterior sternoclavicular injuries are very rare and may be associated with life-threatening complications. The ideal management of sternoclavicular injuries in adolescents as well as the optimal method of stabilization has not been well-described.  
Methods: A thorough review of the English literature was performed in order to identify all cases of posterior sternoclavicular dislocations in patients 12-18 years of age. Subject-level data for 117 patients was extracted from 67 case reports/series.  
Results: The mean age of patients was 15.28 years, the majority male (85.47%) and having sustained the injury during participation in athletics (78.63%). Dysphagia and dyspnea were often associated (24.79% and 16.24%, respectively). A total of 45 patients (38.5%) underwent closed treatment only, 38 (32.5%) open treatment alone, and 32 (27.4%) closed then open treatment. 60% of closed reductions performed within 48 hours were successful, compared to 40% of those performed >48 hours post-injury. Treatment complications occurred in 1.7% of patients. 86.21% treated with closed reduction regained full function without recurrence, as compared to 92.19% of patients treated operatively.  
Conclusions: Closed reduction alone, open reduction without previous attempt at closed reduction, and closed then open reduction are all commonly reported types of treatment for posterior sternoclavicular joint dislocation. Complications of treatment are potentially life-threatening but very rare. Although availability of follow-up data varies considerably, both closed and open treatment methods have been shown to provide excellent results.  

PLEASE NOTE BELOW IS ABSTRACT FOR CASE SERIES, SUBMITTED FOR PUBLICATION.  

Abstract: Posterior Sternoclavicular Joint Injuries in the Adolescent Population: A Case Series  
The management of sternoclavicular injuries in adolescents has not been well-described. The purpose of this study is to describe our institution’s experience treating this rare and potentially life-threatening injury. This is a retrospective study of all individuals affected by an isolated posterior dislocation or physeal fracture at our institution between 2003-2011. Initially, all adolescent patients who underwent treatment for a medial clavicular physeal fracture or sternoclavicular dislocation between 2003 and 2011 were identified with ICD-9 diagnostic codes. Sternoclavicular injuries with posterior displacement were then isolated from this cohort for thorough chart review, and subjects were contacted for purpose of completing a brief phone survey and shoulder specific outcome instruments. A total of 12 male subjects (mean age 14.8 +/- 2.74) were included in the study. The incidence of significant associated symptoms was 8.3% (1/12). Eight subjects were initially treated with closed reduction, two of which were successful (25%) and six of which required subsequent open reduction (75%). Four of the twelve subjects underwent an immediate open reduction. Braided composite sutures were used to treat all injuries that underwent open reduction (10/12). Six subjects, all of whose injuries had been treated with open reduction, completed the phone survey and shoulder instruments. All six had returned to full activity level and all self-reported perfect QuickDASH and Simple Shoulder Test scores (0 and 12, respectively). Among adolescents, medial clavicular physeal fracture and sternoclavicular dislocations can be effectively managed with closed or open reduction.
When closed reduction is unsuccessful or is contraindicated, open reduction with braided composite sutures is associated with excellent long-term results.
Project Title: Eosinophilic meningitis in a child with recent travel to Kauai, Hawaii

Thematic Area: Clinical Science

Abstract: Angiostrongylus cantonensis is the leading cause of eosinophilic meningitis worldwide. We present a case of eosinophilic meningitis caused by A. cantonensis in a 14 year old boy presenting to the Children’s Hospital Colorado with recent travel to Kauai, Hawaii. This case is the first reported that utilized a novel diagnostic polymerase chain reaction (PCR) developed at the Centers for Disease Control & Prevention to confirm the diagnosis. This case advocates for an increased awareness of A. cantonensis in pediatric patients, highlights the need for more research into appropriate treatment modalities, and encourages the development of more readily available diagnostic tools.
**Project Title:** Cardiac crossroads: deciding between mechanical or bioprosthetic heart valve replacement

**Thematic Area:** Clinical Science

**Abstract:** Nearly 15 million people in the United States suffer from either aortic or mitral valvular disease. For patients with severe and symptomatic valvular heart disease, valve replacement surgery improves morbidity and mortality outcomes. In 2009, 90,000 valve replacement surgeries were performed in the United States. This review evaluates the advantages and disadvantages of mechanical and bioprosthetic prosthetic heart valves as well as the factors for consideration in deciding the appropriate valve type for an individual patient. Although many caveats exist, the general recommendation is for patients younger than 60 to 65 years to receive mechanical valves due to the valve’s longer durability and for patients older than 60 to 65 years to receive a bioprosthetic valve to avoid complications with anticoagulants. Situations that warrant special consideration include patient co-morbidities, the need for anticoagulation, and the potential for pregnancy. Once these characteristics have been considered, patients’ values, anxieties, and expectations for their lifestyle and quality of life should be incorporated into final valve selection. Decision aids can be useful in integrating preferences in the valve decision. Finally, future directions in valve technology, anticoagulation, and medical decision-making are discussed.
Project Title: Autism and Developmental Disability Interaction Training for First Responders

Thematic Area: Public Health and Epidemiology

Abstract: The goal of this project was to improve the training of first responders (firefighters, police officers, EMTs and paramedics) for their interactions with people who have developmental disabilities (autism, Down’s syndrome, cerebral palsy and other diseases that affect the normal function of a body system). This project started with an assessment of the training available to first responders that addresses their interactions with people who have developmental disabilities. This showed a limited number of resources available in Colorado and it was determined that there was a need for further training. The next step in our process was to create educational resources to help fill this gap. The cornerstone of these resources is an online continuing education program that has been certified for one-hour of continuing education credit for all EMTs and paramedics in the state of Colorado. We also created a 20-minute “course in an box” that focuses on interactions with people who have autism; this training is designed for EMT-basic courses. To help families prepare for interactions with first responders, we created a resource list that includes information on personal identification products, how to contact first responders before there is a problem and optional tracking devices for family members who wander. Finally, we have developed a “quick tips” card that first responders can carry with them to remind them of the main points of the online and EMT-basic training. After the training programs were developed the focus of the project turned to implementing the training. We have initiated conversations with the Denver Fire Department (including the Chief of the department), the Denver Police Department, the Aurora Police Department, the Denver Health Paramedic Division and the University of Wisconsin Emergency Medicine Residency to implement the training in their programs. In a continued attempt to disseminate the training to a wide audience we engaged the Colorado Governor’s Office. With the help of Lorez Meinhold, Governor Hickenlooper’s deputy policy director, we were able to build a relationship with the Colorado Department of Public Health and Environment (CDPHE). As a result of conversations with the CDPHE, we are in the process of developing contacts with continuing education coordinators at community colleges, paramedic training centers and crisis intervention training programs across the Denver metropolitan area. We will have more opportunities to teach and promote the training in the spring of 2013. Along with fellow medical student Chris Rogers, I gave a presentation about the training program at the 2011 Colorado State EMS Conference. Approximately 50 EMS professionals attended this presentation. We believe that it could be useful to present the training again at a future Colorado State EMS Conference. We have gathered post-course survey data that indicates the online training program can have a positive impact on first responders’ ability to identify someone with a developmental disability and to optimize their field interactions with this population. We have two main goals at this point of the project. The first is to increase the number of first responders who take the training. We are actively working to continue to build relationships in the community to meet this goal. Our second goal is to continue to expand our data on whether our training modalities are effective in preparing first responders for these interactions.
**Project Title:** Efficacy of Shared Medical Visits on Management of Type II Diabetes Mellitus in Underserved Populations

**Thematic Area:** Public Health and Epidemiology

**Abstract:** Context: Type II Diabetes Mellitus is becoming a rapidly spreading epidemic, disproportionally affecting certain racial and ethnic groups and persons from disadvantaged backgrounds. Shared medical visits have been shown to be beneficial for the management of chronic diseases, such as diabetes. More information is needed regarding the effects of group visit models on the populations most affected by this health disparity. Purpose: This study aims to examine the effectiveness of Shared Medical Visits in disadvantaged and medically underserved populations to improve the health, knowledge, and self-management of patients with Type II Diabetes Mellitus. Methods: Chart Review of 47 English and Spanish speaking patients with Type II Diabetes Mellitus whom participate in the Shared Medical Visits at Inner City Health Clinic. Participants were ethnically diverse with majority being Hispanic/Latino. Primary laboratory outcomes measured include HbA1c, weight, and blood pressure. Non-laboratory outcomes, assessed through a questionnaire, include diabetes knowledge, perception of one’s ability to control their diabetes, and self-management behaviors. Results: Statistical analysis of changes in HbA1c and weight in SMV participants showed small improvements, although not statistically significant. 54% of patients had BP
Project Title: Multiple Autoimmune Disorders in Children with Type 1 Diabetes

Thematic Area: Clinical Science

Abstract: OBJECTIVE: We sought to define the prevalence of nonislet, organ-specific autoantibodies at diagnosis of type 1 diabetes and to determine the prevalence of comorbid autoimmune diseases. RESEARCH DESIGN AND METHODS: Children (n = 491) diagnosed with type 1 diabetes at the Barbara Davis Center for Childhood Diabetes were screened for autoimmune thyroid disease (thyroid peroxidase autoantibodies [TPOAb]), celiac disease (tissue transglutaminase autoantibodies [TTGAb]), and Addison disease (21-hydroxylase autoantibodies [21OHAb]). RESULTS: Of the 491 children, 161 had at least one nonislet autoantibody, and of these, 122 (24.8%) were positive for TPOAb, and 15 of the 122 (12.3%) had autoimmune thyroid disease. There were 57 (11.6%) who were positive for TTGAb, of whom 14 (24.6%) had celiac disease. Five (1.0%) were positive for 21OHAb, of whom one had Addison disease. CONCLUSIONS: Many autoantibody-positive subjects present with additional autoimmune disorders. Detection of these autoantibodies at type 1 diabetes onset may prevent complications associated with delayed diagnosis of these disorders.
Project Title: I Need a Refill, Doc: Challenges Facing Primary Care Physicians Prescribing Chronic Opioids

Thematic Area: Clinical Science

Abstract: Prescription opioids have become more prevalent as a treatment option for chronic pain but are complicated by the potential for addiction and misuse. A 66 year old man gentleman with no history of substance abuse has been treated for chronic low back pain with opioid therapy for 6 years. For the past two years his opioid dose has increased and he has admitted to self-increasing his dose to manage his pain. Recently he has exhibited behaviors that may suggest opioid addiction. This case is presented to highlight the difficulty in screening for and diagnosing opioid addiction in patients using chronic opioid treatment for chronic pain. This paper will also emphasize the minimal research into patient-centered care for chronic pain with opioid treatment and how further research may assist treating patients on chronic opioids.
**Project Title:** Convective Ablation of Intratumoral Regulatory T Cells Restores Cellular Immunity and Promotes Tumor Clearance in Murine Glioma

**Thematic Area:** Clinical Science

**Abstract:** Introduction: A hallmark of glioblastoma (GBM) is subversion of the cellular immune response, a process partially mediated by tumor-infiltrating regulatory T cells (Tregs). Though Tregs are susceptible to therapeutic targeting by anti-CD25 antibodies, the limited permeability of the blood-brain barrier to antibodies presents a challenge for this approach. We hypothesized that intracranial convection-enhanced delivery (CED) of anti-CD25 monoclonal antibody would improve local antibody delivery and augment the efficacy of this immunotherapeutic strategy in an animal model of GBM. Methods: Mice underwent intracranial injection of a PDGF-expressing retrovirus and were treated on day 14 following tumor induction with single-bolus or continuous delivery (via osmotic minipump) of anti-CD25 antibody, delivered either systemically (by intraperitoneal injection) or intracranially. Subsets of animals were sacrificed at pre-determined time points for analysis of intratumoral T cell infiltrates and peripheral cellular immune function. Survival was evaluated in additional cohorts of animals to compare the relative clinical benefit of each treatment strategy. Results: We found that CED of anti-CD25 directed intratumoral lymphocyte populations toward a pattern canonically associated with immune tumor clearance. Intratumoral Tregs were significantly lower after two weeks of treatment (0.11±0.08% of CD4+ T cells) when compared to controls (33.17±1.71% of CD4+ T cells; p
Project Title: The Implementation of Positive Deviance Model/Hearth in Cap-Haitien with Identified Endemic Malnutrition

Thematic Area: Global Health

Abstract: Childhood malnutrition is a significant problem in Haiti, severe malnutrition being as high as 2.5% in some urban areas. Global health researchers and workers are recognizing more and more that sustainable projects are the key to long-term improvement in health determinants in the poorest countries. With this in mind we set out to develop a Positive Deviance/Hearth model in Cap-Haitien, Haiti to help address under-five malnutrition in the area. The Positive Deviance theory screens a community to identify families who struggle with malnutrition and those mothers in the same with children at a healthy weight. These latter mothers are termed positive deviants. An inquiry is made into their practices and these findings are taught as lessons, along with other nutrition and hygiene information in hearth sessions, or daily communally prepared meals composed of the mothers with malnourished children. The following is an anecdotal description of our efforts in establishing a Positive Deviance/Hearth model and some of the challenges we faced doing so.
Project Title: Incidence and descriptive analysis of congenital heart disease in parturients – Obstetric and anesthetic outcomes

Thematic Area: Clinical Science

Abstract: INCIDENCE and DESCRIPTIVE ANALYSIS OF CONGENITAL HEART DISEASE IN PARTURIENTS - ANESTHETIC and OBSTETRIC OUTCOMES C Warrick MS3, J Hart MSPH, A Lynch MD MSPH, JL Hawkins MD, BA Bucklin MD Departments of Anesthesiology and Obstetrics and Gynecology, University of Colorado School of Medicine, Aurora, CO Objective: Congenital heart disease (CHD) is a major cause of heart disease in pregnant women in the U.S. Cardiovascular changes of pregnancy place these women at risk for maternal and fetal complications during labor and delivery. In addition, cardiac disease is a leading reason for intensive care unit (ICU) admission and maternal death. This study describes anesthetic management, complications, and obstetric outcomes in a cohort of women with CHD. Study Design: Patients with CHD who delivered between October 2005 and October 2012, were identified from a large perinatal database (n=18,226) based on history of cardiac disease, pulmonary disease, or subacute bacterial endocarditis (SBE) prophylaxis given during labor (n=857). From this population, each parturient’s medical record underwent screening for CHD based on echocardiogram results. Comprehensive retrospective review of anesthetic, obstetric, and neonatal outcomes was also performed. Results: 117 women had CHD (0.6% of 18,226). Women with CHD were predominantly younger (mean age = 26.6 years). The majority were non-Hispanic whites (61%), Hispanic whites (28%), and nulliparous (53%). Most were non-smokers (90%) and 37% were overweight (18%) or obese (19%). Table 1 describes the subsets of CHD from this cohort as well as anesthetic, obstetric, and neonatal outcomes. There were 3 maternal ICU admissions solely and one case of maternal mortality. There were 17 operative vaginal deliveries in the CHD cohort. There were also 30 NICU admissions among the CHD group. Conclusions: Cesarean delivery was more common in patients with CHD (28%) compared to our institutions’ overall rate (26%). Operative vaginal deliveries were significantly higher in CHD patients (15%) compared to overall (4%). NICU admissions were also significantly more common, 26% compared to 14%. Most patients received regional anesthesia for cesarean delivery and vaginal labor. Although most had a prolonged hospital stay, ICU admissions were rare. Pregnant women with CHD may undergo labor and delivery with few complications but have prolonged hospital stays, babies with more NICU admissions and more invasive deliveries.
Project Title: Design and Pilot Testing of a Novel Curriculum on Contemporary Slavery and Human Trafficking for Denver Area Schools

Thematic Area: Global Health

Abstract: This paper outlines the design and pilot testing of a novel curriculum on contemporary slavery and human trafficking. Though illegal in every country, human slavery and the closely associated crime of human trafficking is a growing problem, and now ranks among the most profitable and widespread criminal enterprises worldwide. Contrary to popular assumptions, both forced labor and sexual forms of slavery are common within the United States, and young people, especially adolescent women, are at risk of victimization through commercial sexual exploitation. Currently, the Denver public school system does not have in place any established curriculum to educate young people about modern slavery and human trafficking. Existing curriculum used elsewhere varies in duration and scope, and in focusing preferentially on either prevention of future exploitation, or promotion of awareness and advocacy as primary endpoints. After considering these approaches, a brief, modular, introductory curriculum was designed with the purposes of promoting awareness and raising advocacy around this issue, and of laying basic groundwork for future preventative education. Pilot testing was initiating in partnership with a Denver area high school, and final evaluation results are pending. Early feedback suggests that the curriculum serves well as a first step in raising student awareness, but would benefit from revision and expansion with additional small group activities and projects, and a focus on classroom discussion. This information and the results of pilot testing surveys and objective exams will be used to modify the curriculum before it is submitted as a resource to the Denver School Board to be made available on a wider basis.
Project Title: An analysis tool for correlating gene expression patterns in microarrays

Thematic Area: Basic Science

Abstract: A software tool was developed to correlate gene expression values discovered by microarray chips. These correlations were then compared across multiple cell lines and compared with outliers removed. The resultant highly-correlated genes are likely involved together in whatever processes, pathologic or otherwise, is currently being investigated.
Project Title: METABOLIC CHARACTERIZATION OF UNFOLDED PROTEIN RESPONSE BRAIN TUMOR CELLS: IMPLICATION FOR THE SECRETOME

Thematic Area: Basic Science

Abstract: The unfolded protein response (UPR) is an endoplasmic reticulum (ER)-based cytoprotective mechanism activated in response to misfolded proteins. This stress response is frequently active in tumors and has been implicated in the highly invasive nature of certain tumor types, possibly by influencing cell metabolism and the secretome. Additionally, brain tumor-derived exosomes are believed to affect the microenvironment and neighboring cells’ metabolic activity in order to manipulate their surroundings. We wondered what effect UPR activation has on glioma cell metabolism and if exosomes are capable of independently altering tumor cell metabolism. To investigate this, we used human glioblastoma cell line U87 grown in C13 glucose and subsequently treated with dithiothreitol (DTT) to induce the UPR. The metabolic profile of these cells was then analyzed using nuclear magnetic resonance. We also probed cells treated with exosomes—naïve and UPR induced—for key enzymes of glucose and lipid metabolic pathways using western blotting techniques. The resultant data demonstrated an increase in both glycolytic and lipid synthesis pathways with a proportionately larger increase in the latter. These findings suggest that during periods of cell stress, tumor cells increase overall energy metabolism and possibly divert much of this excess energy into lipid synthesis pathways in a cumulative effort to increase a lipid mediated stress response. We hypothesize that the function of this cellular response is to synthesize exosomes that will ultimately influence the tumor microenvironment. The metabolomic profile of stressed tumor cells and their potential ability to transmit the metabolic response via exosomes could be valuable in understanding tumorigenesis and possibly uncovering targets for new therapies and biomarkers.
Project Title: Smoking Legislation and Cardiovascular Mortality

Thematic Area: Public Health and Epidemiology

Abstract: Smoking legislation has the potential for rapid and long-lasting public health improvements. Despite the well-known ill-effects of smoking, 19.8% of adults in the United States are active smokers. Smoking bans have been shown to decrease both active and passive smoking. Several studies of municipal smoking bans have demonstrated impressive decreases in cardiovascular mortality after smoking ban enactment, including a meta-analysis of 16 studies that demonstrated a 19% decrease in acute myocardial infarction following smoking ban enactment. These large reductions in cardiovascular mortality following smoking ban enactment are encouraging, but definitive confirmatory research encompassing all 851 municipal, county, and state smoking bans has yet to be published. The authors utilized a database of all 851 municipal, county, and state smoking bans from the American Nonsmokers' Rights Foundation and the CDC mortality dataset to assess cardiovascular mortality one year before and after enactment of a smoking ban compared to a control group during the same time period. The results are not yet available.
**Project Title:** “Addressing Occupational and Environmental Health and Safety Issues Relevant to Rural Medical Providers,”

**Thematic Area:** Public Health and Epidemiology

**Abstract:** Rural primary care providers often serve as the occupational and environmental health specialist for their community. Recognizing and managing work-related injuries requires training. Unfortunately, a majority of currently practicing Colorado primary care providers report their medical school and residency educations to be inadequate in the area of occupational health. The purpose of this project is to develop a systematic elective educational experience addressing this disparity using lectures, small-group case-based discussions, field trips, and an online message board to engage students in active learning. The curriculum changes are being made with collaboration between the University of Colorado School of Medicine Rural Track and the University of Colorado School of Public Health. This project is initiating annual student assessments with a planned review of the data at 2 and 4 years to assess the effectiveness of the intervention.
**Project Title:** EGFR tyrosine kinase inhibitor response in NSCLC

**Thematic Area:** Clinical Science

**Abstract:** INTRODUCTION: Epidermal growth factor receptor (EGFR) protein expression in non-small cell lung cancer (NSCLC) is not recommended for predicting response to EGFR tyrosine kinase inhibitors (TKI) due to conflicting results, all using antibodies detecting EGFR external domain (ED). We tested the predictive value of EGFR protein expression for response to an EGFR TKI with an antibody that detects the intracellular domain (ID) and compared fluorescence-based Automated QUantitative Analysis (AQUA) technology to immunohistochemistry (IHC).  

**METHODS:** Specimens from 98 gefitinib-treated NSCLC Japanese patients were evaluated by IHC (n = 98 of 98) and AQUA technology (n = 70 of 98). EGFR ID (5B7)- and ED-specific antibodies (3C6 and 31G7) were compared.  

**RESULTS:** EGFR expression evaluated with 5B7 was significantly higher in responders versus nonresponders to gefitinib both with IHC and with AQUA. ED-specific antibodies did not significantly predict response. Using AQUA and ID-specific antibody resulted in the best prediction performance with a positive and negative predictive value (PPV/NPV) for responders of 50% and 87%, respectively. EGFR expression with ID-specific antibody and AQUA also predicted responders in EGFR-mutated patients. Increased EGFR expression with the ID antibody is associated with increased median progression free survival (PFS; 11.7 months vs. 5.0, log rank, P = 0.034) and overall survival (OS; 38.6 vs. 14.9, P = 0.040) from gefitinib therapy.  

**CONCLUSIONS:** EGFR protein expression using an ID-specific antibody specifically predicts response to gefitinib in NSCLC patients, including in EGFR-mutated patients, and increased PFS/OS from gefitinib. These data suggest that the choice of diagnostic antibody and methodology matters to predict response and outcome to specific therapies. The potential clinical application needs further validation. Clin Cancer Res; 17(24); 7796-807.