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## Early Prediction of Trauma Patient Discharge Disposition

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# PROCEEDINGS

**Wright State University  
Boonshoft School of Medicine  
Fifth Annual Medical Student Research  
Symposium**

*Celebrating Medical Student Scholarship*

**April 4, 2013  
Gandhi Medical Education Center  
White Hall  
5:45 – 8:00 PM**



Boonshoft  
School of Medicine  
WRIGHT STATE UNIVERSITY

*Symposium Director:* Adam Deardorff  
*Assistant Symposium Directors:* Kevin Bree, Ahmed Hawash, Bijan Salari, Jacob Vincent  
*Proceedings Editor:* Adam Deardorff  
*Proceedings Assistant Editors:* Kevin Bree, Bijan Salari

## RESEARCH LEARNING COMMUNITY

The Fifth Annual Medical Student Research Symposium culminates another productive year of academic programming sponsored by the Research Learning Community at Wright State University Boonshoft School of Medicine. The Research Learning Community was developed by the Medical Student Research Club and the BSoM Office of Research Affairs to promote research-related educational opportunities for WSU medical students. Programs supported by the Research Learning Community include the Medical Student Research Club, Medical Student Journal Club, Research Learning Community Lecture Series, and research electives for M1 and M2 students (SMD 616 and SMD 617).

Research Learning Community Home Page  
[med.wright.edu/ra/rlc](http://med.wright.edu/ra/rlc)

Proceedings, 2012 Medical Student Research Symposium  
<http://core.libraries.wright.edu/handle/2374.WSU/6320>

Proceedings, 2011 Medical Student Research Symposium  
[core.libraries.wright.edu/handle/2374.WSU/5259](http://core.libraries.wright.edu/handle/2374.WSU/5259)

Proceedings, 2010 Medical Student Research Symposium  
[core.libraries.wright.edu/handle/2374.WSU/5257](http://core.libraries.wright.edu/handle/2374.WSU/5257)



## 2013 DISTINGUISHED SCHOLAR AWARDS

The Annual Distinguished Scholar Award is presented to the fourth year student or students who have demonstrated a continued commitment to medical scholarship. Distinguished Scholars are recognized for generating a significant body of scholarly work, for working collaboratively with students and faculty, for demonstrating leadership in the Research Learning Community, and for advancing student research at the Boonshoft School of Medicine. The Medical Student Research Club is proud to announce the 2013 BSOM Distinguished Scholar Award recipients:



*Left to right: Jennifer L. Rammel, M.P.H., M4; Colleen M. McCormick, M4; Nathan M. Weir, Ph.D., M4; Lakshman Swamy, M4*

**COLLEEN M. MCCORMICK** is an MD/MPH candidate in the Wright State University Boonshoft School of Medicine Physician Leadership Development Program with certification in leadership and global health. Her culminating experience project, *Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis (Tdap) Vaccination and Influenza Vaccination of Pregnant and Postpartum Women* investigates pertussis and influenza vaccination rates as well as barriers to Tdap and influenza vaccination for pregnant and postpartum women and has led to the creation of a new standing order protocol at Miami Valley Hospital. She is also actively involved in several quality improvement, clinical, medical education, and practice-based research projects, including studying incidence of foot ulceration and lower extremity amputations in patients with co-morbid diabetes mellitus and hepatitis C, improving palliative care utilization in the medical ICU, assessing medical student perceptions of clinical quality and safety, and analyzing the effects of specific curricular interventions on medical student empathy and self-reflection. She has manuscripts in review at several peer-reviewed journals, has presented at numerous national and regional conferences, and has been an active participant in the Research Learning Community. In addition to her scientific work, Ms. McCormick is highly involved in the American Association of Medical Colleges and the Institute for Healthcare Improvement. She is a member of the American Academy of Pediatrics, the American Medical Association, the American Medical Student Association, Alpha Omega Alpha, Phi Rho Sigma and Gold Humanism Honor Society. She has served as a student representative to various academic committees including the BSoM Cultural Competence Committee, PLDP Curriculum Rebuilding Committee, Wright Curriculum Task Force, BSoM Faculty Curriculum Committee, and B1/B2 Subcommittees. She has also participated in several community outreach and volunteer programs, including providing patient care at Reach Out Montgomery County as well as rural clinics in Honduras and Bolivia and organizing a BMI/nutrition booth at the Dayton Children's Health Festival. In 2012, she received an American Medical Association Foundation Physicians of Tomorrow Award for her significant accomplishments in academics and community service. Ms. McCormick will soon enter residency training in Pediatrics at Northwestern University in Chicago, Illinois.

**JENNIFER L. RAMMEL** is an MD candidate at the Wright State University Boonshoft School of Medicine. In 2009, she completed her MPH at Wright State University with a focus in health promotion and education. She has produced a substantial body of research on health literacy and barriers to self-efficacy in achieving positive health outcomes, including examining the relationship between online health-seeking behavior and health anxiety among college students, identifying health literacy barriers to inpatient pediatric care, and the use of technology to improve adherence of adolescents with childhood-onset systemic lupus erythematosus. She has extensively investigated barriers to care for inner city asthmatic children and is actively involved in several projects examining disease control barriers in children suffering from pediatric allergic rhinitis, with a focus on parental health literacy, parental self-efficacy, and parental socioeconomic status. Ms. Rammel has a scientific publication in a peer-reviewed journal, has presented her work at numerous national and regional conferences, and, in 2011, received a trainee abstract award at a regional Academic Pediatric Association meeting. She has served as a clinical research coordinator and both Dayton and Cincinnati children's hospital and has been a continued and active participant in the Research Learning Community, where she has presented her research orally in the Research Learning Community Seminar on "Health Disparities in Pediatrics" as well as presenting abstracts at several Medical Student Research Symposia. In addition to her scientific work, Ms. Rammel has participated in community outreach and volunteer programs, including providing patient care at Reach Out Montgomery County. She is a member of the American Academy of Pediatrics and will soon enter residency training in Pediatrics at University of Florida in Jacksonville, Florida.

**LAKSHMAN SWAMY** is an MD/MBA candidate in the Wright State University Boonshoft School of Medicine Physician Leadership Development Program. In 2012, he studied healthcare safety and quality improvement at the Center for Clinical Excellence Brigham & Women's Hospital in Boston, MA where he worked on several research projects, including a multidisciplinary committee on heparin safety, the creation of an outcomes driven value dashboard for heart failure treatment, and the use of time derived activity based costing to define value and reduce expenditures in rotator cuff repair. He has also studied the cost reducing effects of instituting in-house TEM-PCR technology for the rapid identification of patients requiring isolation precautions and the avoidance of unnecessary precautionary isolation at the Kettering Health Network. He is actively involved in researching the attitudes and skills of medical students in addressing issues of patient safety and quality in various clinical settings, and he is a member of a team of medical students creating a tool to evaluate the role of quality improvement in medical schools across the nation. He has scientific publications in several peer-reviewed journals, has presented his work at numerous regional and national conferences, has served as reviewer for Academic Medicine and Advanced Chronic Kidney Disease, and has been an active participant in the Research Learning Community. In addition to his scientific work, Mr. Swamy is actively involved in the Institute for Healthcare Improvement (IHI), serving as Midwest Regional Leader for the IHI Open School. He is co-founder and director of Radio Rounds, a radio talk show designed to promote humanism and empathy in medicine, and is a member of the American College of Medical Quality, American College of Physician Executives, American College of Healthcare Executives, American College of Physicians, American Medical Association, Ohio State Medical Association, American Medical Students Association, and Phi Rho Sigma. He has also participated in several community outreach and volunteer programs, including providing patient care at Reach Out Montgomery County, mentoring WSU premedical students, and raising money for victims of the 2010 earthquake in Haiti. Mr. Swamy will soon enter residency training in Internal Medicine at the Boston Medical Center in Boston, Massachusetts.

**NATHAN M. WEIR** is an MD/PhD candidate at the Wright State University Boonshoft School of Medicine. In 2012, he completed his Ph.D. studies in Biomedical Sciences with a concentration in Neuroscience and Physiology in the laboratories of Drs. Khalid Elased, Pharm.D., Ph.D. and Mariana Morris, Ph.D. He has produced an extensive body of research on the mechanisms of disease in hypertension and diabetes. His dissertation, *The Role of Angiotensin Converting Enzyme (ACE) 2 in a Murine Model of Insulin Resistance and Albuminuria* elucidates the role for ACE2 in Type 2 Diabetes and provides new insight into the pathophysiology of obesity associated insulin resistance and diabetic kidney disease. He has also studied the role of several enzymes and receptors in the renin angiotensin system with respect to alterations in blood pressure, cardiac function and development of metabolic syndrome. Dr. Weir has several scientific publications in peer-reviewed journals and has presented at his work at both national and international conferences, winning the Caroline Tum Suden award at Experimental Biology in 2009. In 2010, he received a graduate fellowship award from the American Heart Association Great Rivers Affiliate and, in 2011, received the Academy of Medicine Student Research Award. He is a member of the American Physiological Society, the American Physician Scientist Association, and the American Heart Association. In addition to his scientific work, Dr. Weir has participated in several community outreach and volunteer programs, including providing patient care at Reach Out Montgomery County, providing diabetic nutritional information for local urban community center, as well as working with the Dayton Special Olympics and the Adaptive Adventure Sports Coalition. He has also served on the Medical School Student Council and is a founding member of the Medical Student Research Club, where his leadership was instrumental to growth of the Medical Student Research Symposium and the Research Learning Community. Dr. Weir will begin residency training in Dermatology at Wright State University in Dayton, Ohio after completing a preliminary medicine year at the University of Illinois at Chicago in Chicago, Illinois.





# STUDENTS ON RESEARCH

## *Personal Insights from our Student Presenters*

*In undergrad when doing research, it was so easy to get discouraged or to dislike the experience simply because everything we did was so far out of my realm of knowledge. I chose to do research again while in medical school because it was a good way to do something productive during the summer. In addition, it is an inescapable part of being in the medical field; whether it is to participate or to understand the results. Having a stronger science background now after graduating, research seems so much more enjoyable and interesting.*

*I chose to engage in research because I see its benefit both to my career and to the care of our future patients. Research in medical school provides the opportunity to learn from a mentor who is working in my future research field. It has taught me how to create a distinct research question and discover the untouched areas of patient care. I will utilize the skills I have developed in medical school throughout my career, and for that, I am very glad to have conducted research while in medical school.*

*The research symposium helps to remind medical students of the importance of research and the evolving, complex science of medicine. We have amazing students at this school, who are going to make even better physicians. I love seeing what people have been working on behind all of the books and laptops! The research symposium is a fun and laid-back way to showcase everyone's hard work and dedication to medicine.*

*The Fifth Annual Medical Student Research Symposium provided me a great opportunity to display and discuss my research project for the first time with other medical and public health faculty members. I really enjoyed sharing my research findings and receiving feedback from various academic faculty. I would definitely recommend this experience for all medical students who have contributed to a research project!*

*I chose to do research during medical school because I wanted to learn how to answer a question that hasn't been answered before. The Research Symposium gave me the opportunity to admire the hard work of my colleagues and it also gave me a chance to practice my presenting skills in a low stress environment.*

*My first symposium experience was wonderful. I received excellent feedback and guidance from the Symposium coordinator beforehand, which helped me to feel more prepared for the event. The event itself was run smoothly, there was great attendance, and the judges were relaxed but interested.*

*I, like others, was discouraged by my experience with clinical research in college. After spending most of my free time 1st and 2nd year with school organizations, I decided to dedicate my free time during 3rd year to writing and publishing a case report. I am interested in specializing in Pediatrics, and because I'd like to sub-specialize, I wanted to have some experience writing and publishing during medical school. My faculty mentor was enthusiastic about working with students, which helped encourage me to finish the project. While it can be difficult to seek out opportunities, I can say that my experience at the Symposium was definitely worth the effort I put in!*

*Before the symposium, I had no idea how many of my classmates were involved in research and it was a great way for me to see the variety of subjects my peers were interested in.*

*Research is a foundational component of medicine; in its various forms, it is the basis of all improvement. Incorporating research into medical education is a way to reinforce this notion and also fulfill a thirst for discovery. The symposium was fantastic, both as an event, and also as an opportunity to realize the breadth of research going on at our school that showcases this motivation of the researchers to improve medicine in some form or another.*

*The symposium provides opportunities to meet and discuss with your elder peers who are conducting research. During the symposium you are able to learn of physicians who are conducting research in your field of interest and perhaps even join one of their projects. Critiquing and discussing the work of your peers is a great opportunity to get to know them in a unique facet and to foster your EBM skills.*

## ABSTRACTS

(In Alphabetical Order by Presenting Author)

### **Using a Patient Therapy Manager with opioid alternatives to Allow for Patient Controlled Analgesia via an Implanted Intrathecal Pump**

Clara Antoury; Amol Soin, MD, MBA

*Presenting Author:* Clara Antoury

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* None

*Poster Number:* 48

**Objective:** Investigating the effectiveness of opioid alternatives in pain management using a Patient Therapy Manager via an Implanted Intrathecal Pump **Background:** Chronic pain management has relied heavily on opioids to treat patients with resistant pain. Finding an alternative to opioid therapy can be useful in preventing medication abuse and diversion. In a previous study, we used an implanted intrathecal pump to administer continuous infusion of opioids to treat a patient with chronic pain. IT pump is equipped with a Patient Therapy manager (PTM) that allows patients to control the frequency of bolus medications they receive. To ensure patient safety and prevent accidental overdoses, PTM is equipped with a lockout that prevents further boluses after reaching a predetermined maximal level. After testing this modality on a patient with chronic pain and getting promising results, we recruited 2 additional patients and substituted the usual opioid medications with a non-opioid therapy. **Methods:** Three subjects underwent IT/PTM procedure. A 49 year-old male with severe lumbar radiculopathy pain due to multiple spinal surgeries received continuous infusion of morphine 2 mg per day and PTM device set for 100 mcg bolus with a 10 bolus per 24hr lockout. A 48 year-old male with failed back surgery syndrome received continuous infusion of combination of bupivacaine running at 0.65 mcg per day and prialt 1.2 mcg per day with PTM set for 0.1 mcg bolus of bupivacaine with a 10 bolus per 24hr lockout. A 36 year-old female patient with complex regional pain syndrome received continuous infusion of only prialt running at 4.5 mcg per day with PTM set for 0.1 mcg bolus of

prialt with a 10 bolus per 24hr lockout. Pain reduction was measured using the visual analog scale (VAS). **Results:** The patient who received opioids obtained the greatest reduction in overall pain score by 88%. The patient who received the combination of bupivacaine and prialt reported 43% reduction in overall pain and the patient who received prialt alone reported a 28% overall pain reduction. All three patients were weaned off all oral opioid pain medications which reduced opioid induced side effects such as constipation and breakthrough pain. **Conclusion:** Usage of a PTM device in an intrathecal pump with non-opioid therapy may benefit patients with chronic pain. It allows patients to titrate their medication regimen safely, achieve effective pain control, while reducing the risk of opioid abuse and aversion.

### **Knowledge and Attitudes about Brain-Death Among First-Year Medical Students: Implications for Education and Practice**

Ayesha Ashai; Mercedes Thompson, MD; Adrienne Stolfi, MSPH; Nicole Borges, PhD; Ashley K. Fernandes, MD, PhD

*Presenting Author:* Ayesha Ashai

*Faculty Mentor:* Ashley K. Fernandes, MD, PhD

*Previous submission:* Association of American Medical Colleges Central Group on Educational Affairs Annual Meeting, Cincinnati, OH, March 2013

*Poster Number:* 9

**Objective:** Our hypothesis was that first-year medical students would lack knowledge and conceptual clarity about the neurologic criteria for death. **Background:** Clinical criteria for brain death emerged in the late 1960s, not coincidentally, at the time when medical advances allowed solid organ transplantation in humans to become a feasible, albeit intensive, option. While the shortage of organs increases along with demand, emerging research has shown that the lack of conceptual clarity regarding the notion of brain death in physicians can begin as early as medical school. Without proper identification and

educational interventions, this can contribute to decreased confidence in diagnosing brain death, poor communication with potential donor families, and higher mortality rates for organ transplantation. **Methods:** A pre-validated, anonymous survey of attitudes and knowledge about organ donation and brain death, along with three hypothetical clinical scenarios was administered to first-year medical students (n =97, response rate 100%). **Results:** The data showed that, while students had very positive attitudes about brain death, their knowledge about what brain death constitutes is sub-optimal (50% correct response rate). Furthermore, clinical scenarios parsing out the differences between brain death, coma, and PVS—and the implications for organ donation in each case—showed that first-year students were, for the most part, deeply confused and conflicted. **Conclusion:** The results of this study not only serve as a “needs assessment” for our own institution, but have broader implications for medical education and ethics. First, in the short-term, medical educators should encourage the establishment of pre-clinical exercises to develop confidence and comprehension of brain death. Second, the establishment of such courses should open the door for better communication with potential donor families and improvement in organ donation rates in the longer-term. Finally, the ethical implications should also be underscored: a medical student or physician who does not understand what brain death is vis-a-vis other end-of-life states is unlikely to give proper information to patients concerned about their choices at the end of life

### **Application of ice after selective laser trabeculoplasty may reduce risk of intraocular pressure spike**

Robert Beaulieu; Kristine Kunesh-Part, MD; John Kunesh, MD

*Presenting Author:* Robert Beaulieu

*Faculty Mentor:* Kristine Kunesh-Part, MD; John Kunesh, MD

*Previous submission:* None

*Poster Number:* 27

**Objective:** Does the application of ice to an eye immediately post-op decrease the risk of elevated intraocular pressure readings one hour after the

procedure? **Background:** Glaucoma is an eye disease in which the optic nerve is progressively damaged, usually due to increased intraocular pressure (IOP), ultimately leading to vision loss if untreated. Selective laser trabeculoplasty (SLT) is an effective, safe, and economically beneficial approach to the treatment of open angle glaucoma. SLT can achieve comparable results of IOP reduction in comparison with medical management and does not require long-term patient compliance, which is a major contributor to glaucoma management failure. While SLT is relatively safe, side effects do exist which can necessitate further treatment. IOP spikes >5 mmHg have been reported in 3-27% of patients who underwent SLT, typically 1-4 hours post-treatment. Due to the danger of increased IOP in patients with glaucoma, IOP spikes need to be managed due to the susceptibility for optic nerve damage. The administration of topical anti-hypertensive medications pre or immediately post-procedure have shown benefits in reducing IOP spikes in other ocular procedures, such as argon laser trabeculoplasty (ALT), nd:YAG laser posterior capsulotomy, intravitreal injections, and cataract surgery. However, no methods to prevent IOP spikes post-SLT have been described in the literature. This study investigated the benefits of an ice pack application post-procedure compared to expectant management for the development of IOP spikes in patients undergoing SLT. **Methods:** A retrospective cohort study of 100 patients who underwent SLT during the fall of 2012 was conducted. IOP measurements pre-procedure and 1 hour post-procedure were recorded. 50 patients had an ice pack placed over the treated eye immediately post-SLT and 50 patients received no post-op care for IOP spike prevention. Patient data was pooled from three treating physicians. Patients received the ice pack treatment if it was part of the regular post-op care provided by his or her physician (one physician practiced expectant management and two provided ice pack treatment). Post-SLT IOP recorded at a level greater than 5 mmHg from the pre-procedure measurement was designated as an IOP spike. The resulting data was analyzed by the chi-squared test to determine statistical significance. **Results:** Five patients (10%) in the expectant management group experienced an IOP spikes while one patient (2%) in the preventative ice pack treatment group

experienced an IOP spike. Chi-squared analysis provided a p-value of 0.092. This is significant at the 90% confidence interval but falls short of the 95% confidence interval. **Conclusion:** IOP spikes following ocular procedures are a concern due to the increased risk for optic nerve damage, especially in patients without significant reserve to withstand further damage, such as those with glaucoma. Current practice for SLT does not involve preventative measures post-treatment to reduce the risk of IOP spikes and no proactive treatments have been described in the literature. The application of an ice pack to the treated eye is a simple, easily implemented method to potentially prevent the rate of IOP spikes post-SLT. While this study does not show statistical significance at the 95% confidence interval, it can be argued that initial results show clinical promise. A larger sample size should be sought to help further elucidate the value of this intervention.

#### **Early prediction of trauma patient discharge disposition**

Robert Beaulieu; Priti Parikh, PhD; A. Peter Ekeh, MD, MPH; Ronald Markert, PhD; Mary McCarthy, MD

*Presenting Author:* Robert Beaulieu

*Faculty Mentor:* Mary McCarthy, MD

*Previous submission:* None

*Poster Number:* 28

**Objective:** Do pre-injury and early hospital admission characteristics help predict patient discharge disposition? **Background:** Total one-year treatment cost of adult major trauma in the United States is estimated at \$30 billion annually, with 58% of the cost due to the index hospitalization. Increased length of stay (LOS) increases morbidity and delays rehabilitation. Prediction of discharge to a location other than home through univariate risk factor methodology and development of a multivariable binary logistic regression model allows early discharge planning. **Methods:** A one-year Level 1 trauma center registry dataset was used to develop a predictive model of discharge disposition using 2836 trauma patients. Patients with a documented discharge location, comorbidities, injuries, vital statistics, and hospital stay information were included in the study. ANOVA and chi-square analysis were

performed to determine univariate predictors of discharge to home vs. non-home (i.e., nursing home, hospice, long-term acute care unit). Multivariable binary logistic regression determined independent predictors for discharge to non-home locations. We developed two models: (i) a regular discharge (RD) model to predict discharge to non-home locations based on demographic and clinical characteristics at the completion of hospital stay and (ii) an admission planning discharge (APD) model based on data available shortly after admission. **Results:** For the RD model, increased age, female sex, longer ICU and hospital stays, and the comorbidities of neurologic deficiencies, diabetes, coagulopathy and obesity were independent predictors of non-home discharge. The RD model accounted for 56.2% of the variance in discharge to non-home and correctly predicted discharge to home and not home 87.2% of the time. For the APD model, increased age, female sex, and the comorbidities of neurologic deficiencies, diabetes, coagulopathy and obesity were independent predictors of non-home discharge. The APD model accounted for 39.4% of the variance in discharge to non-home and correctly predicted the discharge to home and not home 82.9% of the time. Further, the authors derived Clinical Decision Rules (CDRs) for both the RD and APD models. **Conclusion:** Demographic and clinical information for trauma patients predicts dispositions early and late in the hospital stay. If the clinical decision rules derived from this study are validated, steps can be taken by hospital staff to arrange placement earlier in the hospital stay, allowing for a smoother transition for the patient and cost savings.

#### **Cost-effectiveness of routine laboratory and imaging in the follow-up of melanoma patients**

Colleen Begley; Holly Paugh, MD; Marlene Willen, MD

*Presenting Author:* Colleen Begley

*Faculty Mentor:* Marlene Willen, MD

*Previous submission:* Creighton University Honors Day, Omaha, NE, April 2012

Research Day for the Chester Scholars Program, MetroHealth Medical Center, Cleveland, OH, August 2010

*Poster Number:* 24

**Objective:** This study aims to determine the cost-effectiveness of routine laboratory tests and imaging studies in the follow up of melanoma patients. If successful, the results will help clinicians to determine the value of these tests in patient follow-up care. Our hypothesis is: "Laboratory tests and imaging scans are effective for diagnosing recurrence in melanoma patients only when there is a clinical concern."

**Background:** Malignant melanoma, an aggressive form of skin cancer, has a 40-71% five-year survival rate if lymph nodes are involved and an even lower survival rate with distant metastases. Therefore, it is important for clinicians to catch melanoma recurrence early, before it spreads. Clinical examination has been proven effective at detecting recurrent disease and metastases, but the National Comprehensive Cancer Network considers all follow-up imaging and laboratory studies to be "optional". **Methods:** Malignant melanoma patients were identified through a diagnosis search in Epic and de-identified using a code. We then classified the patients by melanoma stage (0, I, II, III, IV) using the updating staging guidelines (2009).<sup>9</sup> We created a database of the follow-up management methods used for each patient, whether a method detected recurrent disease or metastasis, and whether it was used routinely or because of clinical signs and symptoms. Each follow-up method was statistically evaluated for its effectiveness at detecting recurrence when used routinely. We used a 2x2 Chi squared test to compare the results of clinically indicated versus routine tests or imaging. Tests with a value of less than 5 for any result category were analyzed using the Fisher's exact test. We also calculated sensitivity, specificity, positive predictive value, and negative predictive value for each test to further evaluate overall effectiveness at diagnosing recurrent disease. **Results:** We identified 57 patients with Stage III melanoma for our initial results. A Chi Square value  $>3.84$  demonstrated statistical significance at the 5% level in favor of the hypothesis. The LDH blood test had a Chi Square value of 19.73,  $P<0.01$ , 38.46% sensitivity and 91.74% specificity. CT scan of the abdomen had a Chi Square value of 6.08,  $P<0.01$ , 100% sensitivity and 83.02% specificity. CT scan of the pelvis had a Chi Square value of 13.44, 100% sensitivity and 95.24% specificity. CT scan of the

chest had a Chi Square value of 5.61,  $P<0.05$ , 100% sensitivity and 88.89% specificity. Chest x-ray had a Chi Square value of 25.51, 50.00% sensitivity and 97.66% specificity. MRI of the head had a p value of  $<0.05$ . Less than 20 patients had a CT scan of the head and/or full-body PET scan, but these tests had a p value  $>0.05$  and Chi-Square value of 1.72 respectively. **Conclusion:** Imaging studies were found to have a low yield in detecting recurrence when used routinely in Stage III patients with the possible exception of a CT scan of the head or PET whole-body scan. Further investigation is warranted, especially evaluating the cost-effectiveness of these two scans because of our small sample size.

### **Evaluation of the Counter-transference of Residents towards Borderline Personality Disorder Patients**

Claire Brandon; Brenda Roman, MD; Jerald Kay, MD

*Presenting Author:* Claire Brandon

*Faculty Mentor:* Jerald Kay, MD

*Previous submission:* None

*Poster Number:* 21

**Objective:** The purpose of this study was to attempt to understand whether or not there is a bias towards Borderline Personality Disorder patients from resident physicians and whether or not this possible bias differs between medical specialties. The responses were also used to attempt to identify whether or not there is a difference in perceived stigma between genders, medical education background, year in training and specialty in general. Gathering of this type of information may be helpful in order to understand more about the stigma present in mental illness as well as what can possibly be done to help alleviate this. It has also been the hope of this study to begin understanding the expectations of physicians regarding the recovery of borderline personality disorder patients. **Background:** While the effect of stigma surrounding the care and recovery of mental illness has been studied in the past, there have been a only a few studies attempting to analyze how psychiatric staff reacts towards patients diagnosed with borderline personality disorder (BPD). Surprisingly, none of these studies have attempted to look at residents outside

of psychiatry, the physicians who make up much of the interaction on a daily basis with BPD patients. Gathering of this type of information may be helpful in order to understand more about the stigma present in mental illness as well as what can possibly be done to help alleviate this. It is also the hope of this study to begin understanding the expectations of physicians regarding the recovery of borderline personality disorder patients. **Methods:** The study invited 256 resident physicians (psychiatry, emergency medicine residents, OB/Gyn, internal medicine, family medicine, and general surgery) at one United States medical school via email to participate in the research survey. The study tool was a 10-question Qualtrics survey including an example vignette designed to elicit both demographical information and emotional responses surrounding the BPD patient, created by the authors. A 4-point Likert scale was used. All invitations were sent out via email to university-linked accounts and an incentive of a \$10 gift card was used to encourage participation in the busy resident populations. **Results:** Out of the 256 residents to which the survey was sent, the total response rate was 12%. Of the participants, 48% were male, 52% were female. The residents were asked to respond about their medical education background and 100% responded to be from an American medical school versus IMG. Residents responded from PGY1 (32%), PGY2 (16%), PGY3 (45%), and PGY5 (6%). Response rates by specialty were 25% for psychiatry, 24% for OB/Gyn, 19% for emergency medicine, 9% for family medicine, 3.8% for internal medicine, and 2.6% for general surgery. In overall results it appears that residents in all specialties are nearly split evenly in their feelings about psychiatric patients in response to relating to frustration (52% strongly disagree/disagree versus 45% agree/strongly agree) as well as their feelings of being “on guard” (55% strongly disagree/disagree as compared to 42% agree/strongly agree). In regards to BPD patients, overall residents overwhelmingly agreed that they were frustrated and on guard. Finally the residents were asked to rate the prognosis for BPD patients and 94% felt that it was treatable in some way. **Conclusion:** Although there is still much work to be done in understanding the relationship of the BPD patient and residents, it is promising that they are able to at least understand that there

are treatment measures for these patients and treatment is available. In overall interaction with psychiatric patients it appears that residents feel overall prepared, however, the slightly less confident and overwhelmingly more frustrated feelings towards BPD patients speaks to the fact that there is still likely some education and exploration to be done regarding working with this patient population. In this study there were less responses than expected and therefore the information was heavily obtained from psychiatric residents who appeared more motivated to participate. In the future it would be helpful to get a more broad range of residents to respond in order to make the data more generalizable and able to be used in order to direct resident education about interactions and enhanced care for BPD patients.

### **Facilitation and Placement of a Neurostimulation Cuff via Cadaveric Dissection**

Cole Budinsky; Emily Tibbits; Vivek Yedavalli; Amol Soin, MD, MBA

*Presenting Author:* Cole Budinsky

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* None

*Poster Number:* 42

**Objective:** Can cadaveric dissection enhance the facilitation and placement of a Neurostimulation cuff in a human subject? **Background:** Clinically, there are several challenges that one encounters when attempting to place a neuromodulating electrode cuff around a peripheral nerve in a live human subject. Familiarity of nearby anatomic structures to the peripheral nerve in question, and understanding the physical size and nature of the nerve to be modulated must be evaluated prior to in vivo implantation of the neurostimulation cuff in a human subject. As part of an ongoing multiyear clinical case study this abstract has updated and new information to report compared to the prior. To date, there are a total of 3 dissections- one male and two female cadaver subjects, the most recent being a female. During this exploration, new percutaneous and paddle lead arrays (neurostimulation cuffs) were placed near the peripheral nerves studied to complete high frequency neurostimulation techniques. In an effort to evaluate and master the above, human



cadaveric dissections are a necessary precursor to eventual human surgical lead placement. **Methods:** Both upper and lower extremities of each of the three cadavers were dissected down to the major peripheral nerves investigated: ulnar, median, femoral, sciatic, posterior tibial, and common peroneal nerves. Other major anatomical landmarks such as blood vessels and muscle groups were observed and left intact. Dissection not only allowed for access to implant a peripheral neurostimulation cuff, but also provided access to accurate measurements of the major peripheral nerves in the upper and lower extremities additionally offering insight to potential size differences as related to gender. **Results:** Fig.1 shows implantation of a cuff directly on the Right Median nerve, just proximal to the elbow joint in the antecubital fossa. Fig. 2 represents implantation of the cuff directly on the right ulnar nerve, again just proximal to the elbow joint. Fig. 3 shows a right femoral nerve passing under the inguinal ligament with a successfully placed cuff right on distal portion of the nerve, just proximal to the anterior and posterior divisions. Fig.4 depicts a percutaneous lead placement on the right tibial nerve, just proximal to the elbow joint in the antecubital fossa. Fig.5 demonstrates a percutaneous lead placement on the right ulnar nerve. Fig.6 represents a percutaneous lead placement on the right sciatic nerve situated just proximal to the anterior and posterior branches. **Conclusion:** Using a high frequency alternating current (HFAC) to activate voltage-gated ion channels has been shown in previous studies to produce a depolarization of the nerve through the membrane when conduction of the current is placed directly on the nerve. By delivering the alternating current directly to the nerve tissue, the surrounding motor fibers are not affected, and a nerve block can be successfully achieved without exciting nearby muscular structures. This has been shown to only be effective when the peripheral neurostimulation cuffs are placed directly around the nerve fibers. The uses for delivering HFAC via a properly fitted and implanted neurostimulation cuff around the affected nerve can result in effective measures to provide analgesia treating: chronic pain conditions, post-surgical neuromas, and residual limb pain secondary to limb amputation. Based on the cadaveric dissection results, and the fact that

nerve diameter varies based on body size, we conclude that a screening ultrasound in vivo may be helpful in determining cuff diameter for lead placement. If such screening were not available, it would be advantageous to use a smaller diameter in any female patient, as it is critical to appropriately measure and size the cuff of the stimulating device to achieve optimal results.

### **Ultrasound Guidance as Predictor of Success for High Frequency Electric Nerve Block in Patients with Amputation Stump Pain**

Jennifer Castelbuono; Samira Sihabdeen; Scott Seider; Amol Soin, MD, MBA

*Presenting Author:* Jennifer Castelbuono

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* None

*Poster Number:* 43

**Objective:** Ultrasound guided peripheral nerve blocks may be a predictor of success for high frequency electric nerve block in patients with amputation stump pain. **Background:** Residual limb pain affects more than seventy percent of amputees in the United States. New techniques for analgesia in patients with amputation stump pain are being developed. One such technique is the placement of high frequency alternating current (HFAC) on peripheral nerves. Animal studies have demonstrated instantaneous and reversible conduction block of motor and sensory nerves by using an alternating current of 5-50 kHz. High frequency nerve block can be accomplished in patients by surgically implanting a stimulating cuff around the peripheral nerve. In order to screen patients to assess their candidacy for high frequency nerve block, a test nerve block was completed using an amide local anesthetic (1% lidocaine) under ultrasound guidance. The mechanism of action of high frequency electric nerve block is similar to injecting a peripheral nerve with an amide local anesthetic (which is an instantaneous and reversible conduction block of motor and sensory nerves). Therefore, a pilot study was conducted to test the theory that ultrasound guided peripheral nerve blocks can be used to predict the success of high frequency electric nerve block in patients with amputation stump pain. **Methods:** Nine lower-limb amputees with chronic and severe residual limb pain were

enrolled in the study. Each patient underwent an ultrasound guided peripheral nerve block. If the patient was a below the knee amputation (3 of the 9 patients) a popliteal fossa block of the peroneal and tibial nerve was completed. If the patient was an above the knee amputee a sciatic nerve block was completed. Ultrasound guidance was used to help visualize the nerve and neuroma in the amputated limb and then to identify a site for the nerve block as well as for surgical placement of a peripheral nerve spiral cuff. After a successful nerve block, a spiral nerve cuff electrode was placed on the target nerve during a 30-minute surgery under general anesthesia. An external waveform generator was connected to the implanted electrode via a percutaneous interface. **Results:** Of the 9 patients enrolled, 6 were above the knee amputees and 3 were below. Each underwent a screening peripheral nerve block using ultrasound guidance. Only 5 patients achieved significant pain reduction (defined as a perceived 50% reduction in pain) in two different peripheral nerve blocks one week apart. 4 of the above the knee amputees and 1 below the knee amputee patients responded to the local anesthetic. The other patients failed, in theory, due to the fact that the neuroma in the severed nerve may not have been the primary pain generator. The five responding patients were then implanted with a spiral cuff and underwent testing with an external waveform generator. All 5 patients achieved pain reduction with 4 out of 5 achieving significant pain reduction mimicking the test injection that was reproducible and repeatable. **Conclusion:** The most important finding in this study is that a local anesthetic peripheral nerve block under ultrasound may be a positive predictor of high frequency electric nerve block. In residual limb pain the stump pain is generated by a neuroma of the severed nerve. If one is able to block the pain signal transmission from the nerve, the pain should be reduced. Since it is not practical to continuously infuse an amide local anesthetic proximal to a neuroma, a medical device consisting of a spiral nerve cuff and implantable internal pulse generator may be a way to accomplish a continuous nerve block in these patients. Ultrasound guidance with an amide local anesthetic can be used to predict the success of implanting an internal pulse generator for continuous nerve block.

## **Alternative to Endotracheal Tubes to Facilitate Airway Access in Cases of Documented Difficult Airways Using a ProSeal**

Paul Craig; Amol Soin, MD, MBA

*Presenting Author:* Paul Craig

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* None

*Poster Number:* 56

**Research Question:** Is the Proseal a viable option for airway access in obese patients with documented difficult airways? **Background:** Otolaryngologists and anesthesiologists often encounter patients with difficult airways. The Laryngeal Mask Airway (LMA) is a device designed to help attain airway access in such patients during procedure. The major limitation of the LMA is that when it conducts positive pressure ventilation above peak airway pressures of 20 mmHg, the device loses its functionality. At pressures over 20 mmHg, air can force its way into the gastrointestinal tract through the esophagus, potentially leading to abdominal distention or gastric aspiration. These deleterious effects limit the use of the traditional LMA in procedures requiring high positive pressure ventilation. The ProSeal is a new type of LMA developed to be used in such surgeries, and has two major advantages over the traditional LMA. First, it creates a better seal to prevent air from entering the esophagus. Secondly, its open tip gives the operator access to the stomach for suction of air and gastric contents, preventing abdominal extension and decreasing risk of aspiration. **Methods:** Building upon a previous case report, 9 additional patients undergoing surgery requiring mechanical ventilation, and meeting the criteria of BMI between 35-40 and a Class III Malampati airway were enrolled. Laparoscopic and robotic surgeries were excluded due to the abdominal insufflation. Throughout each surgery, an orogastric tube was inserted through the distal port of the ProSeal to decompress the abdomen periodically. Before reversing the muscle relaxant and halting mechanical ventilation, an additional decompression was completed. Patients were followed up for post operative complications. **Results:** Periodically throughout each surgery, the orogastric tube was successfully inserted through the ProSeal port to decompress the abdomen. Post

operation, ventilation was discontinued and all patients resumed normal respiration. Upon awakening, the ProSeal was removed and the patients were moved to recovery in stable condition. No respiratory complications were reported. **Conclusion:** Although this case series is limited by size, it demonstrates that the ProSeal is a safe and viable alternative to endotracheal intubation during abdominal surgery in obese patients with a documented difficult airway. Further studies with large sample sizes are warranted.

### **Results of Short Term Human Testing of High Frequency Nerve Stimulation**

Shamie Das; Amol Sooin, MD, MBA

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*Faculty Mentor:* Amol Sooin, MD, MBA

*Previous submission:* None

*Poster Number:* 44

**Objective:** Can high-frequency nerve stimulation be used in the acute treatment of intractable pain in residual limbs? **Background:** Animal studies showed instantaneous and reversible conduction block of motor and sensory nerves by alternating current of 5-50 kHz. This first-in-human study is to prove feasibility of acute treatment of intractable pain in residual limbs by applying high-frequency current on peripheral nerves proximal to the pain source, the neuroma formed at the end of the severed nerve. **Methods:** Five lower-limb amputees with chronic and severe residual limb pain who attained temporary but significant pain reduction after local anesthetic injection were enrolled. A spiral nerve cuff electrode was placed on the target nerve during a 30-min surgery under general anesthesia. An external waveform generator was connected to the implanted electrode via a percutaneous interface. Frequencies between 5 and 30 kHz were tested. Subjects attaining significant and consistent pain reduction were given the portable generator for home therapy. All electrodes were explanted on 28th day post implantation per protocol. **Results:** In subject 1, during one test with 10 kHz, immediate and complete reduction of chronic pain was attained. Pain returned to baseline level in 20 min after current termination. Subjects 2 and 3 both had baseline pain level of 0 during office

visits. Partial or complete reduction of mechanically-induced pain was achieved inconsistently. In subjects 4 and 5, testing with 10 kHz resulted in pain reduction in minutes from 7 to 2 and 7 to 0, respectively, and pain relief lasted tens of minutes to hours after each 10-min therapy. Both subjects used the therapy at home and reported significant and consistent pain reduction. Subject 4 reported significant improvement in his ability to conduct daily activities. Subject 5 reported marked improvement of sleep, noting first pain-free sleep in years. No adverse events occurred during study. No noticeable nerve tissue damage was found upon visual inspection during explant surgery. No detectable sensory/motor function deterioration was found on post-explantation examination. **Conclusion:** The most important finding of this study is that a brief application of high-frequency current can result in an extended period of pain reduction. This means the device does not have to deliver energy to the nerve continuously for continuous pain relief, a huge benefit for the realization of this therapy by an implantable, battery-powered generator. The feasibility of using high-frequency nerve block in reducing amputation pain is demonstrated without adverse events by this first-in-human study. Larger-size and longer-term studies are warranted to confirm the findings.

### **Developing a Research-Focused Learning Community at Boonshoft School of Medicine**

Adam Deardorff, MS; Mark Willis, MA

*Presenting Author:* Adam Deardorff

*Faculty Mentor:* Mark Willis, MA

*Previous submission:* Association of American Medical Colleges Central Group on Educational Affairs Annual Meeting, Cincinnati, OH, March 2013

*Poster Number:* 1

**Objective:** Medical schools have organized learning communities to meet a range of goals such as promoting academic and social support networks, providing student services, and filling gaps in the curriculum. The Research Learning Community (RLC) at Wright State University Boonshoft School of Medicine has undertaken each of these goals during its six-year evolution. However, the RLC differs from other medical

school learning communities in several significant ways: it formed in response to student initiatives; it developed gradually over time, utilizing existing resources and expertise; and within the broader goal of enhancing the learning environment, its purpose is focused on supporting medical student research. **Background:** This collaboration among students, faculty, and administrators began in 2006 with the goal of helping students to find faculty research mentors for student-designed elective courses and extracurricular projects. The collaboration brought together student peer-support efforts and services provided by the medical school's research office. **Methods:** Over time the collaboration developed into a network of student organizations and a series of shared events (monthly lectures, workshops, and annual symposia) where students and faculty could present research results and discuss career issues in a range of professional settings. Wide-ranging, informal discussions among students and faculty led to a growing perception that these shared events supported an emerging learning community. In 2010 it was given the name "Research Learning Community." **Results:** Student leaders also set the goal of establishing defined research courses in the elective curriculum. They envisioned a series of courses that could prepare students for independent research projects later in medical school. Elective tracks had been developed in the areas of service learning and global health, and the students believed that research needed a similar focus. Thus far, two research electives have been developed using the RLC's shared events as an organizing principle. SMD 616 introduces first-year students to the range of research conducted at the medical school and develops strategies for finding faculty mentors. SMD 617 provides second-year students with a supportive environment for continuing research projects begun in year 1 with the goal of presenting their results at an RLC event. **Conclusion:** The RLC is a research-focused learning community that emphasizes peer learning and diverse student-faculty interactions through shared research events. Within and beyond the formal curriculum, the RLC's flexibility and responsiveness to student initiatives is its greatest strength. Its greatest need for improvement moving forward is increasing participation by faculty research mentors.

**Barrow's sign: Assessing the utility of a novel physical exam skill in the evaluation of isolated meniscal tears**

Ryan Noska; Zachary J. DiPaolo; Michael W. Barrow, MD

*Presenting Author:* Zachary J. DiPaolo

*Faculty Mentor:* Michael W. Barrow, MD

*Previous submission:* None

*Poster Number:* 34

**Background:** Meniscal tears are common injuries amongst the active adolescent population. The meniscus is a cartilaginous cushion between the femur and the tibia, which contribute to the structure of the knee joint. Under normal physiologic conditions, this cartilage serves to absorb the impact and dissipate the energy created during axial loading at the knee. Damage to the meniscus can cause mild to severe pain as well functional instability within the knee, thereby impeding physical activity. The ability to diagnose a meniscus tear quickly and correctly allows the athlete to begin the recovery process as soon as possible and aids in a faster return to competition. In addition to the meniscus, several ligaments stabilize the knee. A ligamentous injury can present similarly to meniscus tears, which complicates the physician's ability to make an appropriate clinical diagnosis. A simple and painless physical exam test for differentiating between meniscal and ligamentous injuries enables the physician to properly diagnose and effectively treat the patient, thereby facilitating a more rapid recovery and return to the playing field. The purpose of Barrow's sign is to accurately diagnose an injury to the meniscus in the absence of an associated ligamentous injury. The test is performed as follows: have the patient sit on the edge of the exam table, allowing their legs to hang freely in the air. A positive Barrow's sign is indicated when the patient experiences a decrease in the amount of pain or a sensation of relief in the knee. Conversely, a negative Barrow's sign is signified by continued pain in the knee, likely due to associated ligamentous injury. **Methods:** Patients ranging from ages 12-20 years presenting with knee pain underwent a typical knee exam. Special attention, however, was fixed on three specific physical exam maneuvers (Thessaly, McMurray's and

Barrow's) as part of a comprehensive musculoskeletal exam. Given the general consensus of the superiority of the Thessaly test in diagnosing meniscal tears, it was used as a comparison to Barrow's sign. Additionally, Barrow's sign was also compared to MRI. Exclusion criteria consisted of falling out of the age range, inadequate physical exam secondary pain or limited range of motion and inability of the patient to obtain an MRI. **Results:** The first set of results will focus on Barrow's sign being compared to the Thessaly test. Of the 24 patients eligible over the 4-week period the study was conducted, 13 qualified for participation. The other 11 were excluded based on age or inability to complete the exam. Of the 13 study participants, 7 had both a positive Thessaly test and Barrow's sign, 2 had a positive Thessaly test with a negative Barrow's sign, 1 had a negative Thessaly test with a positive Barrow's sign and 3 had both a negative Thessaly test and Barrow's sign. This yielded a sensitivity of 77.8%, a specificity of 75%, a positive predictive value of 87.5% and a negative predictive value of 60%. The second set of results will focus on the Barrow's sign being compared to a MRI. Of the 24 patients eligible over the 4-week period the study was conducted, 10 qualified for participation. The other 14 were excluded based on age, inability of patient to obtain an MRI, issues procuring MRI results from medical records and the decision to attempt physical therapy prior to radiologic work-up. It was found that of the 10 participating patients, 2 had both a positive MRI (meniscal tear) and Barrow's sign, none had a positive MRI with a negative Barrow's sign, 5 had a negative MRI (no meniscal tear) with positive Barrow's sign and 3 had both a negative MRI and Barrow's sign. This yielded a sensitivity of 100%, a specificity of 62.5%, a positive predictive value of 28.6% and a negative predictive value of 100%. **Conclusion:** The ability of the physician to clinically determine the presence or absence of an isolated meniscus injury saves the patient both time and money by forgoing the hassle of an MRI. If the physician concludes that the injury is minor and the pain is tolerable, the patient may begin physical therapy in an attempt to rehabilitate the injury and avoid a costly procedure. Furthermore, knowing that the ligaments around the knee are free from injury,

allows both the doctor and therapist to better focus treatment on the injured meniscus. As it currently stands, Barrow's sign has utility in ruling out meniscus injuries as opposed to being equally good at ruling in a meniscus injury. A limitation of the study is the small number of participants and will require further evaluation on a larger study population to assess if these preliminary results hold true. Due to the ease of the maneuver and small amount of pain associated with Barrow's sign, this test can safely be used in a comprehensive evaluation of knee injuries in adolescents.

### **Extending Healer's Art: Developing a Finding Meaning in Medicine Group for 3rd and 4th Year Medical Students**

Meaghan Ebetino; Sonya Hovsepian; Karen Kirkham, MD; Colleen McCormick; Stephen Donnelly; Mike Rabow, MD; Evangeline Andarsio, MD

*Presenting Author:* Meaghan Ebetino; Sonya Hovsepian

*Faculty Mentor:* Evangeline Andarsio, MD

*Previous submission:* Gold Humanism Honor Society Biennial Conference, Chicago, IL, October, 2012; American Association of Medical Colleges Annual Meeting, San Francisco, CA, November, 2012

*Poster Number:* 10

**Objective:** To understand the impact of a new Biennium 2 medical student reflection program.

**Background:** Wright State University Boonshoft School of Medicine in Dayton, OH has taught the Healer's Art (HA) course to first-year medical students for the past 7 years. A subset of medical students in the third and fourth years felt a strong desire for a program similar to HA to reflect on clerkship experiences. With the help of the faculty involved in The Healer's Art, they created for medical students a chapter of a program similar to Healer's Art, called Finding Meaning in Medicine (FMM). The group is led by medical students and meets on a monthly basis at a faculty member's home. **Methods:** Leaders of the FMM group have made adjustments to the structure of the meetings based on feedback from those in attendance. Third and fourth year medical students were also surveyed at the end of the

2011-2012 academic year, allowing them to reflect on what FMM has meant to them during their clinical years and how it has impacted their views on humanism in medicine. **Results:** In a one-year time period, 28 students attended one session, and over half attended more than one session. FMM leaders found that discussion flowed most easily with a student leader who directed the conversation. Responses to the survey identified the strengths of FMM to be the depth of the conversation/topics, other students present (positive qualities), accepting environment, faculty involvement, and protected time for reflection. Weaknesses included schedule conflict/location, other students present (negative qualities), rigid structure, and complaining/gripe session. The most common reason for not attending a meeting was due to a scheduling conflict. The majority of the student-identified worthwhile means of reflection involved discussion. **Conclusion:** Finding Meaning in Medicine is a forum that could easily be modeled at other medical schools. The forum could provide other medical students with outlets for sharing difficult experiences, improve their listening skills, and remind students of their humanistic goals in being physicians.

**Capnographic waveforms may be useful for assessment of the Emergency Department dyspneic patient**

Ashlee Edgell; Christopher Lindsell, PhD; Kim Ward Hart, MA; Jason McMullan, MD

*Presenting Author:* Ashlee Edgell

*Faculty Mentor:* Jason McMullan, MD

*Previous submission:* Oridion Emergency Medicine Capnography Summit, Hyattsville, MD, December 2011

*Poster Number:* 22

**Objective:** We evaluated the utility of capnographic waveforms in distinguishing dyspnea caused by reactive airway disease (RAD) from non-RAD in adult ED patients.

**Background:** Dyspnea is a common ED complaint with a broad differential diagnosis and disease-specific treatment. Bronchospasm alters capnographic waveforms, but the affect of other causes of dyspnea on waveform morphology is unclear. **Methods:** This was a prospective,

observational, pilot study of a convenience sample of adult patients presenting to the ED with dyspnea. Waveforms, demographics, past medical history, and visit data were collected. Waveforms were independently interpreted by two blinded reviewers. When the interpreters disagreed, the waveform was re-reviewed by both reviewers and an agreement was reached. Treating physician diagnosis was considered the criterion standard. Descriptive statistics were used to characterize the study population. Diagnostic test characteristics and inter-rater reliability are given. **Results:** Fifty subjects were enrolled. Median age was 52 years (range 21-82), 50% were female, 34% were Caucasian. 29/50 (58%) had a history of asthma or chronic obstructive pulmonary disease. RAD was diagnosed by the treating physician in 19/50 (38%) and 32/50 (64%) had received treatment for dyspnea prior to waveform acquisition. The interpreters agreed on waveform analysis in 47/50 (94%) cases (Kappa = 0.88). Test characteristics for presence of acute RAD, including 95%CI, were: overall accuracy 70% (55.2%-81.7), sensitivity 69% (43.5%-86.4%), specificity 71% (51.8%-85.1%), positive predictive value 59% (36.7%-78.5%), negative predictive value 79% (58.5%-91.0%), positive likelihood ratio 2.25 (1.36-3.72), negative likelihood ratio 0.42 (0.23-0.74). **Conclusion:** Inter-rater agreement is high for capnographic waveform interpretation, and shows promise for helping to distinguish between dyspnea caused by RAD and dyspnea from other causes in the ED. Treatments received prior to waveform acquisition may affect agreement between waveform interpretation and physician diagnosis, impacting the observed test characteristics.

**The effects of weekday, season, federal holidays, and severe weather conditions on emergency department volume in Montgomery County, Ohio**

Kiran Faryar; Sara Paton, PhD; Mark Gebhart, MD

*Presenting Author:* Kiran Faryar

*Faculty Mentor:* Sara Paton, PhD; Mark Gebhart, MD

*Previous submission:* None

*Poster Number:* 14

**Objective:** What effects do weekday, season, federal holidays, and severe weather conditions have on emergency department volume in Montgomery County, Ohio? **Background:** The purpose of this study was to determine whether day of the week, season, federal holidays and different severe weather conditions affected emergency department (ED) volume in Montgomery County, Ohio. While many studies have examined the effect one specific variable has on one individual hospital, no study to date has analyzed the effects of many severe weather conditions on all of the hospitals in one area. **Methods:** A retrospective analysis of emergency department visits from July 1, 2010 to July 1, 2011 was conducted. Meteorological and climatological data in Montgomery County was obtained from the National Oceanic and Atmospheric Administration (NOAA). Weekday, season, holiday, extreme temperature, wind, thunderstorm, tornado, flood, and precipitation were analyzed for their effect on ED volume. A two tailed Analysis of Variance (ANOVA) was used to determine if the total number of ED visits were significantly associated with these independent variables. **Results:** There were 264,433 total ED visits. Of these ED patients, 58.1% were female and 41.9% were male. On average, 20.7% of patients were children (<18 years old), 62.9% were adult (18-64 years old) and 16.4% were elderly (>64 years old) per day. The average number of ED visits per day was 722.5. Mondays had the highest ED volume (739.5±18.2 visits per day) and Saturday had the lowest number of patients (614.3±18.6 visits per day). Winter saw the highest ED volume (706.3±17.2 visits per day), and Fall had the least number of ED visits per day (639.0±18.1). Holidays ( $p < 0.001$ ), extreme cold temperature defined as  $< 32^{\circ}\text{F}$  ( $p = 0.0257$ ), and precipitation ( $p = 0.0071$ ) were associated with a statistically significant decrease in ED patient volume. The day after an extreme cold temperature event had a statistically significant increase in ED volume ( $p = 0.0320$ ). Strong winds, thunderstorms, tornadoes, floods, and the day after a precipitation event did not have a statistically significant impact on ED volume. **Conclusions:** Emergency department patient volume is highest on Mondays and during the winter. Extreme cold temperatures and precipitation cause a decrease in ED volume. By using weekday trends and weather forecasts,

emergency departments can anticipate patient volume and adjust their staffing and resources accordingly.

### **Use of an Audience Response System (ARS) in an interactive histology laboratory**

Patrick Feasel; Evan Xanthos; Nicole Borges, PhD; Larry Ream, PhD

*Presenting Author:* Patrick Feasel

*Faculty Mentor:* Larry Ream, PhD

*Previous submission:* None

*Poster Number:* 7

**Objective:** To maximize the effectiveness of the combined laboratory-based use of microscopes and glass slides with computer-based instructional technologies. **Background:** The realization that medical students may fail to integrate normal histology, histopathology and resulting clinical manifestations with the advent of virtual-histology has led us to identify the need to introduce methods that promote active learning in an interactive laboratory setting. Little research has been done on the potential value of introducing interactive learning methods in the histology laboratory using an audience response system (ARS). Many studies have shown that the use of an ARS can facilitate interactivity in large group settings and promote active learning. Therefore, in an effort to maximize the effectiveness of the combined laboratory-based use of microscopes and glass slides with computer-based instructional technologies, we plan to introduce a pre-laboratory exercise that utilizes an ARS. Our intended purpose of using the ARS will be to promote individual students' responsibility for their own learning and allowing for practical application of learned material, and to become less reliant on memorization and overly focused on short-term objectives. **Methods:** Three clinically-based multiple choice questions were presented at the beginning of each laboratory session as a review of material that had already been covered. The questions were timed to simulate the conditions of the laboratory exam. After one minute, the students were asked to submit their answers, and the results were displayed. A brief explanation of the answer choices were then discussed by the instructors according to feedback obtained from the ARS. This was done for each of the six

laboratory sessions. Five survey questions based on the 5-point Likert scale were presented according to our objectives. The questions asked ranged from the impact that the sessions had on their study skills to their overall satisfaction with their experience in the laboratory. Students were also given the opportunity to provide qualitative feedback through specific written comments.

**Results:** In an effort to promote individual students' responsibility for their own learning and to become less reliant on memorization in the histology laboratory, we introduced an interactive clicker-question session utilizing an ARS. Emphasis was placed on introducing clinically relevant concepts by incorporating histology and histopathology with clinical manifestations of disease. Our results indicate that by providing clinically relevant "board-style" questions, the laboratory sessions made learning histology more relevant and meaningful. Students strongly agreed that the clicker-questions stimulated discussion and enhanced interaction with their peers. Written feedback was also very helpful in identifying students' perceptions of the sessions which were not addressed in the feedback survey questions. It is our goal to refine and adjust the pre-laboratory exercises accordingly in order to maximize the usefulness of using the ARS in the histology laboratory for future classes.

**Conclusion:** The ARS enhanced the learning environment. - Clicker questions made the laboratory sessions more meaningful and relevant. - The laboratory sessions were more enjoyable with clicker questions.

### **Novel Approach to Anomalous Pulmonary Artery Repair for the Pediatric Anesthesiologist**

Christo Frangopoulos; Abigail Monnig; Amol Soin, MD, MBA

*Presenting Author:* Christo Frangopoulos

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* None

*Poster Number:* 37

**Objective:** The anomalous origin of a pulmonary artery from the ascending aorta, also known as hemitruncus arteriosus, is a very rare congenital cardiac anomaly (i.e. < 1% of all cardiac anomalies) with most cases involving the right

pulmonary artery. Patients often present clinically with failure to thrive, cyanosis, or signs of congestive heart failure very early in life. Diagnosis is often made via echocardiography. Repair is often performed within the first six weeks of life to prevent severe vascular obstructive disease, pulmonary hypertension, and heart failure. Further, repair allows for normal, physiologic perfusion of the pulmonary vascular beds. Mortality rates without correction can reach 70% before 6 months of age. This ongoing, multi-year study describes surgical repair in two neonates without using cardiopulmonary bypass. **Background:** Patient #1 is a 4 week old infant born at 38 weeks to a mother who had her pregnancy complicated by a prolonged premature rupture of membranes. The patient's past medical history was significant for micrognathia, cleft palate, Enterococcus bacteremia, femoral hypoplasia, an undescended testicle, left hip dislocation, a sacral dimple, and syndactyly of left foot. The patient developed respiratory distress soon after birth requiring intubation which was difficult as the patient had laryngomalacia and obstruction of the airway with arytenoid cartilage collapse. The patient had both an echocardiogram and cardiac catheterization which both demonstrated the left pulmonary artery originating from the ascending aorta. The patient was taken to the OR and anesthesia was induced with midazolam, fentanyl, and rocuronium. The airway was secured via a nasal fiberoptic technique after an initial attempt via oral fiberoptic was unsuccessful secondary to the patient's anatomic defects. Anesthesia was maintained with intermittent boluses of fentanyl. No volatile agents were used throughout the case, as the patient had hemodynamic instability with sevoflurane in a prior anesthetic for the patient's cardiac imaging. The case proceeded without incident while the surgical team was able to perform the repair without using bypass. Patient #2 was a 3 week old neonate who presented with a hemitruncus arteriosus on echocardiogram after the patient had persistent hypoxia with oxygen saturations in the low 80s. In the OR, the airway was secured easily with an endotracheal tube after being initially paralyzed with rocuronium and fentanyl. The patient was maintained on 0.25 MAC of isoflurane alongside fentanyl boluses during a successful operation again without the



use of bypass. This now demonstrates that both volatile agents and total intravenous anesthesia have been used successfully during this type of surgical repair. **Methods:** This is an ongoing, multi-year study gathering information on a number of patients who had an anomalous pulmonary artery origin from the ascending aorta that undergo surgical repair without the use of cardiopulmonary bypass. This study began 2 years ago with 2 patients currently enrolled in the study. The median age when surgical repair was performed is 3.5 weeks with clinical presentation and diagnosis occurring within the first few days of life. Follow-up is being conducted on said patients with no complications to date. **Results:** The 2 patients currently enrolled in this study had successful repairs without use of cardiopulmonary bypass during surgery, with close attention to proper anesthetic management during the operation. This is a novel approach and thus far has proven to be effective. However, follow-up and further studies in additional patients are needed. **Conclusion:** In this case series, we describe a 4 week old infant who underwent successful repair of an anomalous origin of the left pulmonary artery—the first neonate to undergo this procedure without use of cardiopulmonary bypass. Our second case was also successful in surgical repair without bypass; both surgeries proceeded without complications. Although further studies are warranted, these clinical cases demonstrate that avoiding the invasive use of cardiac bypass is possible with appropriate anesthetic management and meticulous surgical care.

### **Mechanisms regulating the hippocampal taurine transporter protein in rat brain**

Amanda Freeman; Jim Olson, PhD

*Presenting Author:* Amanda Freeman

*Faculty Mentor:* Jim Olson, PhD

*Previous submission:* Society for Neuroscience 42<sup>nd</sup> Annual Meeting, New Orleans, LA, October 2012

*Poster Number:* 16

**Objective:** We hypothesize that neuronal TauT activity is regulated by a TK signaling pathway whereas astroglial TauT activity is regulated by serine/threonine kinases. This differential

regulation contributes to neuronal volume regulation and astrocytic swelling via taurine redistribution during cytotoxic brain edema. **Background:** In cytotoxic edema, net efflux of taurine from neurons and accumulation by astrocytes contributes to neuronal volume regulation and astrocytic swelling. Taurine is accumulated in both cell types by a sodium- and chloride-dependent 72-75 kDa protein transporter, TauT. TauT functional activity decreases in osmotically swollen neurons but is unaltered in swollen astrocytes, in vitro. This swelling-induced downregulation of neuronal TauT activity is blocked with the tyrosine kinase (TK) inhibitor, genistein. In contrast, PKC activation has no effect on neuronal TauT, but inhibits astrocytic TauT. **Methods:** Primary neuronal and astrocytic cultures from rat hippocampus were incubated under iso- or hypo-osmotic conditions in the presence or absence of activators or inhibitors of TK or PKC. Subcellular TauT localization was measured after 30 min using cell fractionation, cell surface biotinylation and western blot analyses. Phosphorylation was measured after 30 min using immunoprecipitation and western blot analyses with phosphoprotein-specific antibodies. **Results:** We found neuronal and astroglial TauT primarily localized to cytosolic and membrane/particulate fractions in isoosmotic conditions. However, cell surface biotinylation of TauT decreased in swollen neurons while phosphorylation of tyrosine residues increased. In contrast, phosphorylation of serine and threonine on neuronal TauT was unchanged. Surface biotinylation decreased and phosphorylation of serine and threonine residues on astrocytic TauT increased upon treatment with 1  $\mu$ M PMA. Cell surface biotinylation and phosphorylation of TauT in astrocytes were unaffected by cell swelling. **Conclusion:** The results suggest the signal for neuronal TauT translocation from the cell membrane during hypoosmotic cell swelling involves tyrosine phosphorylation. Membrane localization of astroglial TauT remains unchanged during hypoosmotic cell swelling. These changes may account for the observed reduction in functional TauT activity in swollen neurons and may contribute to neuronal volume regulation during cytotoxic edema.

## **Indirect Video Laryngoscopy to Achieve Airway Access In Documented Difficult Airways**

Marc Gelpi; Eric Vangeloff; Jason Miller; Amol Soin, MD, MBA

*Presenting Author:* Marc Gelpi

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* WSU BSoM 4<sup>th</sup> Annual Medical Student Research Symposium, Dayton OH, April 2012

*Poster Number:* 54

**Objective:** Should a new airway algorithm be developed to include indirect video laryngoscopy?

**Background:** The process of securing the airway is necessary in order to adequately anesthetize and place the patient on mechanical ventilation. Traditionally, this has been performed with a technique known as direct laryngoscopy. This technique requires a direct line of sight through the mouth, pharynx, and larynx to the opening of the glottis. In cases with non-complicated airways this method has shown to be successful; however, patients often present with underlying pathology such as trauma, tumors, infection, congenital abnormalities or obesity causing a difficult airway (Rose, 1994). A difficult airway has been defined as the clinical situation in which a conventionally trained anesthesiologist experiences difficulty with face mask ventilation or the upper airway, difficulty with tracheal intubation, or both (Anesthesiology, 2003). A technique called indirect video laryngoscopy has arisen presenting an alternative to direct laryngoscopy. In this technique, the physician inserts a laryngoscope, equipped with a camera at the tip of the blade, into the oral cavity and is then able to visualize on a screen where to place the endotracheal tube. These devices give the anesthesiologist a vantage point that is not possible using direct laryngoscopy. The current airway algorithm for patients with a difficult airway involves attempting direct laryngoscopy first. **Methods:** Multiple observational case studies by Dr. Amol Soin using indirect video laryngoscopy in the management of difficult airways were examined. A PubMed literature search was conducted using the following MeSH terms: “Airway”, “Intratracheal Intubation” and “Laryngoscopy”. Additional search items

included: “Difficult Airway”, “Factors Affecting Intubation” and “Practice Guidelines”. From this selection, relevant articles were reviewed, including randomized controlled trials, observational studies and review articles. In addition, a manual review of bibliographies was conducted for relevant articles. An article from the American Society of Anesthesiology proceedings was included. **Results:** The observational case studies provided by Dr. Soin indicated that indirect video laryngoscopy was required in order to successfully intubate patients with difficult airways. A recent study of 6276 video laryngoscopic intubations was performed over a 2 year period by 13 anesthesiologists from the Department of Neuroanesthesia at the Neurologic Institute Carlo Besta in Milan. This group used the GlideScope and combined it with the the El-Ganzouri simplified risk index (EGRI) to produce a new difficult airway management algorithm. Their algorithm called for using indirect video laryngoscopy as a first line method in documented difficult airway. The unexpected result of this study was a 100% success rate intubation using the GlideScope video laryngoscopy (Caldiroli, 2004). A systematic review conducted by Healy et al looked at the role of video laryngoscopy in successful intubation and found that while the evidence is limited, in patients at higher risk of difficult intubation, video laryngoscopy is recommended (2012). It must be noted that the evidence for efficacy for indirect video laryngoscopy in the patient with the difficult airway is limited. The existing evidence is primarily a combination of randomized prospective and observational data, and is limited by poor subject classification and diverse outcomes. Despite these limitations, evidence supports the efficacy of indirect video laryngoscopy in the management of the difficult airway (Healy et al, 2012). **Conclusion:** Analysis of the observational case studies provided by Dr. Soin and the literature searches yielded the result that indirect video laryngoscopy is an important tool in the management of the difficult airway. In light of this data, it is reasonable to reexamine the current algorithm for the management of patients with difficult airways; however, cost benefit and risk benefit analysis will need to be analyzed before it is clear that indirect video laryngoscopy

should be a first line modality in patients with documented difficult airways.

### **Failed Vascular Repair after Direct Laceration of the Popliteal Artery During Total Knee Arthroplasty - A Case Report**

Cody Green; Homayoun Mesghali, MD; Emmanuel K. Konstantakos, MD

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*Faculty Mentor:* Homayoun Mesghali, MD

*Previous submission:* WSU BSoM Central Research Forum, Dayton, OH, November 2012

*Poster Number:* 30

**Objective:** To describe a direct injury of the popliteal artery during a total knee arthroplasty (TKA) and the complications that follow a failed repair. **Background:** Direct injury of the popliteal artery during a TKA is a rare event that usually has a good prognosis following vascular repair. **Case Presentation:** We present a case report of direct laceration to the popliteal artery during a total knee arthroplasty in which the vascular repair failed due to thrombosis, leading to compartment syndrome and foot drop. **Discussion:** Review of injuries to the popliteal artery during TKA as well as a review of predisposing factors that increase a patient's risk of vascular complications during the procedure are presented. To our knowledge, there are few previously reported cases of direct damage to the popliteal artery during a TKA, and no other cases reporting thrombosis as a secondary complication to the failed initial repair. **Clinical Relevance:** Recommendations follow to avoid similar vascular complications during or following a total knee arthroplasty. Awareness of direct popliteal complications during TKA's that become more serious indirect complications will be identified and addressed in a timely manner.

### **Long Term Management of Back Pain via Thermal Radiofrequency Ablation of the Sacroiliac Joint**

Paul Gruber; John Herald; Vivek Yedavalli; Amol Soin; MD, MBA

*Presenting Author:* Paul Gruber

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* WSU BSoM 4<sup>th</sup> Annual Medical Student Research Symposium, Dayton OH, April 2012

*Poster Number:* 49

**Objective:** To discover the efficacy of radiofrequency ablation in management of chronic back pain in the sacroiliac joint refractory to other treatment modalities. **Background:** Sacroiliitis is a frequent etiology of individuals suffering from chronic lower back pain. This study is part of an ongoing multiyear clinical case study on treatment of sacroiliac (SI) joint pain. As a result, this abstract has updated information to report from that which was previously submitted. Pain in the SI joint can be caused by a number of mechanisms including regional trauma, dysfunctional movement, pregnancy, infection, inflammatory joint disorders, and degenerative arthritis. It is commonly associated with spondyloarthropathies. Though treatment modalities for sacroiliitis are heavily dependent on the cause of the condition, current options include anti-inflammatory and analgesic medications, physical therapy, injections of local anesthetic into the joint, and chiropractic manipulation. Radiofrequency ablation (RFA) has emerged as a promising treatment alternative for refractory cases of SI joint pain. In this method, thermal energy is delivered to the sensory neurons of the sacral nerve roots that innervate the SI joint (S1-4). There is considerable variability in the way that RFA may be performed, and there is a variety of equipment choices. The RFA method described here involves the use of a needle inserted near the joint to deliver heat to local sensory neurons. RFA is thought to provide durable pain relief by ablating or producing lesions in these sensory nerves. The proposed mechanism for pain reduction is thermal protein degradation inducing Wallerian degeneration in local sensory neurons. **Methods:** Building upon last years study where 2 subjects (n=2) were enrolled an additional 8 patients, for a total of 10 (n=10) patients, were treated with the SINERGY sacroiliac radiofrequency ablation (RFA) technique. Inclusion criteria included successful sacroiliac joint injection with lidocaine on two separate occasions achieving greater than 50% pain reduction. Participants had failed all treatment modalities with the exception of this local

anesthetic block near the sacral nerve roots which alleviated the pain temporarily. Traditional RFA utilizes a 20- or 22-gauge needle to create small lesions distal to the tip of the needle. With the large number and anatomical inconsistency of lateral branches from rami exiting the posterior sacral foramina, traditional RFA is impractical as it would require placing an excessive amount of needles into the patient. Alternatively, a single probe was used containing multiple electrodes placed parallel to the patient's sacrum to create a strip lesion across the S1-4 nerve roots. To confirm the absence of motor fiber contact, a test current of 2 milliamps at 2 Hz was first applied to the electrodes with observation for parasacral muscle twitching. After confirming motor activity absence, sensory testing was then carried out by delivering 50 milliamps at 0.5 Hz in order to reproduce the pain. With confirmation of appropriate probe placement, RFA lesion creation was performed at 80 °C for 90 seconds per site. Following completion of the procedure all patients were discharged home without complication. **Results:** The patients were seen in follow up at 2 weeks and 3 months after the procedure. Of the 10 study participants, all patients received pain reduction based on the Visual Analog Scale (VAS) with average scores dropping from 6.2 to 1.6 and average duration of pain reduction of approximately 13 months. Participants denied both motor weakness and excessive numbness. **Conclusion:** Future patient trials are planned, but this case series exhibits use of minimally invasive RFA in creating sacral nerve root lesions as a safe, effective, and durable treatment modality for back pain associated with sacroiliitis. To be more effective in management of back pain, further high-grade randomized controlled trials on RFA efficacy and safety are needed.

### **The Effect Of Statins On The Risk Of Developing Clostridium Difficile**

Flor Guerengomba; Salma Akram, MD; Ofor Ewelukwa, MD

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*Faculty Mentor:* Salma Akram, MD

*Previous submission:* None

*Poster Number:* 26

**Objective:** The aim of this study is to explore the hypothesis that statins play a protective role against the development of C.diff associated diarrhea, and reveals risk factors and comorbidities that play an important role in developing C. Difficile infection. **Background:** Clostridium difficile (C.diff) diarrhea is a devastating disease condition whose incidence has increased dramatically over the past two decades and has surpassed MRSA as the leading cause of hospital associated infections in the US<sup>1</sup>. Hospitalizations and mortality associated with C.diff in the US have increased by 237% and 230% respectively between early 2000 and 2009 making it the 9th leading cause of gastrointestinal death<sup>2</sup>. Cost associated with C.diff treatment is enormous accounting for over \$1.1b in 2009<sup>2</sup>. Risk factors associated with C.diff include increasing age, use of antibiotics, hospitalization and residence in long term care facilities<sup>3</sup> though evidence suggest increasing incidence in younger population as well as up to 27% of cases starting in the community<sup>4</sup>. Evolution of the disease has led to the emergence of hypervirulent strains which cause more severe and treatment resistant cases<sup>3</sup>. The mainstay of treatment is with the use of Metronidazole and Vancomycin though Fidoximicin has shown efficacy in reducing recurrence<sup>5,6</sup>. Fecal microbiota transplantation is effective in the treatment of refractory cases<sup>7</sup>, while addition of immunoglobulin to standard treatment has been shown to decrease recurrence<sup>8</sup>. The growing search for risk factors and prevention of C.diff has led to the hypothesis that statins predispose to the infection<sup>9</sup> while another study showed a 22% decrease in the rate of C.diff infection in patients on statins<sup>10</sup>. Statins appears to have a beneficial role in sepsis probably due to its pleiotropic properties such as anti-inflammatory, antioxidant and immunomodulation<sup>11-15</sup>. **Methods:** This will be a matched case-control study using data from the Dayton VAMC to identify all the patients above 18 years admitted with laboratory confirmed ICD-9 code 008.45 diagnosis of C. diff diarrhea between 2000 and 2011. Cases will be divided into community onset and healthcare facility onset. Community onset will be those without healthcare facility or nursing home contact that were admitted with diarrhea that started prior to admission up till 5 days into hospitalization. Healthcare facility onset will be

those admitted with recent history of contact with healthcare facilities, nursing homes or those with symptom onset after 5 days of admission. Controls will be those admitted with other diagnosis matched for age (within 10 years), race, gender, date of admission and medical co-morbidities. Using the computerized pharmacy records on CPRS, the medication history will be assessed to determine the use of statins among both cases and controls. Statin exposure will be considered for those with any history of statin use prior to admission. Statins to be considered will include Simvastatin, Atorvastatin, Pravastatin, Lovastatin, Fluvastatin, Cerivastatin and Rosuvastatin. Data on potential confounders such as age, gender, and race will be collected as they are known to influence statin prescription and use 16-19. Other variables that will be collected include history of smoking, alcohol, BMI and medical co-morbidities like coronary artery disease, atrial fibrillation, hypertension, diabetes mellitus, chronic kidney disease and malignancies. Adequate sample size calculation will be done to detect a 22% reduction in the risk of developing C.diff among patients taking statins. Crude and odds ratio for mortality will be calculated using conditional logistic regression. SPSS will be used for the statistical analysis and a p-value of < 0.05 will be considered statistically significant. **Results:** A total of 22 patients were reviewed, and 19 patients have at least one episode of C. Difficile infection with an average BMI of 36.29. All 19 patients are male only one is a female. Four patients are African American while 15 patients are Caucasian. Among the 19 patients with C. Difficile, 5 patients have a recurrence with an interval of 2 months between the first and second C. Difficile infection. Among the 19 patients, 9 patients were taking statin (Atorvastatin or simvastatin) when they have an infection with C. Difficile. In other word, 47% of patient with C.difficile infection were taking Statin. Among 19 patients that have C. Difficile infection, 13 have DM, 15 have Hypertension, 15 are using alcohol, and 13 are smokers. From this data, it can be said that there is positive association with alcohol use, smoking, DM, and HTN and development of C. Difficile infection. Among 19 patient with C. Difficile, 5 patient have CHF, 3 patients have COPD, and 6 patients have CAD; thus C. Difficile infection is not correlated with comorbidities such

as CHF, COPD, and CAD. Among 19 patients with C. Difficile, only 2 patients are using inhaled steroid, and only 3 patients are using oral steroids. Therefore steroid does not play any effect in developing C. Difficile infection. **Conclusion:** In conclusion, current studies did not show conclusive protective effect of statin in developing C. Difficile infection and recurrence. High BMI (>30), HTN, DM, alcohol, and smoking have a strong effect in developing C. Difficile infection. However, only 19 patients are reviewed without controls; thus, more patients need to be reviewed for a conclusive result.

### **Yield of Alpha fetoprotein on Patients with Hepatocellular Cancer in Veteran Population**

Eric Hard; Joseph Baber, DO; Salma Akram, MD

*Presenting Author:* Eric Hard

*Faculty Mentor:* Salma Akram, MD

*Previous submission:* None

*Poster Number:* 25

**Objective:** To study the yield of AFP levels in patients with HCC at time of diagnosis and determine its impact on HCC associated mortality. We propose that increased AFP levels will be associated with higher mortality. **Background:** Patients with cirrhosis of varied etiologies are threatened with risk of hepatocellular carcinoma (HCC) to warrant interval screening. With its rapidly increasing incidence in the US since 2000, it remains the most common primary malignancy of the liver. HCC is now increasingly recognized at a much earlier stage as a consequence of the routine screening of patients with known cirrhosis with serum alpha fetoprotein (AFP) and imaging studies of liver. The role of AFP tumor marker as a screening modality has been called into question because of its limited sensitivity and was removed from the most recent American Association of Society for Liver Disease (AASLD) practice guidelines recommendation. Recent data indicates that AFP holds particular prognostic value on survival among patients with hepatitis C related HCC. We aim to study the yield of AFP levels in patients with HCC at time of diagnosis and determine its impact on HCC associated mortality. We propose that increased AFP levels will be associated with higher mortality. **Methods:** This was a retrospective study. After IRB approval, all

patients diagnosed with HCC at Dayton VA Medical Center between January 2000 to December 2010 were identified through the electronic patient database. Various demographic, imaging, laboratory, and treatment information was abstracted from electronic records. Our objective was to compare variables including AFP levels in patients with HCC to identify prognostic information. **Results:** We identified 63 patients with the diagnosis of primary HCC who underwent AFP testing in a 10-year period from January 2000 to December 2010 at Dayton VAMC. All the identified study subjects were male, 38/63 (63%) white, 21/63(35%) black with no identified racial group in the remainder. The median age at diagnosis was 60 years. Twenty nine (46%) patients had positive serology for hepatitis B virus infection and 40 (63%) were positive for hepatitis C virus (HCV). Among patients with HCV, genotype was available in 28/40 (70%) with 25/28 (89%) patients with genotype 1 and 3/28 (11%) patients with genotype 3a. The median AFP level at diagnosis was 18.9 ng/mL (Range <5 to 26191 ng/mL), 25/63 (40%) with AFP levels <10ng/mL, 23/63 (37%)  $\geq$ 10 to 100 ng/mL, 1/63 (2%)  $\geq$ 100 to 200 ng/mL and 13/63 (21%) had AFP levels >200ng/mL. The average tumor size was 6 cm with 48/63 (76%) patients having tumor greater than 2 cm. About one-third patients 19/63 (30%) had tumor size  $\geq$ 6cm and 20/63 (32%) had multifocal HCC at diagnosis. Patients with tumor  $\geq$ 6 cm and those with multifocal HCC were more likely to have higher levels of AFP. Forty seven (75%) patients died during the study period. The median survival following diagnosis of HCC was 3 months in patients with  $\geq$  6 cm tumor vs. 10 months in those with tumor <6 cm. HCC was treated with locoregional therapy including trans-arterial chemoembolization and/or by radiofrequency ablation in 43/63 (73%) patients. Systemic chemotherapy with Sorafenib was used in 10/63 (16%). Only three patients underwent surgical resection. AFP level >200ng/ML at diagnosis was not associated with higher mortality. **Conclusion:** In this cohort of veteran population serum AFP level at the time of HCC diagnosis was not a predictor of mortality or response to therapy.

## **Ultrasound Mapping for Placement of a Long Term Neurostimulation and Postoperative Nerve Healing**

Willie Harrington; Vivek Yedavalli; Amol Soin, MD, MBA

*Presenting Author:* Willie Harrington

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* None

*Poster Number:* 45

**Objective:** Utilizing Ultrasound Guided Imaging for Pre and Post Operative of Neurostimulation Cuff. **Background:** Continuing from an ongoing ultrasound study, we wanted to identify the potential affects of ultrasound-guided neurostimulation of the peripheral nerves of the lower limb. After successful high frequency nerve stimulation with the implanted nerve cuff, we monitored subjects for 30 days postoperative. This pilot study (n=5) focused to determine if there were any pathological changes with the healing nerves (edema, swelling, or scarring to the nerve or change in diameter). Cuff electrode placement was achieved by undergoing surgical dissection to expose the targeted peripheral nerves. After this minimally invasive procedure, we employed a post-operative screening ultrasound to identify the target nerve for healing. **Methods:** From a continual ongoing study, nine lower-limb amputees with chronic and severe residual limb pain who attained pain reduction after local anesthetic injection were enrolled to date. A spiral-type nerve cuff electrode was placed on the sciatic nerve in above-knee amputees, or tibial and common peroneal nerves in below-knee amputees, during a 30-min surgery under general anesthesia. In order to place the cuff electrode, surgical dissection is required. In the preoperative holding area a linear 7.5 MHz ultrasound probe was placed on the posterior aspect of the amputated limb. In the below knee amputees, the probe was placed over the popliteal fossa near the site of screening local anesthetic injection. In above knee amputees, the probe was placed over the sciatic nerve. Using the ultrasound probe, we were able to preoperatively determine the depth and location of the peripheral nerves and the patient was marked with the nerve location and depth prior to surgery. Postoperatively 5 subjects were furthered enrolled in 30 day imaging study. Utilizing the same

ultrasound probe, we monitored the healing progression of the patients. **Results:** Building upon last years study where 5 subjects (n=5) were enrolled in a short term 30 day study of high frequency stimulation we present the usage of a screening ultrasound to map peripheral nerve and vascular tissue prior to implantation of the nerve cuff. This data served to compliment the previous ultrasound mapping study, in that an additional end point in this subset of patients was a screening ultrasound after explanation of the nerve cuff to determine if there was any post operative edema, swelling, scarring to the nerve or change in nerve diameter. 5 patients who were implanted for a short-term nerve cuff implantation received a screening ultrasound map to determine location and depth of nerve cuff placement. After 30 days of testing the nerve cuffs were removed. Then post operative ultrasound mapping of the nerves were completed specifically to determine if there was any post operative edema, swelling, scarring to the nerve or change in nerve diameter. In all 5 subjects the nerve diameter remained the same and there was no edema or swelling or scarring noted. With the previous study, cuffs ultrasound guidance was successful in identifying the target nerves preoperatively in the study. This allowed for faster dissection in addition smaller incisions, and provided the surgical team with significant anatomical knowledge to facilitate cuff placement. By continuing the use of ultrasound guidance, further monitoring can be conducted to evaluate the nerve(s) that have been treated. **Conclusion:** Pre and post-operative ultrasound screening are effective modalities to help image nerve tissue. Additionally it helps with pre surgical planning as well as post-operative evaluation of nerve integrity. Ultrasound allowed us to assess for any nerve damage after cuff implantation was completed. Ultrasound mapping potentially allows for a more targeted, efficient and easier dissection to expose peripheral nerves and facilitate placement of a peripheral nerve cuff electrode.

### **What are the radiologic findings of a lysosome storage disease in a 2-year-old boy?**

Shaina Hecht; Dawn Light, MD, MPH

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*Faculty Mentor:* Dawn Light, MD, MPH

*Previous submission:* None

*Poster Number:* 32

**Objective:** What are the radiologic findings of a lysosome storage disease in a 2-year-old boy?

**Background:** Hunter syndrome (MPS type 2) is an X-linked recessive inherited mucopolysaccharidosis in which an iduronate-2-sulfatase deficiency causes lysosomal accumulation of glycosaminoglycans (GAGs), specifically dermatan sulfate and heparan sulfate, in the brain, spinal cord, liver, kidneys, bone, connective tissue, and spleen. Clinically, patients with the severe form of Hunter syndrome will begin to show symptoms beginning at the age of 18 months and up to 4 years of age. Facial dysmorphism may be the initial physical exam finding, typically described as coarse facies. Neurological pathology manifests as conductive/sensorineural deafness and seizures. Enlarged tonsils, adenoids, and tongue are common, leading to upper airway obstruction. Hepatosplenomegaly and umbilical hernias are seen, as well as valvular abnormalities. Patients may have kyphosis of the spine, macrocephaly, contractures, or dysostosis multiplex resulting in decreased range of motion and stiffness. Patients usually succumb to their illness in their teens due to respiratory or cardiac involvement. Atrophy and white matter lesions are seen on MRI in patients with Hunter syndrome. Flexion-extension radiography is useful to screen for atlantoaxial instability. Skeletal surveys may reveal thickened bones and irregular epiphyseal ossification, which leads to growth retardation later in life. A urine GAG assessment (quantification and electrophoresis) is the screening test of choice. Along with enzyme replacement therapy, treatment involves improving quality of life, including cardiac valve replacements as it becomes necessary, physical therapy, and hearing aids. **Case Presentation:** A 2-year old boy was referred to genetics clinic because of concern for a mucopolysaccharide disorder. His aunt had a son with Hurler syndrome and noted that the patient had a similar facies. Past medical history is significant for upper airway congestion and two episodes of otitis media, and surgical history is significant for adenoidectomy and bilateral pressure equalizer tube placement on three separate occasions. On initial presentation, the patient was happy and engaged, in no

distress. Facies showed frontal bossing and mildly course facial features. Liver edge was felt 4cm below the R costal margin. Musculoskeletal exam revealed mild limitation of pronation and supination of the arms. On imaging, the abdominal ultrasound showed hepatosplenomegaly. The skeletal survey revealed a J shaped sella, short and wide long bones, anterior beaking of the L1 vertebral body, and widened metacarpals with inferior pointing. Cranial MRI showed a thin corpus callosum, areas of cystic change in the superior medial margins of the lateral ventricles, a mega cisterna magna, and abnormal T2 uptake. An echocardiogram was completed, which revealed an abnormal mitral valve with mild mitral valve insufficiency. Urine mucopolysaccharide levels were elevated, serum iduronate-2-sulfatase enzyme activity was markedly low, and alpha iduronidase activity was normal. A diagnosis of Hunter syndrome was obtained and patient is to receive weekly infusions of Elaprase (idursulfase) indefinitely and follow up with his specialists and pediatrician regularly. **Discussion:** Upon review of this patient's history, it became clear that he clinically fit the picture of Hunter syndrome before the diagnosis was ever entertained. By the age of 33 months, he had been seen and examined by at least two physicians and had surgery on four separate occasions. On physical exam, he exhibited at least three abnormal findings for his age, all of which are classically seen in Hunter syndrome. However, his diagnosis was not determined until appropriate laboratory tests and radiology images were ordered. While the quantifications of urine mucopolysaccharide levels and serum enzyme activities was the best evidence for his diagnosis, radiographic findings correlated strongly to his laboratory findings when considering the diagnosis of Hunter syndrome. **Clinical Relevance:** Because routine newborn screening has not yet been instituted for this disease, a high index of suspicion is critical in patients who may simply present with a constellation of several routine pediatric problems that could better be explained by a single common denominator. Recurrent respiratory infections, snoring, umbilical or inguinal hernias, joint stiffness, and behavioral concerns can be benign alone, but may represent a single diagnosis when they present in a single patient. Due to the non-

specific signs and symptoms of Hunter syndrome, it is possible that a diagnosis may be delayed until after severe organ damage has occurred. It is essential that primary care providers know when and what to order if presented with a patient with a similar clinical picture, as well as inquire about family history of any lysosome storage diseases. Hunter syndrome is an excellent example of a disease that is best treated with a multidisciplinary approach, including the patient's pediatrician, geneticist, otolaryngologist, cardiologist, physical therapist, and radiologist.

### **All-Terrain Vehicle Injuries: A Comparison with Motorcycle Injuries**

Christopher Heid; Ronald Markert, PhD; Priti Parikh, PhD; A. Peter Ekeh, MD, MPH

*Presenting Author:* Christopher Heid

*Faculty Mentor:* A. Peter Ekeh, MD, MPH

*Previous submission:* WSU BSoM Central Research Forum, Dayton, OH, November 2012

*Poster Number:* 15

**Objective:** The purpose of this study is to compare the morbidity and mortality between all-terrain vehicles and motorcycles. **Background:** Motorcycle (MC) use is associated with more injuries and deaths than regular automobile use and is accordingly regulated by licensure requirements. Nationwide, All-Terrain vehicles (ATVs) are minimally regulated and have no age limit for use on public lands. We compared injuries occurring from MC vs. ATVs, hypothesizing that the reduced ATV regulation would translate to worse injuries and involve younger patients. **Methods:** All ATV and MC trauma patients admitted a Level I Trauma Center over a five year period (January 2006 to December 2010) were identified. Variables recorded included age, gender, vehicle, helmet use, injury severity scale (ISS), length of stay (LOS), intensive care unit days (ICU), and mortality rate. Injuries were noted based on location; i.e., head, face, spine, chest, abdomen, pelvis, upper extremity and lower extremity. Independent samples t-test analysis was used to compare age, ISS, LOS, and ICU. Pearson chi-square analysis was used to compare gender, discharge status, and injury location. **Results:** In the studied period there were 1133 MC injuries and 247ATV injuries. The mean age was



significantly lower in the ATV group, MC (41.8 yrs) versus ATV (32.4 yrs),  $p < 0.001$ . This suggests that children and young adults are disproportionately involved in ATV trauma. The MC group had a higher injury severity than the ATV group (13.7 vs. 10.9 with  $p < 0.001$ ). Overall hospital LOS and ICU length of stay were also significantly higher for MC injuries than ATV injuries ( $p < 0.001$ ). We, however, observed that helmet use was less frequent in the ATV (23.6%) than the MC (31.8%) cohort and so higher incidence of head injuries with ATV. **Conclusion:** MC injures are more prevalent and severe at our Level I Trauma center than those resulting from ATVs. ATV injures however involve a younger population, are associated with less helmet use and more head injuries. Given the younger population and the incidence of head trauma in ATV trauma, implementation of helmet laws and/or increase education and safety training programs for ATV riders would be useful in reducing injuries.

### **3 Dimensional Reconstruction as a Technique to Enhance Image Quality in Discography**

John Herald; Uloma Oziril; Laura Devita; Cole Budinsky; Amol Soin, MD, MBA

*Presenting Author:* John Herald

*Faculty Mentor:* Amol Soin, MD

*Previous submission:* WSU BSoM 4<sup>th</sup> Annual Medical Student Research Symposium, Dayton OH, April 2012

*Poster Number:* 51

**Objective:** To advance traditional provocative discography by utilizing high-powered, colored, three-dimensional CT images to better characterize disc morphology for diagnosis of discogenic pain. **Background:** Provocative discography is an invasive diagnostic procedure employed to determine the etiology of chronic low back pain in patients who are undiagnosed after more conservative measures. It is also utilized to select patients for surgery and to attain which disc levels to operate upon. Using fluoroscopy, dye is injected into the nucleus pulposus of the suspected diseased discs with two objectives. The first is that the patient will experience pain if the disc is compromised as the dye is chemically irritating to the nerve fibers and the fluid causes mechanical distension. Secondly, CT scan or plain

radiographs are taken after injection allowing for visualization of disc morphology. The test is unique in that it provides both functional and anatomic information and allows correlation of symptoms with disc morphology. This study examined the use of a 64 slice cardiac CT scan with three-dimensional image reconstruction that allows better resolution and manipulation of the images. **Methods:** This study is part of an ongoing multiyear clinical case study. As a result, this abstract has been updated with new information reported compared to the prior. Last year, we attempted a pilot study to reconstruct 3 dimensional images of post contrast CT discography. A 44-year-old white male presented to the outpatient pain center with complaints of lower back pain that occasionally radiated to the bilateral buttocks but never extending below the thighs. A presumptive diagnosis of discogenic pain was made by a neurosurgeon and provocative discography was requested. The patient underwent traditional discography using fluoroscopy and, immediately following the fluoroscopy, was sent to obtain CT scanning. Building upon last years study, two additional patients received post discography CT scanning. The CT was a high-powered, 64-slice scan, which allowed image reconstruction using color three-dimensional technology. The images could then be manipulated through the rotation and removal of spinal tissue to obtain colored, three-dimensional images of the epidural space, the intervertebral disc, and the morphology of the spine. Additionally, we were able to create an animated visual tour of the spine and intervertebral disk. **Results:** While the images are significantly enhanced and in color, we are still not able to obtain any additional or new information compared to 2 dimensional black and white images. However, given the dramatic images and improved visualization coupled with the fact that the first subject enrolled ( $n=01$ ) was the first reported case using 3 dimensional color enhancement for diagnostic discography, the original author filed a provisional method patent on the technique. **Conclusion:** Using a high powered 64-slice cardiac CT scan to reconstruct colored three-dimensional images with provocative discography has promise in advancing the diagnosis and treatment of disc disease by allowing innovative views of disc morphology.

Thus far we have not been able to increase the diagnostic yield of provocative discography using the reconstructed 3 dimensional colored images, but further research on more subjects is needed to fully characterize the utility of this technology.

### **Creating a Culture of Interactive Feedback: An Assessment of Current Trends and Hurdles**

Ankush Kalra; Karen Kirkham, MD

*Presenting Author:* Ankush Kalra

*Faculty Mentor:* Karen Kirkham, MD

*Previous submission:* None

*Poster Number:* 11

**Objective:** What is the current perception of the practicality and usefulness of the current evaluative feedback system in the Internal Medicine Clerkship at Wright State, and what aspects of the system must be targeted to remedy it's flaws? **Background:** Evaluative feedback is a critical aspect of the learning process for third year medical students on their clerkships. While the Internal Medicine clerkship at Wright State has often been praised as a very valuable learning experience, there have been many reports of frustration with the current evaluation system, from both students and evaluators. The Global Clinical Performance Rating (GCPR) is currently the primary measurement for assessing performance and progress within the six ACGME core clinical competencies, yet studies have consistently demonstrated that this tool has a low inter-rater reliability at 0.41. At the same time, a feedback effect size of 0.79 has been demonstrated in 12 meta-analyses, with the largest effect size coming from the provision of information around a specific task; this emphasizes the central importance of structured, formative feedback in medical education. **Methods:** Original surveys examined the perceptions of 51 current third year medical students in Wright State's class of 2014, and a similar survey was administered to 34 current Internal Medicine residents and attendings who have worked with and evaluated these students. Subjects were surveyed on quality and practicality of feedback, preferred feedback methods, and frequencies of setting educational goals, observation around clinical tasks, and seeking to give or receive feedback. **Results:** When looking at rates of discussing and setting

educational goals, students reported that this never or rarely occurred 37.3% of the time, while another 37.3% said this occurred sometimes. 78.8% of evaluators, on the other hand, reported that goal-setting occurred sometimes, often, or always. 94.2% of students stated that they sometimes, often, or always sought feedback, whereas 42.4% of evaluators reported that students rarely sought feedback. When considering evaluators approaching students for feedback, 43.3% of students stated that this never or rarely happened while 57.6% of evaluators stated that they often or always sought students for feedback. When surveyed on most effective feedback methods, 74.5% of students and 84.8 % of evaluators reported that oral feedback is the most useful method of feedback. Online evaluations were reported to be the least useful method by 58.8% of students and 59.4% of evaluators, while 25% of both students and evaluators reported self-reflection to be the least useful method. **Conclusion:** The data demonstrated that student and evaluator perceptions about quality and practicality of feedback are mixed, although more than half agree that quality and practicality is at a high level. Evaluators appeared to overestimate the frequencies of setting goals with students and observing them around clinical tasks when compared to student reports. Reports on seeking to receive and provide feedback were even more significant, with students reporting markedly higher rates of seeking feedback when compared to evaluator perceptions. Clearly, the most significant piece of data from the results is the agreement students and evaluators with regards to oral feedback being the most useful feedback method and online evaluations being the least useful. Interestingly, self-reflection was deemed least useful by 25% of both students and evaluators. It is clear that efforts must be made to replace the culture of electronic feedback with one of more personal and goal-directed, oral feedback. At the same time, methods of feedback such as self-reflection appear to be undervalued by students and evaluators, when such reflection has been demonstrated to be very effective, especially when combined with the setting and reassessment of goals.

## A "Twist" on Abdominal Pain: Volvulus of the Small Intestine in a 46-Year-Old Woman

Jared Klein; Kate Baxstrom; Stephen Donnelly; Patrick Feasel; Paul Koles, MD

*Presenting Author:* Jared Klein

*Faculty Mentor:* Paul Koles, MD

*Previous submission:* None

*Poster Number:* 31

**Objective:** Small Bowel Volvulus: Case Report and Review of the Literature. **Background:** Small bowel volvulus (SBV) is defined as torsion of a loop of small bowel about the axis of its mesentery, resulting in partial or complete obstruction. SBV is a rare cause of small bowel obstruction in Western countries, comprising 1-6% of cases. SBV may be primary, without any underlying anatomic abnormalities or known predisposing factors. In adults, SBV is most often secondary to post-surgical adhesions, fibrous bands involving the mesentery, or congenital malrotation of the small bowel. In patients with clinical evidence of small intestinal obstruction, the diagnosis of SBV may be suggested by abdominal multislice CT scan that demonstrates the "whirl sign" due to twisting of the small bowel, mesentery, and mesenteric vessels. SBV may lead to ischemic necrosis of the bowel, underscoring the necessity of prompt diagnosis and surgical intervention. Mortality rates vary depending on time delay before surgical intervention, but overall mortality ranges from 10-38%. We present a case of a 46-year-old woman whose clinical evaluation did not lead to surgical intervention, resulting in death due to complications of small bowel infarction. **Case Presentation:** A 46-year-old African American woman presented to the emergency department because of acute, sharp and severe, lower abdominal pain of four hours duration. She had associated nausea and vomiting, which was non-bloody and non-bilious. Her past medical history was significant for hypertension and past surgical history included hysterectomy (for leiomyomas), unilateral oophorectomy, and appendectomy. Physical exam showed a soft, nondistended, non-tender abdomen with no masses or guarding. The woman was tachycardic and had a BP of 130/90 mmHg. **Laboratory studies:** AST, ALT, alkaline phosphatase, lipase, and electrolytes

within normal limits. Complete blood count showed WBC 10,300/ $\mu$ L with 88% neutrophils, otherwise within normal limits. The patient was given one liter of normal saline, dilaudid, phenergan and ondansetron. She was discharged 4 hours after arrival and told to follow up with her primary care physician and to return to the ED if symptoms worsened. The patient presented to another emergency department seven hours later with continuing abdominal pain that had begun 15 hours earlier. Her physical exam was significant for positive rebound tenderness and epigastric guarding. Bowel sounds were present, and the abdomen was not distended. Lipase, amylase, AST, ALT, alkaline phosphatase, and total bilirubin were again within normal limits. A right upper quadrant ultrasound was performed and interpreted as negative for gallbladder, common bile duct, or pancreatic pathology. The patient was treated with a liter of normal saline, morphine, and ondansetron. Her family asked for something "to calm her down"; she was given compazine and diphenhydramine. She was discharged four hours after arrival and told to call her doctor for a follow-up appointment. That evening at home, the patient spoke by phone with a relative who felt she was confused and not responding appropriately. When the relative came to the patient's home, the patient was found to be unresponsive, with bloody emesis on and around her body. **Pathologic Findings:** Postmortem exam revealed acute hemorrhagic necrosis of a 60 cm. long segment of jejunum secondary to volvulus. The mesentery and necrotic segment were twisted and tethered under a thick band of elastic connective tissue in the posterior upper abdomen. The band was located 10 cm. inferior to the edge of the liver's right lobe and 4 cm. right of midline. Duodenum and jejunum proximal to this segment were dilated. The necrotic segment showed diffuse thinning of the muscularis propria and transmural dark purple discoloration. There were no masses, ulcers, scarring, or perforations. Mild fibrous adhesions were found in the lower abdomen and pelvis. **Discussion:** Volvulus is a special form of mechanical intestinal obstruction. It results from abnormal twisting of a loop of bowel around the axis of its own mesentery causing vascular insufficiency, resultant ischemia, and tissue hypoxia. The mechanism of primary SBV has been correlated with the

ingestion of a large amount of fiber-rich food in a short time. The subsequent forceful small bowel peristalsis is believed to be the cause of primary SBV. Secondary causes are numerous and include post-surgical adhesions, malrotation, and congenital fibrous bands. Adhesions are the most common cause in adults; congenital fibrous bands are rare and typically cause symptomatic obstruction in children. Depending on the etiology, intestinal volvulus may present as a closed-loop obstruction in which a segment of bowel is occluded at two points along its length resulting in fluid sequestration and gas production due to bacterial overgrowth. Substantial increases in intraluminal pressure and dilation of the bowel segment further compromise vascular supply to the intestinal wall (strangulating obstruction), ultimately leading to hemorrhagic infarction, necrosis and perforation. **Conclusion:** Clinical Relevance: In summary, clinical clues to the diagnosis of SBV are often non-specific. In this case, causes for concern included the history of unremitting abdominal pain for at least 15 hours, persistent vomiting, the abdominal physical exam, and an absolute neutrophilia on presentation to the first emergency department. In the context of evaluating causes of acute abdominal pain, a CT scan is helpful. Surgical exploration is indispensable to confirm the diagnosis and prevent the death of the patient. In our case, the fibrous band causing volvulus was located at the mesenteric root of the ischemic segment of jejunum. While a congenital band is rare in adults, we favor this interpretation for two reasons. First, the band was anatomically isolated, located at some distance from the mild post-surgical fibrous adhesions identified in lower abdomen and pelvis. Second, its large size is difficult to explain as an acquired lesion, especially without a history of trauma or previous surgery in this anatomic site.

**Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccination and Influenza Vaccination of Pregnant and Postpartum Women**

Colleen McCormick; Sara Paton, PhD; Sherman Alter, MD

*Presenting Author:* Colleen McCormick

*Faculty Mentor:* Sara Paton, PhD; Sherman Alter, MD

*Previous submission:* Pediatric Academic Societies Conference, Boston, MA, April 2012; Proceedings of Joint Perinatal Nurse Manager's Meeting, Cincinnati, OH, May 2012; CityMatCH / Maternal Child Health Epidemiology Conference, San Antonio, TX, December 2012

*Poster Number:* 2

**Objective:** To determine Tdap and FLUV rates in pregnant and postpartum patients and identify factors associated with vaccination. **Background:** Infants <2 months are at greatest risk for morbidity/mortality from pertussis. Tdap vaccines given in late pregnancy or postpartum can protect infants from pertussis. Pregnancy increases risks for maternal and perinatal complications. Influenza vaccine (FLUV) given in pregnancy can protect women and newborns. **Methods:** Miami Valley Hospital delivery records from 01/2009-12/2011 were retrospectively reviewed. Data reviewed included age, insurance, race/ethnicity, and county of residence. Descriptive statistics analyzed prevalence of immunization, timing, and demographics. Chi-square and odds ratios detected differences between characteristics. **Results:** A total of 13704 charts were reviewed. Tdap was administered to 42%, with 93% vaccinated within 10 days after birth. Tdap uptake was significantly greater among younger mothers (49%,  $p=0.023$ ), those with government insurance (48%,  $p<0.0001$ ), and in black mothers (46.8%,  $p=0.023$ ). FLUV was given to 18% during the study period with 78% vaccinated between the third trimester and the 6-week postpartum visit. FLUV vaccination was significantly greater among mothers living within Montgomery County (19.4%,  $p<0.0001$ ) and among black (17.63%,  $p=0.008$ ) mothers. Vaccination rates for both Tdap and FLUV increased over the study period, from 30% to 53% and 11% to 23%, respectively. **Conclusion:** Despite current recommendations, only a minority received vaccinations during pregnancy or postpartum. Vaccination rates increased over time and with certain demographics. Improved strategies may increase FLUV and Tdap administration in this population.

## **A multidisciplinary approach to managing sports-related concussions in adolescents**

Natasha Mehta; Julie Miller, PsyD; Vismai Sinha, MD

*Presenting Author:* Natasha Mehta

*Faculty Mentor:* Vismai Sinha, MD

*Previous submission:* None

*Poster Number:* 33

**Objective:** To review the pathophysiology of concussions and overview the latest guidelines regarding concussion management. **Background:** The science of concussions is an evolving subject. Management decisions remain up to clinical judgment and individualization for each patient. Concussions are in the scope of practice of many medical professionals and specialties, therefore a proper understanding of pathophysiology and management is necessary for appropriate care. The definition of concussion is brain injury induced by biomechanical forces that cause complex and reversible neuropathological changes, which reflect a functional disturbance (versus structural). Treatment is brain rest. It is important to note that an athlete may not even begin the graduated Return to Play (RTP) protocol until concussive symptoms have disappeared and cognition is back to baseline. Cognitive recovery has been shown to more commonly follow clinical symptom resolution, suggesting that cognitive evaluation via neuropsychological testing is an important component of evaluation before RTP protocol. **Case presentation:** Pt is a 14 yo female cheerleader who landed directly on her forehead on the hard floor of a gym when she fell out of a back flip. No LOC. At the time of injury, she had an immediate headache, dizziness, lightheadedness, photo/phonophobia, and vision changes. A physician did not evaluate her until 3 weeks after the injury, during that time she continued to go to tumbling and cheer practice while experiencing symptoms. Pt first went to Dayton Children's and received a head CT, which was negative. One week after the CT, she presents to the sports medicine office with constant HA (rated 6/10), photo/phonophobia, nausea, dizziness, lightheadedness, more irritable, fluctuating sleep, poor concentration, and poor memory. On exam she is healthy appearing with trouble in concentration and postural stability. The

initial management of her concussion with half school days, no extracurricular activity, and nortriptyline was unsuccessful. Many factors needed to be addressed in this case. School compliance with academic accommodations was poor because the teachers had never before encountered this conservative approach to management. The teachers were receptive to information and education about concussions. Pharmacologic management with nortriptyline for sleep and headaches was unsuccessful in this patient, and acutely worsened her symptoms. At this time, she was two weeks into treatment, and six weeks post injury. She was diagnosed with Post-Concussion Syndrome, nortriptyline was stopped, and pt was referred for a Neurocognitive evaluation and Neurorehab assessment. Her results on the Neurocognitive evaluation were significantly poor, but validity was questioned due to effort measures, which could have been caused by significant emotional factors. A DPT in neurorehab assessed her to have "marked oculomotor, coordination, balance, and gait abnormalities." Vestibular rehabilitation recommended. Patient was unable to complete therapy due to insurance issues. With the ultimate participation of school and coaches, the patient's symptoms improved with decreased workload and no physical activity. At her final in office evaluation three months post injury, her only remaining symptom was a headache with improved concentration and postural stability. Once her headache disappeared, she began a graduated return to play protocol. **Discussion:** Although the young brain has a superior regenerative capacity compared to the adult brain, the childhood and adolescent brain is in fact more vulnerable to the effects of a traumatic brain injury (TBI) due to its increased neuronal activity during its development. This puts the young brain at a higher risk of cerebral swelling and structural injury. Various premorbid considerations and childhood developmental factors have been shown to have an effect on the injury and recovery. It should be noted that the childhood and adolescent brain response to injury and the various factors affecting outcome is an emerging area of research, and many of our working hypotheses are extrapolated from studies of children and adolescents who have sustained more moderate to severe TBIs. Symptoms of concussion can be somatic, cognitive, and/or

emotional in nature. 10-15% of patients have persistent symptoms (> 10 days) or Post-Concussion Syndrome, incidence is higher in females. These patients require a more rigorous and involved treatment plan. The pathophysiological changes after a concussion can persist for weeks, therefore close serial monitoring of patients is important. Neuropsychological testing can be employed to determine an athlete's ability to return to play. Physical, occupational, and/or speech therapy can also assist in individualizing the plan of care. Medications can help with symptoms. Nortriptyline is used off-label in patients with ongoing sleep disturbances and headaches that have not improved in the first few weeks of conservative management. Return to Play cannot be started until patient is asymptomatic off of medications. **Conclusion:** Clinical relevance: Early recognition of a concussion is important in a sideline evaluation. Assess attention and memory using a standardized assessment (SCAT2). Standard orientation questions have been found to be unreliable in sports settings. There is absolutely no case in which a child or adolescent should be allowed to return to play in the same day. Children and adolescents can have a delay in onset of concussion symptoms or experience Second Impact Syndrome. Therefore, Ohio is currently passing new legislation, to be enforced in April 2013, forbidding same day return to play in school-aged athletes with a suspected concussion. Management of a concussion in a school-aged athlete involves cooperation of the patient, family, school, coach, and medical specialists. This multifaceted-multimodal and multidisciplinary approach to managing sports-related concussions allows for dynamic and individualized care for each patient.

### **A Cost/Benefit Analysis of Indirect Video Laryngoscopy for Routine Intubations**

Jason Miller; Sarah Elswick; Eric Vangeloff; Cole Budinsky; Amol Soin, MD, MBA

*Presenting Author:* Jason Miller

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* None

*Poster Number:* 55

**Objective:** A Cost/Benefit Analysis of Indirect

### **Video Laryngoscopy for Routine Intubations**

**Background:** A total of 30 patients were enrolled in the study (n= 30) and they were split into 2 groups. 15 patients were selected into the direct laryngoscopy group and 15 for the indirect video laryngoscopy group. **Methods:** We looked at only the additional disposal costs and assumed the video laryngoscope is already available in most ORs as is the laryngoscopic equipment for direct laryngoscopy. **Results:** The current costs of reusable direct laryngoscopy equipment is nominal compared to the high costs of indirect laryngoscopy. **Conclusion:** There is clearly a cost savings for usage of traditional direct laryngoscopy. However, in cases of difficult airways such as Mallampati Class 3 airways, using a video scope has clear advantages for better visualization.

### **Right to Left Shunt During Anesthesia in Liver Transplantation: A Multiyear Clinical Case Series**

Abigail Monnig; Christoforos Frangopoulos; Cole Budinsky; Amol Soin, MD, MBA

*Presenting Author:* Abigail Monnig

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* None

*Poster Number:* 36

**Objective:** In patients undergoing liver transplant could screening for right to left shunt improve patient outcomes, oxygenation and organ perfusion? **Background:** The role of the transplant anesthesiologist is highly important in the preoperative assessment, intraoperative management, and postoperative care of these complex and sick patients, as there is potential for significant hemodynamic instability. Hall and Dhir describe that it is the role of the anesthesiologist to identify patients who may not be appropriate candidates for transplant or who need further treatment before coming to surgery. Hepatopulmonary syndrome (HPS) and portopulmonary hypertension (PPHTN) are examples of complications that can occur in patients with severe end stage liver disease. Hepatopulmonary syndrome is defined as a clinical triad of liver disease, increased alveolar to arterial oxygen gradient on room air, and evidence of intrapulmonary vascular

dilatations. Portopulmonary hypertension is defined as elevated PVR with low or normal cardiac output, and in severe cases, is a contraindication to transplantation. HPS has a prevalence of up to 30% in patients with end stage liver disease, and PPHTN has a prevalence of 2%. Both of these complications raise concern for the anesthetist and require pre-operative clinical evaluation for proper patient management. **Case Presentation:** Patient 1: A 55 year old male, with end stage liver disease secondary to alcoholic cirrhosis and Hepatitis C status post transjugular intrahepatic portosystemic shunt (TIPS), presented for a liver transplant. After a smooth, rapid sequence induction, the patient was positioned for central venous access. After several attempts in the right internal jugular and subclavian veins, it was found that the guide wire could not be advanced down the right side. The patient was successfully cannulated with three devices on the left side. It was unclear why the right side could not be cannulated, but as the case progressed, it was revealed that the lateral TIPS had become occluded. The initial pulmonary artery pressures were found to be 33/19, with a central venous pressure of 11. The patient was hyperdynamic, with a cardiac output of 7 L/min, and had an SvO<sub>2</sub> of 90%. A transeesophageal echocardiogram was performed during the case, which revealed a patent foramen ovale with a right to left shunt. It was decided not to expose this patient to veno-venous bypass, to avoid worsening the right to left shunt. Patient 2: Building upon a previous case report of a patient with a right to left shunt, which was originally thought to be a unique finding, we present a second occurrence. A male in his mid 50's, with liver failure secondary to chronic hepatitis C, presented for a liver transplant. Intraoperatively it was discovered that the patient had an excessively high cardiac output of 12 L/min, probably due to the pathophysiology of his liver failure. A transesophageal echocardiogram was performed, which revealed a patent ductus arteriosus with a right to left shunt. **Discussion:** In both of these cases, the discovery of right to left shunt was a unique finding, given that the patients had no significant pulmonary hypertension and normal right ventricle. The clinical suspicion for Hepatopulmonary Syndrome was low in these patients, as they did not have dyspnea or marked hypoxemia. Portopulmonary

Hypertension could explain the right to left shunt seen in these patients, but rather than low cardiac output, they both had high cardiac output. The shunts put these patients at risk for mixing of deoxygenated blood and hemodynamic instability. Additionally, these discoveries complicated the perioperative clinical decision-making and prevented veno-venous bypass during the anhepatic phase of the liver transplant. **Clinical Relevance:** Kaufman et al. describes that veno-venous bypass from the inferior vena cava and portal vein to the axillary vein during the anhepatic phase of orthotopic liver transplant has been shown to prevent hypotension during cross clamping of the portal vein, inferior vena cava, and hepatic artery. For this reason, screening for right to left shunting in candidates for liver transplant could prevent shunting of deoxygenated blood in already compromised patients by pre-operative closure of the PFO, PDA, etc. Raval et al. describes that extra care should be taken in patients with PFO, and that further studies are needed to determine the ultimate clinical significance of the presence of a PFO during liver transplant and the role for percutaneous closure.

### **Routine Usage of Contrast Dye in Stellate Ganglion Blocks: An Updated Look**

Ryan Noska; Sindhu Samba; Vivek Yedavalli; Amol Soin, MD, MBA

*Presenting Author:* Ryan Noska

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* WSU BSoM 4<sup>th</sup> Annual Medical Student Research Symposium, Dayton OH, April 2012

*Poster Number:* 35

**Objective:** To illustrate the utility of the routine usage of contrast dye in stellate ganglion blocks

**Background:** This study is part of an ongoing multiyear clinical case study. As a result, this abstract has updated information in which to compare to the previous year. Stellate ganglion nerve blocks are often used as a diagnostic and a therapeutic approach to treating sympathetically mediated pain of the upper extremity. The stellate ganglion lies anterior to the C6, C7, and T1 area. Most stellate ganglion blocks are performed using fluoroscopic image guidance with the needle placed anteriorly to the C7-T1 tubercle. Routine

nerve blocks involve the placement of local anesthetic such as Lidocaine or Bupivacaine. Improper injection into the vasculature without the aid of contrast dye, seizure activity or cardiac arrest may occur. Additionally, if particulate steroids such as Depo-Medrol were added, there is an increased risk for developing a spinal cord infarction as well as causing permanent paralysis related to the embolic nature of the particulate steroid compound. **Methods:** Previously, a case where a patient who suffered from Reflex Sympathetic Dystrophy had a stellate ganglion block as a therapeutic modality for the pain. Building upon this study from 2012 where 1 patient was noted to have an intra-arterial contrast injection during a stellate ganglion block, there was a second occurrence of the same phenomenon that occurred in this new 12-month period of using this technique. In a 12-month period, there were a total of 38 stellate ganglion blocks completed on patients as a diagnostic and therapeutic injection of upper extremity sympathetically mediated pain. Here we describe a second occurrence of 2 out of 38 stellate ganglion contrast injections. The patient was placed supine on the operating room table and, using fluoroscopy, a 25 gauge spinal needle was inserted on the C7-T1 tubercle. Contrast dye (3cc of Omnipaque) is injected in order to reveal the location of the stellate ganglion for proper injection of the anesthetic medication. **Results:** A total of 3cc of Omnipaque dye was injected and revealed an inadvertent arteriogram. (Figure 1). This clearly showed the entire vascular tree and appeared to supply the spinal cord. It was hypothesized a radicular branch of the vertebral artery was punctured. The intra-arterial injection of contrast dye (Omnipaque) that showed intravascular needle placement required removal of the needle and redirection to a safer location in order to properly and safely administer the anesthetic. **Conclusion:** Given the fact that major blood vessels lie near the stellate ganglion, it is recommended that fluoroscopy with the assistance of contrast dye be utilized prior to completing a stellate ganglion block. In the case of arterial puncture, repositioning and repeating the contrast dye injection should be completed prior to injecting the therapeutic medications. Given the frequency that this has occurred in a small number of patients, it is highly recommended that some form of contrast dye be utilized in order to safely

deliver medications without encountering undesired complications and side effects.

### **Evaluation patient's presenting with clinical congestive heart failure using echocardiographic assessment of the heart for systolic and diastolic function**

Denada Palm; Mukul Chandra, MD

*Presenting Author:* Denada Palm

*Faculty Mentor:* Mukul Chandra, MD

*Previous submission:* None

*Poster Number:* 19

**Objective:** Congestive heart failure is a common presentation in the inpatient hospital setting. Echocardiographic assessment of systolic and diastolic function is necessary for appropriate diagnosis and management. **Background:** The signs and symptoms of heart failure are often indistinguishable from other medical conditions including pulmonary disease, anemia, thyroid disease, depression and multiple other disorders, especially in patients with co-morbidities. It is also difficult to distinguish diastolic versus systolic heart failure based on physical findings or symptoms. While systolic heart failure can be evaluated by a reduced ventricular ejection fraction, diagnosing criteria for diastolic heart failure continues to be challenging. Echocardiography is a simple and sophisticated tool which is portable and available for making an accurate diagnosis. For this research project we did an observational study of clinical presentation and echocardiography findings in a set of patients with symptoms of heart failure. **Methods:** 1) Retrospective evaluation and chart review of 17 patients presenting with heart failure that were seen in Dr. Chandra's office in the last six months. 2) Organized this patient data by demographic, clinical presentation, associated co-morbidities. 3) Performed assessment of systolic and diastolic dysfunction using American Society of Echocardiography criteria. **Results:** In this study, 17 patients with clinical congestive heart failure were analyzed by 2-D echocardiography, spectral color and tissue Doppler. Systolic function was assessed by the eyeball method. Diastolic function was assessed using mitral inflow and mitral annular tissue Doppler assessment. **Conclusion:** Identified and organized



data regarding diastolic filling patterns in our patient population as either normal, impaired myocardial relaxation, restrictive filling (decreased compliance) or pseudonormalized each representing different stages of diastolic dysfunction.

### **Comorbid Infection with Hepatitis C Virus as a Predictor for Lower Extremity Compromise in Diabetic Patients**

Brian Patterson; Colleen McCormick; Brian Burke, MD

*Presenting Author:* Brian Patterson

*Faculty Mentor:* Brian Burke, MD

*Previous submission:* None

*Poster Number:* 23

**Objective:** The purpose of this study is to determine if Hepatitis C infection is a predictor for lower extremity compromise in diabetic patients. In this research, two possible confounding variables and the magnitude of the comorbid relationship are evaluated.

**Background:** Diabetic patients are at greater risk for lower extremity compromise than non-diabetic populations, and comorbid hepatitis C infection may further exacerbate this risk. Identification of a comorbid population with statistically greater risk for lower extremity compromise would facilitate greater clinician knowledge and lead to more efficient and effective practices of preventative medicine in the high-risk population.

**Methods:** A descriptive analysis of retrospective data from the Veteran's Health Administration of Ohio patient electronic medical records database was conducted on 81,824 diabetic patients. Prevalence and an odds ratio were calculated for the case and control groups. A chi-square and z-Test were used to determine statistical significance of the odds ratio and prevalence difference, respectively. Additionally, ANOVA was calculated for age and BMI to determine if they were possible confounding variables. **Results:** Patients with a comorbidity of diabetes and hepatitis C infection had 1.74 times greater odds of LE compromise than patients with diabetes who tested negative for HCV. A prevalence difference of 29.5 additional cases of LE compromise per 1,000 diabetic patients was determined, implicating HCV infection with

increased morbidity. Both age and BMI were determined to be possible confounding variables by means of ANOVA. **Conclusion:** This study found Hepatitis C to be a predictor for LE compromise in diabetic patients. Diabetic patients with comorbid infection of HCV were at significantly greater odds of LE compromise, compared against a control group. The clinical implications of this study suggest that clinicians should ensure more effective and efficient preventative medicine in individuals with diabetes comorbidly infected with hepatitis C virus.

### **The Frequency Content of the QRS Complex is Significantly Altered by Cardiac Resynchronization in Responders, but not in Nonresponders.**

Mark J. Niebauer, MD, PhD; John Rickard, MD; Niraj Varma, MD, PhD; Patrick J. Tchou, MD; Landon Polakof, BS; Barry Kuban, BS

*Presenting Author:* Landon Polakof

*Faculty Mentor:* Mark J. Niebauer, MD, PhD

*Previous submission:* Heart Rhythm Society 33rd Annual Scientific Sessions, Boston, MA, May 2012

*Poster Number:* 20

**Objective:** The power spectrum of the QRS complex in left bundle branch block (LBBB) is shifted to lower frequencies compared to the normal QRS. We hypothesized that this shift may represent a measure of left ventricular dyssynchrony and that successful cardiac resynchronization therapy (CRT) may redistribute the QRS frequencies to higher values.

**Background:** Cardiac Resynchronization Therapy (CRT) is beneficial in many patients with cardiomyopathy and a wide QRS, yet some CRT recipients show little or no improvement. Studies of large numbers of CRT patients have shown that those with longer QRS complexes, usually greater than 150 msec, derive the greatest benefit. Other clinical studies have shown that while patients with baseline LBBB exhibit the highest rate of clinical and hemodynamic response, there still exist LBBB non-responders. We have noted that the QRS during CRT pacing frequently exhibits morphology changes as well as shortening. Specifically, the CRT-paced QRS morphology often appears "sharper" with more rapid up- or

down-slopes. We hypothesized that these morphologic changes represent alterations in the frequency content of the QRS, and may provide predictive benefit in CRT. In order to more closely examine this hypothesis, we studied a more homogeneous group of CRT patients with a high expectation of benefit and uniform baseline morphology; those with a pre-implant LBBB. **Methods:** We examined the pre-CRT ECG's of 68 patients with baseline LBBB (39 CRT responders, as defined by reduction in the end-systolic volume by  $\geq 10\%$ , and 34 non-responders), and analyzed the frequency content of the intrinsic and post-CRT QRS complexes in standard leads I, AVF and V3 using a custom built computer algorithm. This program generates the QRS power spectrum present within the standard frequency limits of 0.05 Hz and 100 Hz of each applied lead. Since the QRS power in the spectrum is asymmetrically distributed, we designated the midpoint of the cumulative power spectrum as the Median Frequency (Fm), where 1/2 of the power lies above and 1/2 lies below that frequency. We then compared Fm before and after CRT implant in each group using the Student's t-test. **Results:** The Fm exhibited best predictive value in lead V3. The average Fm of the CRT responder group increased from  $5.95 \pm 1.13$  to  $8.60 \pm 3.10$  Hz ( $p < 0.001$ ), while the average Fm of the nonresponder group was unchanged from pre-CRT ( $6.64 \pm 1.41$  Hz) to post-CRT ( $6.74 \pm 1.72$  Hz;  $p = 0.80$ ). **Conclusion:** Clinical responders to CRT, with baseline LBBB, exhibit a significant increase in the Median Frequency in lead V3 soon after implant, while nonresponders fail to shift their QRS frequency content. This may be a useful tool during implantation for early identification of responders to CRT.

### **Order of Training for Technical and Non-technical Surgical Skills**

Natalie Pyatka; Tzu-Ting Sun; Amie Miller, MD; Caroline Cao, PhD

*Presenting Author:* Natalie Pyatka

*Faculty Mentor:* Caroline Cao, PhD

*Previous submission:* ASME 11th Biennial Conference on Engineering Systems Design and Analysis, Nantes, France, July 2012.

*Poster Number:* 6

**Objective:** The objectives of this study were to examine the effects of adding a non-technical component to surgical skills training, and the benefit of combining technical and non-technical components in surgical skills training for trainees with different experience levels. **Background:** Even though laparoscopic surgery has become the preferred technique for many surgeons, the methods of training are not standardized. Most simulators and training programs focus on technical skills, neglecting very important non-technical skills (such as cognitive and communication skills). The inclusion of non-technical skills during the initial learning phases may be desirable. **Methods:** 27 subjects participated in the study: 9 novices, 9 intermediate experience level subjects, and 9 advanced level subjects. They were divided into 3 groups: technical, non-technical, and combined. Subjects were then asked to perform a pick-and-place task (similar to the FLS peg-transfer task) with separable technical and non-technical components. Performance data included: time to completion, number of technical errors, and number of non-technical errors. **Results:** The intermediate and advanced groups showed a significant decrease in number of technical errors using the combined training method. The combined group appeared to have lower non-technical error rates than the other two groups. **Conclusion:** There is an advantage to training non-technical skills first, alone or in conjunction with technical skills. The experience level of the person to undergo training should be considered when designing a laparoscopic training course. For pure novices, the method of training does not appear to reduce the number of either technical or non-technical errors. However, for trainees who have some previous laparoscopic experience and are learning a new task, training in a combined method is more effective.

### **How Prepared are Medical Students to Diagnose and Manage Common Ocular Conditions?**

Elizabeth Shanika Ranasinghe; Bruce Binder, MD, PhD; Nicole Borges, PhD

*Presenting Author:* Elizabeth Shanika Ranasinghe

*Faculty Mentor:* Bruce Binder, MD, PhD; Nicole Borges, PhD

*Previous submission:* None

*Poster Number: 12*

**Objective:** This study investigated how well prepared medical students during their fourth year of medical school are to diagnose and manage common ocular conditions. It also investigates how well our second years learn the basic ophthalmology curriculum. **Background:** It is essential that primary care physicians have a solid fund of knowledge of the diagnosis and management of common eye conditions as well as ocular emergencies, given management of these diseases commonly involves appropriate referral to an ophthalmologist. Thus, it is crucial to receive comprehensive clinical knowledge of ophthalmic disease in the primary care setting during medical school. Currently, the ophthalmology curriculum at Wright State University (WSU) Boonshoft School of Medicine is concentrated within the first two years. **Methods:** With institutional review board approval, the study used anonymous scores from a standardized 12-question quiz with forced choice responses voluntarily administered to fourth-year medical students (N=110) and second-year medical students (N=100) at WSU from August 2012- February 2013. The quiz comprising diagnosis and referral management questions covered the most frequently tested ophthalmology topics on board exams and assessed students' ability to recognize when referral to an ophthalmologist is appropriate. The quiz was constructed using physicians with knowledge and expertise in ophthalmology and was pilot tested. **Results:** 97 (88% response rate) fourth-year medical students had quiz scores ranging from 0-94.5%, with an average score of 68.7% (passing rate was 70%). 97 (97% response rate) second-year students had quiz scores ranging from 27.2-86.4%, with an average score of 63.8%. Student's t- test showed fourth years had a significantly higher quiz average (p=0.003). In terms of diagnosis, both classes performed poorly on retinal detachment, diabetic retinopathy and central retinal artery occlusion questions. In terms of management, both classes passed on questions regarding on glaucoma, cataract, and central retinal artery occlusion. **Conclusion:** Second-year and fourth-year medical students fell short on passing the ophthalmology quiz. Students performed better on diagnostic questions than referral management questions. Students on

average performed better on anterior segment (front of the eyeball) conditions rather than posterior segment conditions (retinal detachment, diabetic retinopathy and central retinal artery occlusion). In terms of management, students may not have performed well on diagnosis of retinal detachment or central retinal artery occlusion but they choose the correct management, demonstrating good clinical judgment consistent between both classes. This study highlights the importance of integration of ophthalmology education within all four years of medical school and placing a greater emphasis on referral management during clinical training.

**Examining the relationship between pediatric allergic rhinitis and parental socioeconomic status**

Jennifer Rammel, MPH, Adrienne Stolfi, MSPH; Shalini G Forbis, MD, MPH

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*Faculty Mentor:* Shalini G Forbis, MD, MPH

*Previous submission:* None

*Poster Number:* 3

**Objective:** To assess the relationship between pediatric AR and parental socioeconomic status. **Background:** Allergic rhinitis (AR) is the most common chronic pediatric disease in the US. AR interferes with sleep quality, decreases quality of life, increases school absenteeism, and can exacerbate asthma. Numerous studies have illustrated the link between low socioeconomic status (SES) and poor health outcomes in the context of chronic disease. **Methods:** An anonymous survey was given to parents of children between 3-17 years with allergy symptoms in 4 pediatric clinics: 2 suburban population and 2 low SES population. The survey included 3 validated tools: Modified Score for Allergic Rhinitis (mSFAR) for diagnosis of AR, Rhinitis Symptom Utility Index (RSUI) for AR symptom control, and General Self-efficacy Scale (GSE) for parental self-efficacy. Other topics: demographics, medications, environmental measures, and confidence level (CL) in managing child's AR/achieving relief of AR symptoms. Surrogate measures of SES included: education, race, and child insurance. Data were analyzed using descriptive statistics, Spearman rank

correlations (rs), and Wilcoxon rank sums tests. **Results:** Out of 167 analyzed surveys, mSFAR scores were positive for AR in 135 (81%). The surveys with non-positive mSFAR surveys were excluded from further analysis. Parent race was 73% Caucasian and 27% African American/Other. Parent education levels were 25% < high school, 31% some college, 44% college degree. Parent age levels were 44% between 18-34 years and 56% 35+ years. Mean (SD) child age was 9.1 (3.8) years. Insurance was 47% private, 53% government. The mean age of AR symptom onset was 3.9 (3.2) years. There was no statistically significant relationship found between any parental demographics and RSUI, CL, or GSE scores. **Conclusion:** Parental SES did not have a statistically significant relationship with AR disease control, confidence levels in managing disease or achieving disease control, or parental self-efficacy. Further research is necessary to determine what barriers exist to achieving disease control in order to improve outcomes for children with AR.

#### **Tuberous Sclerosis Renal Disease: From Cell Biology Quirks to Possible Cures**

Sindhu Samba; Emma Headley; Lu Lu; Ryan Reichert; Brian Siroky, PhD; John J Bissler, MD

*Presenting Author:* Sindhu Samba

*Faculty Mentor:* John J Bissler, MD

*Previous submission:* Medical Student Summer Research Program (MSSRP) Fall Symposium Cincinnati Children's Hospital Medical Center, Cincinnati, OH, October 2012

*Poster Number:* 38

**Objective:** To study thermal stress-induced angiomyolipoma cell death in a cell based model of renal angiomyolipomata. **Background:** Tuberous Sclerosis Complex (TSC) is an autosomal dominant genetic disorder due to a mutation in TSC1 (hamartin) or TSC2 (tuberin). Renal angiomyolipomas occur in approximately 80% of patients. TSC proteins regulate mammalian target of rapamycin complex 1 (mTORC1) mediated protein translation, cell growth, autophagy and survival. Loss of TSC protein in angiomyolipoma cells produces elevated mTORC1 activity and protein translation, leading to endoplasmic reticulum (ER) stress and

activation of the unfolded protein response. Angiomyolipoma cells may be closer to their threshold capacity to compensate for additional proteomic stress. TSC2-deficient human renal angiomyolipoma cells (TRI102) display increased sensitivity to ER stress caused by proteasome inhibition compared to TSC2-rescued cells (TRI103). Increased temperature may cause additional ER stress. We hypothesized that TRI102 (TSC2-deficient) cells will have increased vulnerability to thermal stress compared with TRI103 (TSC2-rescued), and this effect will be augmented by pharmacological agents targeting mTORC1 and the 26S proteasome. **Methods:** Mutant TRI102 and genetically rescued TRI103 cells were incubated at 37°C compared with 45 or 50°C for 1, 6, and 24 hours with and without mTOR inhibitor, RAD001, and proteasome inhibitor, MLN2238. Cell viability was determined using crystal violet DNA dye binding or propidium iodide dye exclusion assays. Western blotting was used to assess changes in levels of phosphorylated SAPK/JNK, heat shock proteins and proteasome function. **Results:** Initial cell viability studies suggest loss of TSC protein function may increase cell sensitivity to thermal stress. Additionally, combination of thermal stress and proteasome inhibition (based on western blot analysis of ubiquitin) appears to enhance stress-induced cytotoxicity based on viability studies and western blot analysis of the stress-sensitive SAPK/JNK. **Conclusion:** These pilot experiments offer mechanistic insight into possible targeted therapy for patients with TSC-associated renal angiomyolipomata. These studies support angiomyolipoma ablation using magnetic resonance imaging guided high intensity focused ultrasound to induce thermal stress. Our long term aim is to change the ablative process from thermally induced necrosis to apoptosis. The clinical benefit of this approach will be absence of renal scarring and post-procedural sequelae like fever and pain.

#### **Trigeminal Ganglion Gamma Knife Ablation to Treat Atypical Facial Pain**

Sindhu Samba; Ryan Noska; Vivek Yedavalli; Amol Soin, MD, MBA

*Presenting Author:* Sindhu Samba

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* None  
*Poster Number:* 39

**Objective:** To describe the effect of Gamma Knife or linear accelerator-based radiation therapy in atypical facial pain from an ongoing multiyear clinical study. **Background:** Atypical facial pain encompasses a group of disorders characterized by pain in the region of the trigeminal nerve but do not fit the classical definition of trigeminal neuralgia. The most common etiology is dental or physical trauma, however, psychogenic origin has also been documented. Atypical facial pain can be challenging to treat due to the small success of NSAIDs, narcotics, neuropathic medications, and interventional pain management procedures. This clinical study provides insight into a novel technique for atypical facial pain treatment using Gamma Knife, a noninvasive radiation therapy that produces numerous beams to coalesce and deliver focused radiation at target tissue, the trigeminal nerve in this study. Previously, two patients, one complaining of facial pain from a motor vehicle accident and the other from a complicated sinus surgery, who did meet the definition of trigeminal neuralgia were trialed with Gamma Knife after all other avenues of therapy were unsuccessful. Building upon last year's study, we describe three additional patients who underwent Gamma Knife therapy. The first two patients presented with post herpetic neuralgia affecting the CNV3 region and the third patient presented with pain from facial trauma from an abusive spouse. **Methods:** A team comprised of an interventional pain physician, neuroradiologist, radiation oncologist, medical physicist, and neurosurgeon was involved in these cases. Prior to Gamma Knife therapy, patients received two separate injections of lidocaine to achieve a minimum of fifty percent pain reduction. Under local anesthetic, stereotactic head frames stabilized the patient's head while awake. High resolution MRI images of the trigeminal nerve were utilized, with both gadolinium-enhanced T1-weighted MRI with magnetization-prepared, rapid-gradient echo, and T2-weighted fast-spin echo sequence. Coronal, sagittal, and axial planes were used to track the course of the nerve from the brainstem to Meckel's cave and the target was radiated with Gamma Knife. Patients were transferred to recovery and head frames were removed. **Results:**

Both patients with post herpetic neuralgia reported numbness and paresthesia after a 6-week follow-up with a significant thirty-eight percent reduction in pain. The third patient also reported numbness and paresthesia over the cheek and face 6-weeks post-op, however, there was no significant pain reduction. This builds upon the results from the two patients last year who noted both an immediate and 6-week post op decrease in frequency and severity of pain, as well as a decrease in overall VAS pain scores for atypical posttraumatic facial pain after Gamma Knife treatment to the trigeminal nerve. **Conclusion:** While further investigation is necessary, results from the study thus far demonstrate that Gamma Knife therapy alleviates some types of atypical facial pain and may be a successful form of treatment in these patients.

**A pilot study of graduating medical student confidence in fulfilling internship responsibilities and the impact of an internship preparation elective**

Robert Beaulieu, Topaz Sampson, Raymond Ten Eyck, MD, MPH, FACEP

*Presenting Author:* Topaz Sampson

*Faculty Mentor:* Raymond P Ten Eyck, MD, MPH, FACEP

*Previous submission:* None

*Poster Number:* 13

**Objective:** Does participation in an elective aimed at better preparing medical school graduates for internship increase confidence in performing procedures and managing physician responsibilities upon graduation?

**Background:** The transition from medical school to internship presents recent graduates with a new role in patient care, increased responsibility, and the need to master a skill-set that they may have only been permitted to observe as a student. Studies have shown that many medical school graduates do not feel adequately prepared to take on these new challenges. Previous work investigating WSU Boonshoft School of Medicine (BSOM) graduates from 2011 showed confidence in performing basic procedures, interpreting images, communicating and documenting effectively, and working as a member of a team. Graduates had decreased levels of confidence in

their ability to place peripheral IV lines, run codes, and perform more advanced procedures. A survey of WSU BSOM residency program directors supported these findings. The Department of Emergency Medicine developed an elective in 2011 to help improve the confidence and preparedness of BSOM graduates for internship responsibilities. Eight members of the class of 2012 completed the elective. We designed a survey for 2012 BSOM graduates to determine their level of confidence in performing procedures and handling common clinical scenarios as well as to compare results between graduates who participated in the elective and those who did not. **Methods:** Following IRB approval, we asked BSOM graduates from the class of 2012 to anonymously complete an on-line survey. Graduates were asked to rank their level of confidence in their ability to perform each of 31 specific clinical functions using a 5-point Likert scale. They were also asked if they participated in the internship preparation elective and to list any additional educational opportunities that they thought they needed. Results from the two groups were compared for trends. The Mann-Whitney U test was used to assess for statistical significance ( $p < 0.05$ ). **Results:** There was no statistically significant difference found between the two groups. There was a trend toward greater confidence in the elective group for central line placement, endotracheal intubation, chest tube placement, cardioversion and defibrillation, prioritizing tasks, assessing acute complaints, delivering bad news, running a code, understanding physician rights and obligation, and handling common tasks faced on overnight call. The majority of graduates felt confident performing basic procedures, interpreting images, performing searches for standards of care, communicating effectively, writing orders, documenting in the medical record, obtaining consent, working as a member of a team, and handling stress. Graduates felt less confident in placing peripheral IV lines and using ultrasound. Graduates lacked confidence in performing advanced procedures. Common themes identified by respondents that could better prepare medical students for internship included: more experience writing orders and dealing with issues faced during overnight call and hand offs; more practice dealing with procedures and resuscitations; and an

increased level of responsibility and independence. **Conclusion:** Although results between the two groups were not statistically significant, response trends help provide feedback regarding potential areas of impact of an elective focused on internship skills. Many areas of confidence among 2012 graduates were consistent with the study of 2011 graduates. This pilot-study data can be used to help determine an appropriate sample size for a larger study designed to assess statistical significance. Furthermore, tailoring medical school experiences to address the areas of concern identified in the survey results may help improve the confidence of future interns and better prepare them to handle potentially problematic situations and procedures encountered during internship.

**Predicting Aneurysmal Rupture Rates: Are Smaller Aneurysms Really Less Apt To Bleed and Does Morphology Matter?**

Ryan Schwieterman; John Terry MD; Ronald Markert, PhD; Bryan Ludwig, MD

*Presenting Author:* Ryan Schwieterman

*Faculty Mentor:* Bryan Ludwig, MD

*Previous submission:* American Academy of Neurology Annual Meeting, San Diego, CA, March 2013

*Poster Number:* 29

**Objective:** To investigate whether more-dysmorphic morphology occurs more frequently in ruptured intracranial aneurysms (RIA) under 7mm. **Background:** An estimated 2%-5% of the general population has an intracranial aneurysm (IA) and the effects of rupture are devastating. Data from the International Study of Unruptured Intracranial Aneurysms (ISUIA) represented a low risk of rupture (0.05%/year) of aneurysms under 10 mm. The majority of RIAs treated in our center have been under 7mm, which forces one to question how best to counsel a patient with an incidentally found IA under 10mm. Aneurysmal 3D morphology is thought to be a useful predictor for risk of rupture. **Methods:** 202 RIAs from 202 consecutive patients during 2004-2012 were evaluated by two blinded, independent neuroradiologists retrospectively using CTA for size and morphology. We used the ISUIA criteria to define size and morphology. We presumed types 1,2 and 3,4 represented less-dysmorphic and

more-dysmorphic morphology, respectively. Inter-rater reliability was of concern; thus, a second evaluation with the examiners was carried out to reach consensus. Chi square analysis was used to evaluate the relationship between RIA morphology and size (under 7mm and above 7mm). Multivariable logistic regression was used to evaluate morphology as an independent predictor of size of RIA while controlling for other factors. **Results:** RIAs under 7mm in diameter represented 53% of the 202 aneurysms evaluated. Of the RIAs under 7mm, 71% had low-risk morphology vs. 45.3% for the above 7mm group. ( $P < 0.001$ ). Controlling for other risk factors, low-risk morphology was an independent predictor of RIAs under 7mm in diameter ( $RR = 0.28$  (95% CI = 0.15 to 0.55)). **Conclusion:** Less-dysmorphic aneurysm morphology is found more frequently with smaller RIAs (under 7mm in diameter). Future research should include both patients with a ruptured IA and those with an unruptured IA to determine if size and morphology is related to the outcome for an aneurysm.

### **Treating Chronic Post Herpetic Neuralgia Using Topical Superconcentrated Capsaicin**

Scott Seider; Jason Miller; Amol Soin, MD, MBA

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*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* None

*Poster Number:* 52

**Objective:** What is an appropriate treatment algorithm for the use of superconcentrated capsaicin to treat Post Herpetic Neuralgia?

**Background:** Post Herpetic Neuralgia (PHN) is often a dramatic pain condition that occurs after the reactivation of the Herpes Zoster Virus. Following the pain associated with the rash, one in five patients will have long-standing pain. The burning and irritation can last for months to years after the infection, and can lead to constant hypersensitivity usually along a single dermatome. Common treatments include: anticonvulsants, tricyclic antidepressants, narcotic and non-narcotic painkillers, and topical applications such as topical lidocaine patches. In severe cases where the pain is not treated adequately, it can lead to insomnia, weight loss, depression, and disability. Our proposal uses a

superconcentrated form of Capsaicin, a formulation that is unlike the current standard Capsaicin formulation. The medication we used is in the form of a transdermal patch known as Qutenza 8%, which contains 300 times greater concentration than over the counter Capsaicin. The objective of this study was to determine an appropriate treatment algorithm for the use of Qutenza in chronic post herpetic neuralgia. **Methods:** In our original study, eight consecutive patients suffering from severe, chronic, debilitating, and refractory pain from PHN in the truncal area were identified. Since the previous study, four more patients were enrolled for a total of twelve, and new data has been compiled. We used a protocol where the patients had EMLA (Eutectic Mixture of Local Anesthetic) applied over the effected dermatome for approximately 1 hour prior to Capsaicin administration. This use of local anesthetic was meant to prevent skin irritation and pain related to Capsaicin. Following the EMLA administration, the 8% Capsaicin patch was placed over the affected dermatome. The patch was left in place for approximately one hour, and every fifteen minutes, vital signs were assessed as advised by the makers of Qutenza. All twelve patients noticed burning pain and irritation near the site of the patch within 30 minutes of application, as expected with the known skin irritation of Qutenza. At the conclusion of the cases, the patch was removed and a cleansing gel was administered to decrease the irritation patients experienced. The patients were then followed up at two week and one month intervals. **Results:** Nine out of the twelve patients were noted as responders to the therapy with two patients getting no relief, and one patient reporting a severe flare up of pain. The nine patients collectively reported a 58% overall decrease in frequency and severity of post herpetic neuralgia pain, as assessed using qualitative pain scales. **Conclusion:** As many people know, Capsaicin is the natural product found in many different peppers (capsicum) that causes the burning and heat sensation in the mouth. The capsaicin proteins found in hot peppers essentially act by stimulating capsaicin receptor proteins found in neuronal cells. As the nociceptor neurons are stimulated by capsaicin, they allow calcium into the neuron, and at superconcentrated doses, sometimes kill off the nociceptor neuron. Another theory of how

capsaicin acts is through the mechanism of depleting painful signaling neurotransmitters, such as Substance P, among others. Through our treatment algorithm, we believe patients are exposed to less pain than the directions of Qutenza, which does not describe the timeframe needed to pretreat with a topical anesthetic. As directed by the Qutenza insert, the treatment may be repeated every three months or as warranted by the return of pain, but not more frequently than every three months. Patients will be continually assessed with the next interval scheduled for six months. We will continue to recruit more patients and follow the previously treated patients to determine how long the effects of superconcentrated Capsaicin last in relieving pain associated with post herpetic neuralgia.

### **Fluoroscopically Guided Minimally Invasive Lumbar Decompression (MILD) to treat Spinal Stenosis- A Case Series of 50 Patients**

Lucy Shi; Simon Choi; Bryan Hill; Sara Chinnappan; Telisha Ortiz; Christoforos Frangopoulos; Cole Budinsky; Amol Soin, MD, MBA

*Presenting Author:* Lucy Shi

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* WSU BSoM 4<sup>th</sup> Annual Medical Student Research Symposium, Dayton OH, April 2012

*Poster Number:* 50

**Objective:** Is there a means to provide the benefits of surgical intervention for patients with lumbar spinal stenosis while also avoiding the risks of an invasive procedure?

**Background:** Lumbar spinal stenosis is a significant cause of increased morbidity becoming more prevalent with age. Following the expected rise in the elderly population approximately 2.4 million Americans will be affected by lumbar spinal stenosis by 2021. Spinal stenosis can cause symptoms ranging from debilitating low back and leg pain to cauda equina syndrome. These patients are often unable to maintain acceptable activities of daily living and require intervention to help to manage their pain. Almost all patients are started on conservative treatments ranging from medical management and epidural steroid injections to physical therapy, but evidence for their efficacy is

lacking. Many do not find relief and turn to surgical intervention. With an older population affected by spinal stenosis, the risks of surgery are higher and must be weighed against the possible benefits. A significant number of those with spinal stenosis fail conservative care but are not good candidates for invasive spinal surgical intervention. Minimally invasive lumbar decompression (MILD) is a technique done under fluoroscopy to perform a laminotomy and debulking of the ligamentum flavum, which reduces the risk of surgery for this high-risk population and still provides the benefit of surgical care, achieving lumbar decompression and reduction of stenosis symptoms. **Methods:** This study is part of an ongoing multi-year clinical case study. As a result, this abstract has updated and new information to report compared to the prior. The inclusion criteria were met by patients with symptomatic lumbar spinal stenosis primarily caused by dorsal element (ligamentum flavum) hypertrophy, failure of conservative therapy, central canal cross sectional area < 100mm<sup>2</sup>, radiological confirmation of ligamentum flavum of at least 2.5 mm by MRI, anterior listhesis of <5mm, and the ability to ambulate at least 10 feet unaided before being limited by pain. Fifty (n=50) patients were identified for the case series and underwent a laminotomy with the MILD technique. Follow up occurred at 2 weeks and again at 6 weeks. The patients were asked to complete a survey preoperatively and postoperatively. Both times, they were asked to rate their Visual Analog Scale (VAS) pain score 0 – 10 at that moment and to rank the VAS score when at its best and worst over the preceding week. Postoperatively, patients were also asked to rate their perceived percentage of improvement in physical function at 2 weeks and at 6 weeks. A simple numerical average was obtained. **Results:** On average, preoperative VAS pain score was 8.6, postoperative VAS score was reduced to 3.2 and 2.7 at 2 weeks and 6 weeks respectively, and perceived percentage of functional improvement was 84% and 78.5% in the 2 week and 6 week time frame. (Reference result graphs on poster) The MILD technique also demonstrates decompression of lumbar spinal stenosis by reviewing intraoperative epidurography done in the pre-MILD and post-MILD period. Figure 1 demonstrates the patient after an initial



epidurography prior to the laminotomy and debulking operation of the ligamentum flavum. Figure 2 depicts the post-MILD patient and shows a significant increase in flow within the epidural space and even increased spread of contrast in the cephalic and caudal locations. **Conclusion:** The MILD technique represents a new tool for the interventional pain management trained physician to treat patients who suffer from lumbar spinal stenosis. Given the risks with surgical intervention in an older population, this technique provides a safer alternative for those with debilitating symptoms. The efficacy of conservative treatment in spinal stenosis is uncertain, while there is more evidence supporting the pain relief and functional improvement provided by traditional surgical decompression. The patients in this study had a reduction of their overall VAS pain score and perceived percentage improvement in functional status. This outpatient technique shows promise in producing similar reduction of morbidity among those who have failed conservative treatment, while reducing the risks of a surgical intervention. This study was limited by the small number of patients studied and the fact that the improvements were based on subjective patient surveys and not objective measurement of physical functions.

#### **Alterations in the ion channels SK3, HCN-1, and Kv2.1 in rodent lumbar $\alpha$ -motoneurons following peripheral axotomy**

Shannon H. Romer, MS; Adam S. Deardorff, MS; Saif Ahmed, MS; Ryan Schwieterman; Ralla Shrit; Robert E.W. Fyffe, PhD

*Presenting Author:* Ralla Shrit

*Faculty Mentor:* Robert E.W. Fyffe, PhD

*Previous submission:* Society for Neuroscience 42<sup>nd</sup> Annual Meeting, New Orleans, LA, October 2012

*Poster Number:* 17

**Objective:** To investigate the effects of peripheral nerve injury on the expression and subcellular distribution of ion channels and their related physiological properties in lumbar  $\alpha$ -motoneurons. **Background:** Peripheral axotomy causes well-characterized alterations in intrinsic motoneuron (MN) activity and excitability including a decrease in rheobase and alterations in spike frequency and afterhyperpolarization (AHP) (Gustafsson, 1979;

Kuno et al., 1974a,b). Alterations in expression, regulation and distribution of multiple ion channels likely underlie the physiological changes observed after axotomy. For example, dynamic modulation of Kv2.1 delayed rectifier currents dramatically affects the intrinsic excitability of both mammalian and non-mammalian neurons (Mohapatra et al., 2009). Several studies suggest type-specific changes in AHP properties following peripheral axotomy, including a shortening of AHP duration in cells innervating slow twitch muscle fibers and a lengthening of AHP duration in cells innervating fast twitch muscle fibers (Kuno et al., 1974a,b; Gustafsson and Pinter, 1984). In motoneurons, small conductance Ca<sup>2+</sup>-activated potassium (SK) currents and HCN mediated I<sub>h</sub> (sag) currents contribute to firing rate by regulating and shaping the AHP and synaptic currents. **Methods:** Using immunohistochemistry and in vivo electrophysiology, we investigated the specific distribution and expression patterns of SK3, HCN-1, and Kv2.1 channel isoforms in physiologically identified rodent spinal MNs pre- and post-axotomy. **Results:** In all MNs membrane expression of Kv2.1 is initially disrupted but returns to a pre-axotomy pattern independent of proper reinnervation of the peripheral target. In axotomized fast type motoneurons there is a prolonged increase in expression of SK3-IR and a decrease of HCN-1 expression, which is consistent with observed changes in AHP duration in this class of MN. **Conclusion:** These results implicate several specific ion channels as potentially important contributors to the complex physiological changes in axotomized motoneurons that may influence motoneuron intrinsic excitability and survival.

#### **Loss of Resistance Using Air versus Saline to Achieve Access to the Epidural Space**

Samira Sihabdeen; Jennifer Castelbuono; Amol Soin, MD, MBA

*Presenting Author:* Samira Sihabdeen

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* None

*Poster Number:* 53

**Objective:** Comparison of air vs saline during loss of resistance during epidural blockade with regard to associated sequelae. **Background:** Epidural

blockade is a common method of delivering analgesia in a variety of clinical settings. Understanding the relevant anatomy & physiology and executing proper technique are crucial to enhancing beneficial effects and reducing the risk of adverse effects associated with epidural anesthesia. During instrumental manipulation of the epidural space, introduction of air into the epidural space or accidental dural puncture may give rise to complications, which include postdural puncture headache, epidural hematoma, and pneumocephalus. As a means of identifying the epidural space, a loss of resistance technique is often used with a syringe containing either air or saline. Comparing the use of air versus saline during loss of resistance is an area of particular interest regarding technique-related risk of adverse events. **Methods:** In a previous study, a patient developed a severe headache due to development of a pneumocephalus after epidural injection with the use of a 14 gauge Tuohy needle and loss of resistance using air. Building upon this study, a case series was conducted where 100 consecutive patients with lumbar radiculopathy received a lumbar epidural steroid injection using either air or saline for loss of resistance. The patients were split into two arms: subjects 1-50 had epidural access with air while subjects 51-100 had epidural access with saline. All patients had epidural steroid injections using a 22 gauge Tuohy needle under fluoroscopic guidance. **Results:** There was no difference in the time to achieve access to the epidural space with a mean time of 2.3 minutes in both groups and no change in the spread of contrast epidurography in either group. Two patients had dural punctures (both were in the saline group). Neither patient developed a post dural puncture headache, epidural hematoma, or pneumocephalus. **Conclusion:** Based upon these results, some important considerations can be made when choosing between air versus saline for loss of resistance during epidural injection. Loss of resistance with saline rather than air may reduce the chance of adverse effects such as pneumocephalus. Size of Tuohy needle may also play a role in this, as a smaller needle diameter may reduce the likelihood of introduction of air into the epidural space or accidental dural puncture. In any case, a patient presenting with headache following an epidural injection could represent a postdural puncture headache,

pneumocephalus, a migraine, or a subarachnoid hemorrhage. Thorough assessment is crucial to prompt diagnosis, management, and prevention of further complications.

### **Relief of Chronic Pain with Long-Term use of High Frequency Peripheral Neuromodulation**

Jonathan Silverman; Shamie Das; Laura DeVita; Amol Soin MD, MBA

*Presenting Author:* Jonathan Silverman

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* None

*Poster Number:* 47

**Objective:** An ongoing multi-year clinical case study to investigate the value of high frequency alternating current (HFAC), as applied through an implantable direct stimulation nerve cuff, in relieving chronic residual limb pain following amputation. **Background:** HFAC, as applied through an implantable direct stimulation nerve cuff, is a safe and effective approach to treating intractable residual limb pain. The current study is the first to investigate the long-term utilization of this technology. **Methods:** Ten patients (n=10) experiencing chronic, intractable residual limb pain were enrolled. After IRB and Investigational Device Exemption FDA approval, each patient was implanted with a direct stimulation nerve cuff. High frequency (10,000Hz) alternating current was applied through the cuff to create a depolarizing nerve block, as previously described. Upon patient demand, the device would administer a 30-minute treatment. Patients received 1-4 treatments per day, on average, for a minimum of 3 months. Treatment efficacy was evaluated before and after each 30-minute session through the patients' pain rating on the Visual Analog Scale (VAS). **Results:** During treatment, patients achieved an average reduction in pain score of 78.1%. Each 30-minute treatment session (100%) successfully achieved some degree of pain reduction. Seven patients (70%) achieved a VAS pain score of 0 at various times during the study. **Conclusion:** Building upon previous studies, in which short-term application of HFAC exhibited the potential for treatment of residual limb pain, the current study provides evidence supporting the efficacy of long-term HFAC treatment using an implanted nerve stimulation cuff. To date, all data

suggest implantable HFAC-delivering nerve cuffs are a viable option in the treatment of chronic residual limb pain.

### **Evaluating Student Perceptions of Clinical Quality and Safety**

Arvind Suguness; Lakshman Swamy; Colleen McCormick; Jake McKeegan, MD; Nicole Borges, PhD; Karen Kirkham, MD

*Presenting Author:* Arvind Suguness

*Faculty Mentor:* Nicole Borges, PhD

*Previous submission:* Association of American Medical Colleges Annual Meeting, San Francisco, CA, November 2012; Institute for Healthcare Improvement National Forum, Orlando, FLA, December 2012

*Poster Number:* 8

**Objective:** Examine the degree to which students may have difficulty perceiving, understanding, communicating, investigating, or improving issues in quality and safety. **Background:** In 1998 the Institute of Medicine (IOM) authored the landmark report, *To Err Is Human*, which outlined the growing body of evidence supporting the prevalence of systemic errors and safety hazards in modern medicine. In 2001, the IOM released another report, *Crossing The Quality Chasm*, which outlined six Aims for Improvement in healthcare. It stated that care should be efficient, equitable, effective, timely, patient-centered, and safe. While students are often aware of deficiencies along some of these dimensions - for example, the crisis of the uninsured - they are less often aware of the full scope of these shortcomings. **Methods:** This is a cross-sectional study of third year (Class of 2013) and fourth year (Class of 2012) medical students at the Boonshoft School of Medicine, as well as third year students across the country through the AAMC electronic listserv. Data were collected electronically through Survey Monkey, for fourth year students at BSOM, through Qualtrics, for students contacted through the AAMC, and through self-administered paper survey, for third year students at BSOM. Response rates were 56% (53/94) for the Class of 2012 and 79% (81/102) for the Class of 2013. There were 122 respondents out of an unknown total offered through the AAMC listserv. **Results:** Across all groups, a majority of respondents

experienced perceived deficits in safety (62%), timeliness (77%), and efficiency (81%). A substantial number of students experienced perceived deficits in equitability (34%), evidence based care (44%), and a “patients first” attitude (29%). More than 90% of students stated that they experienced avoidable events which they thought negatively impacted a patient’s health. Nine percent of students experienced such events weekly, 20% monthly, 62% less than six times a year, and 9% never experienced such events. Among those who experienced one of these perceived deficits, 51% reported speaking to someone about their concerns. However, 90% of students stated that they sometimes, usually, or almost always felt comfortable approaching their superiors about these issues. Fifty four percent of students said they were affected by the experiences addressed in the survey. **Conclusion:** Students are aware of deficits across all dimensions of quality, but they often fail to act to prevent future errors despite reporting high levels of comfort with speaking to their superiors. Educating students and faculty about the shared responsibility for ensuring high quality care could help to address this gap. Student reports of deficiencies may be both under and over reported. For example, students may not be aware of many “near misses” – times when an error almost occurs. This problem could be addressed with quality education which emphasizes that a near miss today becomes a harm tomorrow. On the other hand, students may also over report deficiencies due to gaps in their clinical knowledge. They may believe an error in prescribing has been made, for example, when in fact the correct drug has been prescribed. This problem could be addressed through clinical education. Finally, students reported their perception of medicine was altered by these perceived quality deficits. These effects could lead to frustration and greater physician burnout in the future. Improved quality and humanism training to teach students how to take an active role in improving the delivery of care and avoiding burnout in the future will be of utmost importance.

### **Surgical Technique for Placement of Peripheral Neurostimulation Cuff in Vivo**

Emily Tibbits; Cole Budinsky; Amol Soin, MD, MBA

*Presenting Author:* Emily Tibbits  
*Faculty Mentor:* Amol Soin, MD, MBA  
*Previous submission:* None  
*Poster Number:* 46

**Objective:** Exploring surgical technique for placement of peripheral neurostimulation cuff for delivery of high-frequency alternating current in patients with chronic nerve pain

**Background:** Building upon last year's study in which five subjects (n=5) were enrolled in a short term 30 day study of high frequency stimulation, we present an IDE (investigational device exemption) FDA-approved study in which ten new patients underwent surgical implantation of the stimulation cuffs and had an extension on the lead prior to externalizing it from the skin. Unwanted or uncoordinated generation of nerve impulses is a major disabling factor in many chronic pain conditions. If these impulses could be intercepted or blocked by utilizing high frequency alternating current (HFAC) along the peripheral nerves, then the disabling conditions may be reduced or eliminated. Delivery of HFAC requires surgical implantation of an insulated nerve cuff electrode (or lead) on the targeted peripheral nerve.

**Methods:** Patients suffering from pain originating from a neuroma after amputation of the lower extremity were selected as candidates for spiral cuff implantation to administer peripheral nerve stimulation. Prior to lead implantation, patients were screened by undergoing at least two diagnostic peripheral nerve blocks using 0.2% Ropivacaine near the suspected peripheral nerve pain generator, proximal to the neuroma. Two successful nerve blocks deemed the patient a good candidate for spiral cuff electrode implantation. The site of peripheral spiral cuff electrode implantation was in the popliteal fossa at the junction of the sciatic, peroneal and tibial nerve clusters. After general anesthesia was administered, the patient was placed prone on the operating room table and a 1.5-inch incision was made on the posterior aspect of the popliteal fossa. The spiral cuff was inserted a few centimeters distal to the nerve junction and the lead was tunneled under the skin to exit proximal to the incision. The incision was closed and the proximal end of the lead was attached to the external pulse generator to administer the high frequency alternating current. The following "Results"

section details the change in procedure when compared to the previous year. **Results:** The five patients from last year's study had their nerve cuffs explanted after thirty days. Here we describe the surgical implantation of a nerve cuff in ten patients who are undergoing long term testing with leads externalized outside the skin. Because the surgical cuff placement is invasive, the newly enrolled patients from the study this year had an extension attachment to the external end of the lead. This extension attachment will be unscrewed and, using sterile technique, cut and pulled out of the skin, leaving the inner cuff still implanted. This provides a new attachment location on the end of the lead and yields the ability to internalize it into the pacemaker-sized pulse generator, which will be implanted in sterile fashion. This surgical approach allows the conversion from percutaneous leads that exit the skin to a fully implanted device without having to reopen the cuff site, remove the externalized wires and connect the lead into the pulse generator. The plan going forward is to allow these patients a fully implanted device with a pacemaker style internal pulse generator. **Conclusion:** Clinical application of HFAC nerve block is dependent upon successful surgical implantation of a nerve cuff electrode. Further studies are warranted to determine the effectiveness and utility of HFAC in humans. The clinical application and potential for HFAC include the ability to produce a reliable, gradable, and reversible nerve block to treat several chronic pain states such as residual limb pain, neuroma pain, chronic post surgical pain, and chronic neuropathic pain states.

### **Synthesis of a clickable probe for electrophiles formed in sterol biosynthesis**

Wayne Tse; Ned Porter, PhD

*Presenting Author:* Wayne Tse  
*Faculty Mentor:* Ned Porter, PhD  
*Previous submission:* American Chemical Society National Meeting, San Diego, CA, March 2012  
*Poster Number:* 18

**Objective:** We report advances in the synthesis of a clickable probe to further the understanding of the pathogenesis of Smith-Lemili-Optiz Syndrome (SLOS). **Background:** SLOS is a genetic disorder that is caused by a deficiency in functional 3β-

hydroxysterol- $\Delta^7$  reductase (DHCR7), an enzyme that converts 7-dehydrocholesterol (7DHC) to cholesterol in cholesterol biosynthesis. This causes the buildup of 7DHC, a compound that is prone to form toxic oxysterols upon reaction with oxygen. Nucleophilic amino acid residues of proteins are likely to react with these 7DHC oxysterols by Michael addition, resulting in covalent protein modifications. **Methods:** The probe will contain an alkyne on the terminal carbons of 7DHC ligand chain. Probe-protein adducts can be captured on streptavidin after click derivatization of alkynyl adducts with a photocleavable azido-biotin tag. This synthesis would develop an effective probe to isolate and identify the affected proteins of improper cholesterol metabolism. **Results:** The probe is in its initial stages of development and require further refinement and advancement to provide sufficient quantities to elicit the true pathogenesis of SLOS. **Conclusion:** Finish synthesis of the probe and proceed to testing in cell cultures.

### **Retrospective Analysis of the Influence of The Area Health Education Summer Preceptor Program (AHEC) on Medical Students' Choice of Specialty**

Catherine Ulman; Amanda Bell, MD

*Presenting Author:* Catherine Ulman

*Faculty Mentor:* Amanda Bell, MD

*Previous submission:* WSU BSoM Central Research Forum, Dayton, OH, November 2012

*Poster Number:* 4

**Objective:** This study attempted to determine whether students who participate in The Area Health Education Center Summer Preceptor Program (AHEC) are more likely to choose a primary care residency program (family medicine, internal medicine, pediatrics, or combined internal medicine & pediatrics). **Background:** Currently, the number of U.S. medical students entering family medicine is expected to be inadequate to meet the estimated need for primary care physicians in the United States (Pugno et al., 2010). The year 2010 actually saw the first increase in the number of students entering family medicine since 2004, probably reflecting multiple changes that have increased the information medical students receive about family medicine

(Scherger, 2010). Currently, all but 11 U.S. medical schools have a department of family medicine, more than 80% of medical schools require clinical clerkships in family medicine, and medical schools are increasing the number of elective opportunities in family medicine (Pugno et al., 2010). **Methods:** The study used evaluations collected by the Wright State University (WSU) Family Medicine Department from all WSU Boonshoft School of Medicine (BSOM) students who participated in AHEC from 1998 to 2008 (n = 301). Upon completion of AHEC, students evaluated the overall elective and their preceptors. Additionally, the preceptors (family medicine physicians) evaluated the students' performance in the elective. Then the WSU BSOM's Match Lists from 2001 to 2011 (the graduation years for AHEC participants from 1998-2008) were used to determine which residency programs the AHEC participants matched into. Once paired with the match list results, the AHEC data was de-identified to protect the privacy of the study participants. Chi-square tests were performed to determine if a significant relationship existed between students' and preceptors' evaluations and the students' match results. All statistical analysis of the data were completed using IBM SPSS predictive analytics software. **Results:** For all of the primary care specialties included in this study (family medicine, internal medicine, combined internal medicine & pediatrics, and pediatrics) the percentage of AHEC participants that went into primary care was higher than the percentage of the total medical school class that went into primary care residency programs. No significant relationships were found between students' and preceptors' evaluations and students' residency choices, probably because students almost unanimously rated the their overall AHEC experience and their preceptors very highly. Additionally, preceptors almost unanimously rated the students' overall performance with the highest scores possible. Because there was almost no variability in scoring, the study revealed no statistically significant relationships. **Conclusion:** Making educational electives in primary care available to students may increase the number of medical students who choose to enter primary care residency programs.

## **Is There a Right Way to Study for Medical School Exams?: How Medical Students' Personal and Academic Habits Affect Their Exam Performance**

Catherine Ulman; Nicole Borges, PhD

*Presenting Author:* Catherine Ulman

*Faculty Mentor:* Nicole Borges, PhD

*Previous submission:* WSU BSoM Research Learning Community Lecture Series on Medical Education Research, Dayton, OH, March 2013

*Poster Number:* 5

**Background:** Due to the significant increase in the difficulty and magnitude of work in medical school compared to undergrad, first-year medical students often have to alter their personal and academic habits to keep up with the rigorous schedule. Additionally, first-year medical students often receive conflicting advice from upper-level students, which is not only stressful and confusing but can also cause first-year students to employ study habits that may not help them succeed on exams. **Methods:** A survey collected information about medical students' personal and academic habits as well as their first-year, second-year, and term-one exam scores. All students in the Wright State University Boonshoft School of Medicine Class of 2014 (102 students) were invited to fill out the survey, and 79 students completed the survey (74% response rate). Chi-square tests determined if significant relationships exist between medical students' personal and academic habits and their exam scores. Lastly, the program R was used to train a regression tree to predict students' term-one exam scores based on their study habits. **Results:** In general, success on the first-year and second-year exams can be used to predict long-term retention of information (high score on the term-one exam). However, our analysis of the data found that certain personal and academic habits (eating breakfast, getting more sleep, studying alone, studying in a home/apartment, and reading the required readings) were associated with higher exam scores, while other personal and academic habits (using pre-made study guides, drinking caffeine, running out of time on exams, studying in groups, and making pharmacology flashcards) were associated with lower exam scores. **Conclusion:** Medical students' personal and academic habits

have an influence on their exam scores during the first two years of medical school.

## **A Comparison of Spinal Cord Stimulation Technologies Using an Observational Mechanical Gateway**

Eric Vangeloff; Sarah Chinnapan; Laura DeVita; Amol Soin, MD, MBA

*Presenting Author:* Eric Vangeloff

*Faculty Mentor:* Amol Soin, MD, MBA

*Previous submission:* WSU BSoM 2<sup>nd</sup> Annual Medical Student Research Symposium, Dayton OH, April 2010; WSU BSoM 3<sup>rd</sup> Annual Medical Student Research Symposium, Dayton OH, April 2011; WSU BSoM 4<sup>th</sup> Annual Medical Student Research Symposium, Dayton OH, April 2012

*Poster Number:* 57

**Objective:** A Comparison of Spinal Cord Stimulation Technologies Using an Observational Mechanical Gateway. **Background:**

Observational Mechanical Gateway (OMG) is a device created by Boston Scientific that externally attaches to other companies already implanted spinal cord stimulators and allows patients to experience stimulation from Boston Scientific. The OMG is a version of Boston Scientific's Implantable Pulse Generator and uses their patented Multiple Independent Control to deliver stimulation. This is a somewhat controversial technique because some view it as a technique to increase revenue while others view it as an opportunity for patients to experience a different stimulation. This goal of this project is to evaluate the results of OMG stimulation and to better understand the patients' subjective feeling of pain relief. **Methods:** Fifteen patients (n=15), who received trial spinal cord stimulation from other companies were offered the opportunity to trial OMG stimulation. All 15 patients' trialed OMG stimulation for 30 minutes just prior to permanent implantation. **Results:** At the end of the trial none of the 15 patients reported improvement in the Visual Analogue Scale of pain. All 15 patients reported feeling a "smoother" and "more comfortable" stimulation with the OMG than with their initial trialed device. Of the 15 patients, four desired to switch to Boston Scientific. The remaining 11 patients who did not desire to switch devices cited similar pain relief and comfort with

their original device. Two patients cited the positive rapport with the representative of their original device as their reason for not switching.

**Conclusion:** All 15 patients were successful trials and went on to receive permanent implantation with the device of their choice. Further study with larger sample sizes is warranted to draw any type of clinically significant conclusions.

### **Usage of Cyberknife to Achieve Denervation of the Trigeminal Ganglion in Facial pain patients diagnosed with Trigeminal Neuralgia**

Vivek Yedavalli; Willie Harrington; Cole Budinsky; Amol Soin MD, MBA

*Presenting Author:* Vivek Yedavalli

*Faculty Mentor:* Amol Soin MD, MBA

*Previous submission:* None

*Poster Number:* 40

**Objective:** Comparing the Cyberknife radiosurgical technique to the Gamma Knife technique for achieving denervation of the Trigeminal ganglion leading to decreased pain and improved quality of life for Trigeminal Neuralgia patients. **Background:** Trigeminal Neuralgia is a chronic, debilitating pain condition primary seen in adults under 40 years. This condition is often characterized as severe electric shock-like spasm causing pain located along the distribution of the effected trigeminal ganglion. The condition is unique in that it can be triggered by common everyday activity such as brushing teeth and shaving as well as external stimuli such as wind and sound. The sharp pain is most often localized to one side of the face, primarily around the eye and cheek areas. The condition is generally diagnosed with blood tests, MRIs, and/or testing of the trigeminal reflexes. The current drug of choice for treatment is Carbamazepine, a sodium channel blocker that makes nerve cells less excitable. However, several stereotactic radiosurgical (SRS) techniques have now paved way for longer lasting treatment options using minimally invasive methods. In this study, we describe a case series of two patients who received cyberknife therapy, a newer up and coming SRS, as a minimally invasive way to denervate the trigeminal ganglion compared to gamma knife, a more establish SRS. **Methods:** A case series of two patients who achieved short term but >50%

pain reduction following a set of two diagnostic local anesthetic trigeminal nerve blocks using lidocaine under fluoroscopic guidance were selected to enroll in the study. Following successful short term relief from the local anesthetic block- these patients were referred to cyberknife. A team of physicians including an interventional pain management physician to conduct the local anesthetic block, a neuroradiologist to conduct real time CT scanning to adequately determine the local of radiation denervation and a radiation oncologist were used to complete the patients. **Results:** 2 female patients in the mid 60s both with right-sided trigeminal neuralgia were selected to participate in the study. Following successful local anesthetic blocks with short-term relief from lidocaine they were sent to the cyberknife center. Each patient had a real time craniofacial CT scan completed to help determine where to adequately lesion the trigeminal ganglion. Each patient received an identical cyberknife treatment which included energy of 6MV, total radiotherapy dose of 5,800 cGy with 01 fractions. Unlike gamma knife, which requires a halo frame to be screwed into the patient's skull by a neurosurgeon, cyberknife is frameless and only a customized immobilizing mask was used.

The median time to pain reduction was 4 -5 weeks in the patients studied and both patients achieved an over pain improvement of 82% and a perceived functional improvement percentage increase of 76%. **Conclusion:** Cyberknife offers a potentially less invasive and effective way to achieve denervation of the trigeminal ganglion than gamma knife. Further long-term studies are needed to verify the data presented.

### **Using Ultrasound guided Neurostimulation Lead Cuff Placement for treatment of Chronic Pain**

Vivek Yedavalli; Willie Harrington; Cole Budinsky; Amol Soin MD, MBA

*Presenting Author:* Vivek Yedavalli

*Faculty Mentor:* Amol Soin MD, MBA

*Previous submission:* None

*Poster Number:* 41

**Objective:** To improve quality of life for chronic pain patients through ultrasound guided

neurostimulation cuff placement. **Background:** One of the most common diagnoses today in medicine is chronic pain. It has continued to rise in numbers and now decreases the quality of life for many. In order to improve patient quality of life, chronic pain treatment and analgesia has become an up and coming research area. One promising method of analgesia is the ultrasound guided placement of high frequency alternating current (HFAC) on peripheral nerves. **Methods:** Anesthesiologists now have become well versed in ultrasound technique and now utilize for increased precision of needle placement, especially for peripheral nerve blocks. HFAC achieves a potent nerve block by using surgical cuff stimulating lead. This lead is placed around the peripheral nerve of interest. By doing so, this allows us to only modulate transmission of the targeted nerve. The lead is then attached to an internal pulse generator, which allows for continuous targeted stimulation and eventual nerve blockade. Electric currents from the generator that alter the transmission of the voltage gated ion channels that traverse the nerve membrane produce the blockade. The blockade occurs because HFAC depolarizes the nerve leading to thwarting of transmission. As placement of surgical cuff electrodes near peripheral nerves is not a common

procedure done by anesthesiologists, we first utilized cadaveric dissection to demonstrate the feasibility of peripheral nerve electrode placement. This method included human cadaveric dissections of the upper and lower extremities to expose the major peripheral nerves. **Results:** This study is part of an ongoing multiyear clinical case study. As a result, this abstract has updated and new information to report compared to the prior. A IDE (investigational device exemption) was obtained to undergo a clinical trial using a peripheral nerve cuff. After IRB approval a total of (n=15) patients were enrolled in the study. New inclusion criteria included a screening local anesthetic block with lidocaine. If over 50% pain reduction was obtained the nerve cuff was implanted in the patient. **Results:** 10 Patients were implanted with a stimulation nerve cuff. Preoperative screening ultrasound was conducted on 9 patients to determine the depth and location of the desired nerve. This was marked and dissection was carried out to expose the nerve. Intraoperative time was decrease significantly in the 9 patients screened. Mean exposure time was 12 minutes compared to 68 minutes in a prior study group (n= 5 patients) who did not receive screening ultra sound. **Conclusion:** U/S allows for faster and more efficient cuff placement





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*Faculty Mentor:* Mark Willis, MA  
*Mentor's Department:* Community Health  
*Previous submission:* Association of American Medical Colleges Central Group on Educational Affairs Annual Meeting, Cincinnati, OH, March 2013
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Colleen McCormick; Sara Paton, PhD; Sherman Alter, MD  
*Presenting Author:* Colleen McCormick  
*Faculty Mentor:* Sara Paton, PhD; Sherman Alter, MD  
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Jennifer Rammel, MPH, Adrienne Stolfi, MSPH; Shalini G Forbis, MD, MPH  
*Presenting Author:* Jennifer Rammel  
*Faculty Mentor:* Shalini G Forbis, MD, MPH  
*Mentor's Department:* Pediatrics  
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*Presenting Author:* Natalie Pyatka  
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*Presenting Author:* Arvind Suguness  
*Faculty Mentor:* Nicole Borges, PhD  
*Mentor's Department:* Community Health  
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*Presenting Author:* Ayesha Ashai  
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*Presenting Author:* Meaghan Ebetino; Sonya Hovsepian  
*Faculty Mentor:* Evangeline Andarsio, MD  
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*Presenting Author:* Ankush Kalra

*Faculty Mentor:* Karen Kirkham, MD

*Mentor's Department:* Internal Medicine

*Previous submission:* None

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Elizabeth Shanika Ranasinghe; Bruce Binder, MD, PhD; Nicole Borges, PhD

*Presenting Author:* Elizabeth Shanika Ranasinghe

*Faculty Mentor:* Bruce Binder, MD, PhD; Nicole Borges, PhD

*Mentor's Department:* Family Medicine; Community Health

*Previous submission:* None

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Robert Beaulieu, Topaz Sampson, Raymond Ten Eyck, MD, MPH, FACEP

*Presenting Author:* Topaz Sampson

*Faculty Mentor:* Raymond P Ten Eyck, MD, MPH, FACEP

*Mentor's Department:* Emergency Medicine

*Previous submission:* None

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Kiran Faryar; Sara Paton, PhD; Mark Gebhart, MD

*Presenting Author:* Kiran Faryar

*Faculty Mentor:* Sara Paton, PhD; Mark Gebhart, MD

*Mentor's Department:* Community Health

*Previous submission:* None

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Christopher Heid; Ronald Markert, PhD; Priti Parikh, PhD; A. Peter Ekeh, MD, MPH

*Presenting Author:* Christopher Heid

*Faculty Mentor:* A. Peter Ekeh, MD, MPH

*Mentor's Department:* Surgery

*Previous submission:* WSU BSoM Central Research Forum, Dayton, OH, November 2012

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Amanda Freeman; Jim Olson, PhD

*Presenting Author:* Amanda Freeman

*Faculty Mentor:* Jim Olson, PhD

*Mentor's Department:* Emergency Medicine; Neuroscience, Cell Biology & Physiology

*Previous submission:* Society for Neuroscience 42<sup>nd</sup> Annual Meeting, New Orleans, LA, October 2012

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Shannon H. Romer, MS; Adam S. Deardorff, MS; Saif Ahmed, MS; Ryan Schwieterman; Ralla Shrit; Robert E.W. Fyffe, PhD

*Presenting Author:* Ralla Shrit

*Faculty Mentor:* Robert E.W. Fyffe, PhD

*Mentor's Department:* Neuroscience, Cell Biology & Physiology

*Previous submission:* Society for Neuroscience 42<sup>nd</sup> Annual Meeting, New Orleans, LA, October 2012

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Wayne Tse; Ned Porter, PhD

*Presenting Author:* Wayne Tse

*Faculty Mentor:* Ned Porter, PhD

*Mentor's Department:* Chemistry (Vanderbilt University)

*Previous submission:* American Chemical Society National Meeting, San Diego, CA, March 2012

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Denada Palm; Mukul Chandra, MD

*Presenting Author:* Denada Palm

*Faculty Mentor:* Mukul Chandra, MD

*Mentor's Department:* Internal Medicine

*Previous submission:* None

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Mark J. Niebauer, MD, PhD; John Rickard, MD; Niraj Varma, MD, PhD; Patrick J. Tchou, MD; Landon Polakof, BS; Barry Kuban, BS

*Presenting Author:* Landon Polakof

*Faculty Mentor:* Mark J. Niebauer, MD, PhD

*Mentor's Department:* Cardiovascular Medicine (Cleveland Clinic)

*Previous submission:* Heart Rhythm Society 33rd Annual Scientific Sessions, Boston, MA, May 2012

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Claire Brandon; Brenda Roman, MD; Jerald Kay, MD

*Presenting Author:* Claire Brandon

*Faculty Mentor:* Jerald Kay, MD

*Mentor's Department:* Psychiatry

*Previous submission:* None

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Ashlee Edgell; Christopher Lindsell, PhD; Kim Ward Hart, MA; Jason McMullan, MD

*Presenting Author:* Ashlee Edgell

*Faculty Mentor:* Jason McMullan, MD

*Mentor's Department:* Emergency Medicine (University of Cincinnati)

*Previous submission:* Oridion Emergency Medicine Capnography Summit, Hyattsville, MD, December 2011

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Brian Patterson; Colleen McCormick; Brian Burke, MD

*Presenting Author:* Brian Patterson

*Faculty Mentor:* Brian Burke, MD

*Mentor's Department:* Internal Medicine

*Previous submission:* None

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Colleen Begley; Holly Paugh, MD; Marlene Willen, MD

*Presenting Author:* Colleen Begley

*Faculty Mentor:* Marlene Willen, MD

*Mentor's Department:* Northcoast Dermatology Associates (Independence, OH)

*Previous submission:* Creighton University Honors Day, Omaha, NE, April 2012

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Eric Hard; Joseph Baber, DO; Salma Akram, MD

*Presenting Author:* Eric Hard

*Faculty Mentor:* Salma Akram, MD

*Mentor's Department:* Internal Medicine

*Previous submission:* None

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Flor Guerengomba; Salma Akram, MD; Ofor Ewelukwa, MD

*Presenting Author:* Flor Guerengomba

*Faculty Mentor:* Salma Akram, MD

*Mentor's Department:* Internal Medicine

*Previous submission:* None

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Robert Beaulieu; Kristine Kunesh-Part, MD; John Kunesh, MD

*Presenting Author:* Robert Beaulieu

*Faculty Mentor:* Kristine Kunesh-Part, MD; John Kunesh, MD

*Mentor's Department:* Ophthalmology (Kunesh Eye Center)

*Previous submission:* None

**28. Early prediction of trauma patient discharge disposition**

Robert Beaulieu; Priti Parikh, PhD; A. Peter Ekeh, MD, MPH; Ronald Markert, PhD; Mary McCarthy, MD

*Presenting Author:* Robert Beaulieu

*Faculty Mentor:* Mary McCarthy, MD

*Mentor's Department:* Surgery

*Previous submission:* None

**29. Predicting Aneurysmal Rupture Rates: Are Smaller Aneurysms Really Less Apt To Bleed and Does Morphology Matter?**

Ryan Schwieterman; John Terry MD; Ronald Markert, PhD; Bryan Ludwig, MD

*Presenting Author:* Ryan Schwieterman

*Faculty Mentor:* Bryan Ludwig, MD

*Mentor's Department:* Neurology; Neuroscience, Cell Biology, & Physiology

*Previous submission:* American Academy of Neurology Annual Meeting, San Diego, CA, March 2013

**30. Failed Vascular Repair after Direct Laceration of the Popliteal Artery During Total Knee Arthroplasty - A Case Report**

Cody Green; Homayoun Mesghali, MD; Emmanuel K. Konstantakos, MD

*Presenting Author:* Cody Green

*Faculty Mentor:* Homayoun Mesghali, MD

*Mentor's Department:* Orthopaedic Surgery, Sports Medicine, & Rehabilitation

*Previous submission:* WSU BSoM Central Research Forum, Dayton, OH, November 2012

**31. A "Twist" on Abdominal Pain: Volvulus of the Small Intestine in a 46-Year-Old Woman**

Jared Klein; Kate Baxstrom; Stephen Donnelly; Patrick Feasel; Paul Koles, MD

*Presenting Author:* Jared Klein

*Faculty Mentor:* Paul Koles, MD

*Mentor's Department:* Pathology

*Previous submission:* None

**32. What are the radiologic findings of a lysosome storage disease in a 2-year-old boy?**

Shaina Hecht; Dawn Light, MD, MPH

*Presenting Author:* Shaina Hecht

*Faculty Mentor:* Dawn Light, MD, MPH

*Mentor's Department:* Pediatrics

*Previous submission:* None

**33. A multidisciplinary approach to managing sports-related concussions in adolescents**

Natasha Mehta; Julie Miller, PsyD; Vismai Sinha, MD

*Presenting Author:* Natasha Mehta

*Faculty Mentor:* Vismai Sinha, MD

*Mentor's Department:* Family Medicine; Sports Medicine (Kettering Health Network)

*Previous submission:* None

- 34. Barrow's sign: Assessing the utility of a novel physical exam skill in the evaluation of isolated meniscal tears**  
Ryan Noska; Zachary J. DiPaolo; Michael W. Barrow, MD  
*Presenting Author:* Zachary J. DiPaolo  
*Faculty Mentor:* Michael W. Barrow, MD  
*Mentor's Department:* Family Medicine  
*Previous submission:* None
- 35. Routine Usage of Contrast Dye in Stellate Ganglion Blocks: An Updated Look**  
Ryan Noska; Sindhu Samba; Vivek Yedavalli; Amol Soin, MD, MBA  
*Presenting Author:* Ryan Noska  
*Faculty Mentor:* Amol Soin, MD, MBA  
*Mentor's Department:* Surgery  
*Previous submission:* WSU BSoM 4<sup>th</sup> Annual Medical Student Research Symposium, Dayton OH, April 2012
- 36. Right to Left Shunt During Anesthesia in Liver Transplantation: A Multiyear Clinical Case Series**  
Abigail Monnig; Christoforos Frangopoulos; Cole Budinsky; Amol Soin, MD, MBA  
*Presenting Author:* Abigail Monnig  
*Faculty Mentor:* Amol Soin, MD, MBA  
*Mentor's Department:* Surgery  
*Previous submission:* None
- 37. Novel Approach to Anomalous Pulmonary Artery Repair for the Pediatric Anesthesiologist**  
Christo Frangopoulos; Abigail Monnig; Amol Soin, MD, MBA  
*Presenting Author:* Christo Frangopoulos  
*Faculty Mentor:* Amol Soin, MD, MBA  
*Mentor's Department:* Surgery  
*Previous submission:* None
- 38. Tuberous Sclerosis Renal Disease: From Cell Biology Quirks to Possible Cures**  
Sindhu Samba; Emma Headley; Lu Lu; Ryan Reichert; Brian Siroky, PhD; John J Bissler, MD  
*Presenting Author:* Sindhu Samba  
*Faculty Mentor:* John J Bissler, MD  
*Mentor's Department:* Pediatrics (Cincinnati Children's Hospital)  
*Previous submission:* Medical Student Summer Research Program (MSSRP) Fall Symposium Cincinnati Children's Hospital Medical Center, Cincinnati, OH, October 2012
- 39. Trigeminal Ganglion Gamma Knife Ablation to Treat Atypical Facial Pain**  
Sindhu Samba; Ryan Noska; Vivek Yedavalli; Amol Soin, MD, MBA  
*Presenting Author:* Sindhu Samba  
*Faculty Mentor:* Amol Soin, MD, MBA  
*Mentor's Department:* Surgery  
*Previous submission:* None



**40. Usage of Cyberknife to Achieve Denervation of the Trigeminal Ganglion in Facial pain patients diagnosed with Trigeminal Neuralgia**

Vivek Yedavalli; Willie Harrington; Cole Budinsky; Amol Soin MD, MBA

*Presenting Author:* Vivek Yedavalli

*Faculty Mentor:* Amol Soin MD, MBA\

*Mentor's Department:* Surgery

*Previous submission:* None

**41. Using Ultrasound guided Neurostimulation Lead Cuff Placement for treatment of Chronic Pain**

Vivek Yedavalli; Willie Harrington; Cole Budinsky; Amol Soin MD, MBA

*Presenting Author:* Vivek Yedavalli

*Faculty Mentor:* Amol Soin MD, MBA

*Mentor's Department:* Surgery

*Previous submission:* None

**42. Facilitation and Placement of a Neurostimulation Cuff via Cadaveric Dissection**

Cole Budinsky; Emily Tibbitts; Vivek Yedavalli; Amol Soin, MD, MBA

*Presenting Author:* Cole Budinsky

*Faculty Mentor:* Amol Soin, MD, MBA

*Mentor's Department:* Surgery

*Previous submission:* None

**43. Ultrasound Guidance as Predictor of Success for High Frequency Electric Nerve Block in Patients with Amputation Stump Pain**

Jennifer Castelbuono; Samira Sihabdeen; Scott Seider; Amol Soin, MD, MBA

*Presenting Author:* Jennifer Castelbuono

*Faculty Mentor:* Amol Soin, MD, MBA

*Mentor's Department:* Surgery

*Previous submission:* None

**44. Results of Short Term Human Testing of High Frequency Nerve Stimulation**

Shamie Das; Amol Soin, MD, MBA

*Presenting Author:* Shamie Das

*Faculty Mentor:* Amol Soin, MD, MBA

*Mentor's Department:* Surgery

*Previous submission:* None

**45. Ultrasound Mapping for Placement of a Long Term Neurostimulation and Postoperative Nerve Healing**

Willie Harrington; Vivek Yedavalli Amol Soin, MD, MBA

*Presenting Author:* Willie Harrington

*Faculty Mentor:* Amol Soin, MD, MBA

*Mentor's Department:* Surgery

*Previous submission:* None

- 46. Surgical Technique for Placement of Peripheral Neurostimulation Cuff in Vivo**  
Emily Tibbits; Cole Budinsky; Amol Soin, MD, MBA  
*Presenting Author:* Emily Tibbits  
*Faculty Mentor:* Amol Soin, MD, MBA  
*Mentor's Department:* Surgery  
*Previous submission:* None
- 47. Relief of Chronic Pain with Long-Term use of High Frequency Peripheral Neuromodulation**  
Jonathan Silverman; Shamie Das; Laura DeVita; Amol Soin MD, MBA  
*Presenting Author:* Jonathan Silverman  
*Faculty Mentor:* Amol Soin, MD, MBA  
*Mentor's Department:* Surgery  
*Previous submission:* None
- 48. Using a Patient Therapy Manager with opioid alternatives to Allow for Patient Controlled Analgesia via an Implanted Intrathecal Pump**  
Clara Antoury; Amol Soin, MD, MBA  
*Presenting Author:* Clara Antoury  
*Faculty Mentor:* Amol Soin, MD, MBA  
*Mentor's Department:* Surgery  
*Previous submission:* None
- 49. Long Term Management of Back Pain via Thermal Radiofrequency Ablation of the Sacroiliac Joint**  
Paul Gruber; John Herald; Vivek Yedavalli; Amol Soin; MD, MBA  
*Presenting Author:* Paul Gruber  
*Faculty Mentor:* Amol Soin, MD, MBA  
*Mentor's Department:* Surgery  
*Previous submission:* WSU BSoM 4<sup>th</sup> Annual Medical Student Research Symposium, Dayton OH, April 2012
- 50. Fluoroscopically Guided Minimally Invasive Lumbar Decompression (MILD) to treat Spinal Stenosis: A Case Series of 50 Patients**  
Lucy Shi; Simon Choi; Bryan Hill; Sara Chinnappan; Telisha Ortiz; Christoforos Frangopoulos; Cole Budinsky; Amol Soin, MD, MBA  
*Presenting Author:* Lucy Shi  
*Faculty Mentor:* Amol Soin, MD, MBA  
*Mentor's Department:* Surgery  
*Previous submission:* WSU BSoM 4<sup>th</sup> Annual Medical Student Research Symposium, Dayton OH, April 2012
- 51. 3 Dimensional Reconstruction as a Technique to Enhance Image Quality in Discography**  
John Herald; Uloma Oziril; Laura Devita; Cole Budinsky; Amol Soin, MD, MBA  
*Presenting Author:* John Herald  
*Faculty Mentor:* Amol Soin, MD, MBA  
*Mentor's Department:* Surgery  
*Previous submission:* WSU BSoM 4<sup>th</sup> Annual Medical Student Research Symposium, Dayton OH, April 2012

**52. Treating Chronic Post Herpetic Neuralgia Using Topical Superconcentrated Capsaicin**

Scott Seider; Jason Miller; Amol Soin, MD, MBA

*Presenting Author:* Scott Seider

*Faculty Mentor:* Amol Soin, MD, MBA

*Mentor's Department:* Surgery

*Previous submission:* None

**53. Loss of Resistance Using Air versus Saline to Achieve Access to the Epidural Space**

Samira Sihabdeen; Jennifer Castelbuono; Amol Soin, MD, MBA

*Presenting Author:* Samira Sihabdeen

*Faculty Mentor:* Amol Soin, MD, MBA

*Mentor's Department:* Surgery

*Previous submission:* None

**54. Indirect Video Laryngoscopy to Achieve Airway Access In Documented Difficult Airways**

Marc Gelpi; Eric Vangeloff; Jason Miller; Amol Soin, MD, MBA

*Presenting Author:* Marc Gelpi

*Faculty Mentor:* Amol Soin, MD, MBA

*Mentor's Department:* Surgery

*Previous submission:* WSU BSoM 4<sup>th</sup> Annual Medical Student Research Symposium, Dayton OH, April 2012

**55. A Cost/Benefit Analysis of Indirect Video Laryngoscopy for Routine Intubations**

Jason Miller; Sarah Elswick; Eric Vangeloff; Cole Budinsky; Amol Soin, MD, MBA

*Presenting Author:* Jason Miller

*Faculty Mentor:* Amol Soin, MD, MBA

*Mentor's Department:* Surgery

*Previous submission:* None

**56. Alternative to Endotracheal Tubes to Facilitate Airway Access in Cases of Documented Difficult Airways Using a ProSeal**

Paul Craig; Amol Soin, MD, MBA

*Presenting Author:* Paul Craig

*Faculty Mentor:* Amol Soin, MD, MBA

*Mentor's Department:* Surgery

*Previous submission:* None

**57. A Comparison of Spinal Cord Stimulation Technologies Using an Observational Mechanical Gateway**

Eric Vangeloff; Sarah Chinnapan; Laura DeVita; Amol Soin, MD, MBA

*Presenting Author:* Eric Vangeloff

*Faculty Mentor:* Amol Soin, MD, MBA

*Mentor's Department:* Surgery

*Previous submission:* WSU BSoM 2<sup>nd</sup> Annual Medical Student Research Symposium, Dayton OH, April 2010; WSU BSoM 3<sup>rd</sup> Annual Medical Student Research Symposium, Dayton OH, April 2011; WSU BSoM 4<sup>th</sup> Annual Medical Student Research Symposium, Dayton OH, April 2012

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