2017

The Ohio State University
College of Medicine

MDSRS Annual Research Symposium

Research Trainees
Medical Student Research Program

November 9th, 2017
11:30am – 2:00 pm
Biomedical Research Tower
Nikhil Adapa  
**Mentor:** Kanu Goyal MD  
**Poster:** 80  
**Project Title:** Impact of Casting and Splinting Manipulations on Forearm Pressure: An Experimental Model  
**Abstract:** Background: Splints and casts are routinely utilized to immobilize limbs after musculoskeletal injuries or surgery. Circumferential dressings that are unable to accommodate soft tissue swelling can cause significant pain and discomfort to the patient. The purpose of this study is to demonstrate the influence of different circumferential dressing techniques and manipulations on the pressure within the dressing.  
**Methods:** Experiments were performed on a static PVC pipe model. Continuous pressure measurements were made with a pressure transducer connected to a 100 mL saline bag which was attached to the outside of the PVC pipe. Comparisons were made between intact and bivalved casts, between intact and split padding splints, between synthetic and cotton padding, and between low, medium, or high tension ACE wraps. Further, to simulate the dressing's compliance to soft tissue swelling, the change in pressure was measured after 25 mL of saline was injected into the saline bag.  
**Results:** Cast bivalving reduced pressure up to 67%, and splitting the cotton padding of a splint reduced pressures up to 20%. Intact casts were not very compliant, and surface pressures increased rapidly after swelling was introduced. Bivalving a cast and splitting a splint helped accommodate swelling. Surprisingly, the tension with which an ACE bandage is applied and type of cotton used had an impact on the overall compliance of the circumferential dressings.  
**Conclusion:** These manipulations help reduce surface pressure and allow the construct to be more accommodating to soft tissue swelling. Especially in an acute setting, these changes can improve the pain and discomfort patients experience.

Aderinola Adejare  
**Mentor:** Darrell M. Gray II MD  
**Poster:** 1  
**Project Title:** Examining Barriers to Cancer Prevention Tests among Medicaid Patients in a Patient Navigation Program  
**Abstract:** Background: Patient navigation (PN) is an evidence-based model of care that helps patients overcome barriers to timely cancer screening, diagnosis, and treatment. Although it has been shown to reduce delays along the cancer care continuum among low-income and racial/ethnic minority populations, its effectiveness within an urban Medicaid population is not well established. Characterizing barriers among this population will guide future research and targeted applications of the patient navigation model.  
**Objective:** This study aims to analyze barriers to cancer screening for colorectal, breast, and cervical cancer, among Medicaid patients in a PN program. Differences in reported barriers by race, ethnicity, and clinic site were examined.  
**Study Design:** A retrospective review and secondary analysis of data gathered from a PN program in an urban tertiary referral academic medical center.  
**Methods:** De-identified data from the Way Finder PN Program was reviewed. 1760 out of 1880 patients met our Medicaid inclusion criteria. The data was analyzed using descriptive statistics and SAS software. Variables included clinic site, patients' demographic [i.e. race, ethnicity, age, gender], and patient identified barriers.  
**Results:** There were differences in reported barriers by race/ethnicity: Asian patients reported the highest percentage with language barriers at 86% while comorbidity was the highest reported barrier for black and white patients at 21% for both groups. There were also differences in reported barriers by clinic site: 60% of patients at one clinic site had language barriers, while comorbidity was the highest reported barrier for patients at three different clinics.  
**Conclusion:** PN plays an integral role in identifying and addressing barriers to cancer screening among Medicaid patients. There are distinct barriers, in many cases multiple barriers, to cancer screening among patients with Medicaid insurance that vary by race/ethnicity and clinic site.
David Allen
Mentor: Emmett Whitaker MD
Poster: 27
Project Title: Surgical stress-induced glutamate dysregulation in the prefrontal cortex (PFC) of neonatal piglets: A Pilot Study
Abstract: 1.5 million children aged less than 1 year undergo surgery annually. Thus, elucidation of the potential neurotoxicity of anesthetics is critical to the anesthesia community. This represents a critical knowledge gap to be filled, because until its mechanisms are understood, it will be impossible to develop strategies for prevention and/or treatment of AIDN. Preliminary data from our laboratory suggest that sevoflurane increases extracellular glutamate in the hippocampus of neonatal piglets, potentially inducing excitotoxicity and neuronal death. We hypothesize that 1) increased extracellular glutamate occurs due to a decrease in glutamate clearance via inhibition of glutamate transport at excitatory amino acid transporters (EAATs); and 2) administration of acetyl-L-carnitine (ALC), known to increase glutamate clearance at EAATs, will corroborate this hypothesis by decreasing extracellular glutamate in the setting of sevoflurane anesthesia.

Celia Bangert
Mentor: Courtney Lynch PhD
Poster: 7
Project Title: Strategies for Pregnancy Achievement: Is having difficulty getting pregnant associated with stress, anxiety, and depression?
Abstract: Impaired fecundity affects up to 17% of women of reproductive age. Many studies have shown an increased rate of distress in women undergoing treatment for infertility, but researchers do not agree on the directionality of that association. To begin to examine that association we collected cross sectional data from the screening tool of the Strategies for Pregnancy Achievement randomized controlled trial. We hypothesized that across the sample population the rates of stress, anxiety, and depression will increase as time-to-pregnancy lengthens. In total 500 women met all criteria for inclusion in the analysis. A third of women (29.48%) were found to be anxious while fewer (23.19%) were found to screen positive for depression, and the most (34.61%) reported more stress than an average woman. After adjusting for race, age, infertility treatment status, and recruitment source, women who reported trying greater than 12 months were almost twice as likely to report being stress compared to women trying less than 6 months. Overall, rates of all distress measures were found to be higher than expected for the sample population. While anxiety does not appear to influence time to pregnancy, there is the suggestion of the effect of increased depression among women trying for greater than 12 months compared to those who reported trying less than 6 months. Because there is an increased odds of stress and depression in women trying more than 12 months we believe there is a relation between stress, depression, and decreased fecundity. However, this trend was not linear across all time points therefore directionality of this association remains unclear and further studies are needed. The prospective randomized control trial from which this data was drawn should further elucidate the relation of these variables.
Matthew Basinger  
**Mentor:** Dr. Ginny Bumgardner MD, PhD  
**Poster:** 64  
**Project Title:** Bench to Bedside: Human Alloimmunity  
**Abstract:** Our group discovered a novel subset of regulatory CD8+ T cells, which express IFN-g, negatively regulate Th1 and Th2 CD4+ T follicular helper T cells, kill alloprimed B cells and reduce the production of posttransplant alloantibody in mice. The current study aimed to investigate evidence of comparable antibody-suppressing IFNg+CD8+ T cells in humans. Therefore, we prospectively and serially analyzed peripheral blood lymphocytes and monitored for de novo donor specific antibody (DSA) production during the first year in first-time human kidney transplant recipients immunosuppressed with combined calcineurin and mTOR inhibitors. Of 42 recipients, ten (23.8%) developed DSA (average 6.56±2.2 months posttransplant). Distinct immune profiles were observed prior to DSA production including significantly fewer peripheral IFN-g+CD8+ T cells, increased frequency of IL-4+CD4+ T cells (Th2) and IFN-g+CD4+ T cells (Th1), and significantly lower ratios of IFN-g+CD8+ T cell to IL-4+CD4+ T cell and/or IFN-g+CD4+ T cells compared to recipients that remained DSA-negative. While one year graft and patient survival is 100% in this group of 42 patients, DSA-positive recipients have significantly higher serum creatinine, indicative of reduced graft function compared to DSA-negative patients. Our immunological data supports the hypothesis that antibody-suppressing IFN-g+CD8+ T cells regulate humoral alloimmunity in human kidney transplant recipients and suggests that serial monitoring of the ratio of these cells to IL-4+CD4+ T cells and IFN-g+CD4+ T cells may be predictive of de novo DSA production.

Nicholas Beecroft  
**Mentor:** Daryl McLeod MD  
**Poster:** 48  
**Project Title:** Impact of Delayed Imaging on Blunt Renal Trauma in Children  
**Abstract:** Abstract Molly E Fuchs MD, Nicholas Beecroft BS, Daniel G Dajusta MD, Daryl McLeod MD MPH  
Background Children who sustain renal injuries often undergo tri-phasic computed tomography (CT) scan during their evaluation. While this scanning protocol is recommended and necessary to grade renal images with certainty, little is known about its impact on patient outcomes. It was hypothesized that a minority of patients receive the recommended appropriate level of initial imaging for suspected renal trauma and that the level of imaging does not ultimately affect overall hospital course or trauma outcomes. Methods Data on renal trauma patients was retrospectively collected at a level 1 pediatric trauma center from 2006 through 2015. Demographic information, injury characteristics, imaging, and outcomes were reviewed and analyzed. Patients were categorized into two groups: those who had received CT with delayed images as initial imaging, and those who did not. Results The median length of stay (LOS) among all patients was 3 days without significant differences by cohort (P=0.24). Similarly, the proportion of patients who received 1 or more subsequent CT scans, those who underwent a urologic procedure, and those who received follow-up imaging did not differ significantly for the no delay scan cohort compared to patients who received delay scan. Conclusions This study was ultimately unable to demonstrate a difference in outcomes between patients who had a delayed CT scan and those who did not, as measured by LOS, in-stay subsequent CT scans, post-discharge follow-up imaging, and urologic procedure. These results could support the idea that delayed imaging CT scans are not essential for the care of renal trauma patients. Future Plans Submission to the Gold Journal (Urology).
**Patricia Belle**  
**Mentor:** Kyle Perry MD  
**Poster:** 62  
**Project Title:** Post-nissen fundoplication dysphagia: Evaluation of predictors and treatment options  
**Abstract:** Dysphagia, or difficulty swallowing, is a commonly reported side effect in patients who have been treated for gastroesophageal reflux disease with fundoplication surgery. The occurrence of dysphagia is troublesome for patients leading to surgery dissatisfaction. In order to influence treatment options and to identify people who are at risk for dysphagia, we looked for patient related and procedure related predictors of post-nissen fundoplication dysphagia. Using a database of patients who underwent fundoplication surgery by a single surgeon, we identified those who experienced post-operative dysphagia and were treated with dilation. Our data consisted of 128 patients from the Foregut database between dates 10/21/2014 and 8/27/2015. We excluded 12 patients with Linx surgeries instead of fundoplications. Of the 116 patients included in our analysis, we compared variables of objective testing results, operative data, and patient characteristics. We found that 11 (9.5%) patients underwent postoperative dilation. In comparison to the asymptomatic group without post-operative dilations, the symptomatic group had a higher ratio of female patients (81.8% vs 70.5%), higher percentage of American Society of Anesthesiologists (ASA) level of 3 or greater (81.8% vs 58.1%), and a higher percentage of patients with dysphagia as a post-operative diagnosis (18.2% vs 3.8%). Of the 11 patients in the symptomatic group, 4 patients (36%) had a past surgical history significant for esophagastroduodenoscopy (EGD) with balloon dilation or significant for prior fundoplication procedure, or both. Based on this data, there is a trend indicating that female patients with dysphagia who have had prior fundoplication surgeries or dilations may be at risk for dysphagia post-operatively.

**Pamela Benavidez**  
**Mentor:** Emmett Whitaker MD  
**Poster:** 81  
**Project Title:** Cytokine expression in prefrontal cortex of neonatal piglets in response to sevoflurane general anesthesia and surgical stress  
**Abstract:** Background: Recent studies have raised concern that anesthesia exposure in animals' brains may lead to cell death. Despite these findings, the mechanism(s) of anesthesia induced neurotoxicity (AIN) have not been elucidated. We hypothesized that anesthesia and/or surgery stress would lead to increased expression of inflammatory cytokines in the prefrontal cortex.  
**Methods:** We exposed neonatal piglets to 3% sevoflurane alone and 3% sevoflurane + surgical stress. Untreated piglets served as controls. Inflammatory cytokines were measured in prefrontal cortex (PFC) using western blotting.  
**Results:** Contrary to our hypothesis, IL-1β and TNF-α, were not detected in the acute setting. Future studies will be aimed at examining the inflammatory effects of anesthesia and/or surgery over time.
Kendyl Carlisle
Mentor: Shahid Nimjee MD, PhD
Poster: 51
Project Title: VWF Aptamer Therapy after Thrombosis in a Canine Stroke Model
Abstract: ABSTRACT Introduction: Stroke is a leading cause of death worldwide. Recombinant tissue plasminogen activator (rTPA), the current mainstay treatment has limitations it must be given within 4.5 hours of stroke and often leads to cerebral hemorrhage. Aptamers are molecules that bind to nucleic acids to elicit an effect. A Von Willebrand Factor (VWF) aptamer was previously developed to prevent occlusive thrombus. In this study, we investigate the effectiveness of the VWF aptamer in thrombolysis and reperfusion of the injured vessel in a canine carotid artery stroke model. Methods: 23 adult male and female beagles between 7-13 kg were assigned to one of 4 groups; sham (n=2), aptamer (n=7), vehicle (n=7), or rTPA (n=7). We used a ferric chloride-induced injury model to create a thrombus in the carotid artery and administered drugs intravenously (IV). Doppler flow, heart rate, and blood pressure were measured continuously. Blood draws were taken to measure blood gas, complete blood counts, and platelet closing times (PFA-100 Siemens Diagnostics). Angiograms and magnetic resonance imaging (MRIs) were performed to visualize recanalization, stroke and hemorrhage burden, respectively. Results: 84 minutes after drug administration, VWF aptamer treatment resulted in significantly greater thrombolysis and vessel recanalization compared to both vehicle control (p<0.05) and rTPA (p<0.05). In total, 4 out of the 7 aptamer-treated animals resulted in reperfusion on both angiography and flow compared to zero in control and TPA groups. Conclusion: This study demonstrated that VWF aptamer re-canalized carotid arteries significantly better than control and rTPA following a ferric chloride-induced vascular injury. Further research is needed to explain the variability and underlying thrombolysis mechanism of the aptamer, to perfect dosing and administration techniques, and to incorporate the VWF antidote into the treatment.

Shruthi Chandra
Mentor: Samir Ghadiali PhD
Poster: 59
Project Title: Mechanobiology of Acute Lung Injury and Ventilation Induced Injury
Abstract: Mechanical Ventilation (MV) is used to treat patients with Acute Respiratory Distress Syndrome (ARDS) and can often cause additional injury to these patients called Ventilator Induced Lung Injury (VILI). A549 lung cells were cultured on transwell plates. One set of cells was placed under hypoxia followed by atelectrauma via bubble flow to simulate VILI following the initial hemorrhagic shock. Our hypothesis was that the double hit of hypoxia + atelectrauma would lead to an exacerbated injury response compared to just the hypoxia alone. The injury response was quantified using a live/dead assay and measuring the amount of dead cells. Cell death was significantly increased in the hypoxia + atelectrauma conditions, however this increase was not significantly greater than the death in the atelectrauma only condition. The above findings showed that although there was a statistically significant increase in injury when the cells were exposed to hypoxia and atelectrauma, the double hit of hypoxia and atelectrauma did not exacerbate the injury compared to atelectrauma alone. Another set of A549 cells were transfected with mir146a, which has previously been shown to alter its expression in response to mechanical stimuli, and then exposed to hypoxia followed by barotrauma via oscillatory pressure. We hypothesized that an overexpression of mir146a would have a protective effect on the cells in response to barotrauma. IL-8 showed a significantly decreased inflammatory response in the mir146a overexpressed cells. This data suggests that mir146a may play a protective role in lung cells in response to barotrauma.
David Chen
Mentor: Nilay Shah MD
Poster: 28
Project Title: CRISPR/Cas9-mediated screening of critical oncogenes in 17q gain neuroblastoma

Abstract: Neuroblastoma is a common highly aggressive childhood cancer with highly diverse tumor biology and clinical presentation. This diversity has complicated elucidation of the mechanisms of tumorigenesis and treatment resistance, particularly in patients with high-risk disease. The most common genetic abnormality of high-risk neuroblastoma is a segmental gain of chromosome 17q, which has been correlated with particularly poor prognosis. We hypothesized that the minimally gained region of chromosome 17q contains critical oncogenes contributing to proliferative advantage and chemotherapy resistance, and aimed to use a CRISPR library screen to identify a list of candidate genes. A library of sgRNAs targeting 19,114 genes across the human genome was obtained and used to produce Lentivirus. The library virus was then titered to identify a viral concentration resulting in 30-50% infectious efficiency, corresponding to infection of individual cells with no more than one sgRNA. Simultaneously, the human neuroblastoma cell lines SK-N-SH, NB-SD, NB-EBC1 and NB-1643, all of which have 17q gain, were infected with a Lentiviral construct which incorporated the Cas9 enzyme into those cell lines. Stable expression of Cas9 was confirmed by PCR of cDNA, using primers targeting the Cas9 coding sequence. Moving forward, we will grow and infect four pools each of the Cas9 positive neuroblastoma cells with the titered library virus. Two pools will be treated with the chemotherapy agents doxorubicin and irinotecan. One pool will be collected at 24 hours for use as a control, to determine the baseline representation of sgRNAs. The three remaining pools will be collected after 7 days. Total genomic DNA will be isolated from each sample and the sgRNA sequences will be amplified via PCR, then sent for next-generation sequencing to select candidate genes for validation and further study.

Lauren Chen
Mentor: Jennifer Trittmann MD
Poster: 57
Project Title: Single nucleotide polymorphisms of the MKP gene family are associated with pulmonary hypertension in bronchopulmonary dysplasia

Abstract: Bronchopulmonary dysplasia (BPD) is a form of pediatric chronic lung disease. When BPD is complicated by pulmonary hypertension (PH), morbidity and mortality greatly increases. Therefore, our group is interested in identifying early biomarkers of PH in BPD for improved diagnostics and treatment. Dual-specificity phosphatases (DUSPs) are known to regulate endogenous nitric oxide production, important in pulmonary vasodilation. In this study, we hypothesized that single nucleotide polymorphisms (SNPs) within the DUSP family would be differentially expressed in a cohort of BPD patients with and without PH, and thus serve as an early biomarker for PH in preterm infants with BPD.

BPD patients (n=188) who were born at <35 weeks gestation and enrolled at Nationwide Children’s Hospital were studied. PH was defined by established echocardiographic criteria. DNA from patient blood samples was assayed for 31 SNPs in DUSP genes by Agena Massarray. Clinical characteristics and minor allele frequencies (MAF) were compared between BPD-PH (cases) and BPD alone (control) groups using t-test and chi-square as appropriate, with p-value <0.05 as significant.

In a cohort of 188 patients with BPD, 61 (32%) showed echocardiographic evidence of PH. Patients with BPD-PH had a lower birthweight (806g vs. 972g, p=0.004), gestational age (262 vs. 270, p=0.041), and were more often small for gestational age (20% vs. 7%, p=0.010) than BPD alone patients. Patients with BPD-PH received less surfactant (48% vs. 63%, p=0.044), more post-natal pre-admit steroids (33% vs. 12%, p=0.001), and more mechanical ventilation (92% vs. 73%, p=0.003) than BPD alone patients. Of the 31 DUSP SNPs evaluated, DUSP-1 SNP rs322351 was less common in cases than controls (MAF; 0.320 vs. 0.444, p=0.021), and DUSP-5 SNPs rs1042606 (MAF; 0.443 vs. 0.335, p=0.049) and rs3793892 (MAF; 0.418 vs. 0.315, p=0.049) are more common in cases than in controls.

In the present study, we identified potential clinical and genetic biomarkers for BPD-PH patients including birthweight, gestational age, small for gestational age, surfactant, post-natal pre-admit steroids, mechanical ventilation, DUSP-1 SNP rs322351, DUSP-5 SNPs rs1042606 and rs3793892. Further investigation is needed to determine if these potential biomarkers will be useful as a robust tool for early identification of PH in BPD.
Helen Chou  
**Mentor:** Don Hayes, Jr. MD  
**Poster:** 12  
**Project Title:** Employment and education outcomes in pediatric and young adult lung transplant patients  
**Abstract:** Pediatric lung transplant (LTx) recipients experience barriers to social functioning, but our understanding of these barriers is limited by prior use of cross-sectional surveys and large registry data. We conducted a retrospective analysis of medical records to elucidate the process of social reintegration and identify areas of improvement in follow-up protocol. All medical records of all patients who received a lung transplant at Nationwide Children's Hospital from 2005 to 2017 were reviewed for eligibility. Inclusion criteria were single or bilateral LTx and ages 12- to 25-years old at the time of first LTx. Free-text entries in patient records were queried for details on employment and education outcomes. Fifteen patients were included in the review, of whom 60% (9/15) returned to school post-LTx, while 26% (4/15) were enrolled in school at the time of their last follow-up (median of 1 year since transplant). Five patients (33%) were employed at some point after transplant, but only one patient survived and was employed at the time of review. Health problems were the most commonly cited reason for unemployment or failure to return to school post-LTx. With this study, we demonstrate the feasibility of retrospective record review to ascertain social participation outcomes in adolescent and young adult LTx while avoiding the survivorship bias of cross-sectional surveys. Standardizing documentation of social outcomes to include patient barriers and any support services provided may help identify areas for improvement. Maintaining long-term social follow-up could provide better understanding of quality of life for patients and families.

Daniel Chrzanowski  
**Mentor:** David Dean PhD  
**Poster:** 26  
**Project Title:** Characteristics of Defined Media for the Culture of Human Mesenchymal Stem Cells  
**Abstract:** Producing a tough, resorbable, tissue-based scaffold to bridge large gaps in the skeleton would represent a huge advance for surgical reconstruction technique. Efforts are currently underway in Dr. David Dean's lab to construct fully-functional bony substitutes from a combination of polypropylene fumarate (PPF, a resorbable polymer) matrix and cultured allogeneic osteoblasts. The Dean lab and the OH-Alive group at the National Center for Regenerative Medicine (NCRM) have invented (patent pending) a new system of defined media for the easy culture and differentiation of osteoblasts from adult human bone-marrow-derived mesenchymal stem cells (BM-hMSCs). A manuscript has also been prepared on that work and will soon be submitted. However, that early work did not examine the results of each of the four stages of defined media. We therefore decided to test the effects of each stage of the defined media, as well as compare it to a series of commercially available osteogenic media, for use in the combined bone grafts. We seeded BM-hMSCs onto a sheet of polypropylene fumarate, introduced four stages of the new defined media, and isolated cultures after each change of media. The cultures were be assayed using Alizarin Red and alkaline phosphatase stains to check for differentiation of osteoblasts and ECM calcification, with full quantification done through fluorescent microscopy. Several commercial media controls were run in parallel and subjected to the same regimen. Preliminary results have been positive and strongly suggest that the OH-Alive media is more effective than its off-the-shelf counterparts. We are currently performing a thorough statistical analysis of our data to prove any significance, and we are quantifying mRNA levels within the samples. After these final steps are completed, we expect this study will be considered a definitive proof-of-concept for the complete defined media system.
Jacqueline Chu  
**Mentor:** Craig Hofmeister MD  
**Poster:** 34  
**Project Title:** Shingles occurs in only 0.5% of myeloma patients on any dose of antiviral prophylaxis  
**Abstract:** Background: Because of factors that decrease immunological function, multiple myeloma patients are particularly prone to viral infections, such as shingles. Antiviral prophylaxis is often administered; however no guidelines currently exist on the appropriate dosing regimen. We hypothesized that a less than 1% failure rate can be achieved with an equivalent of acyclovir 400mg twice daily in a patient with normal renal function. In addition, previous studies have demonstrated that ALC/AMC ratio at time of multiple myeloma diagnosis can be used as an indicator of baseline immune status. We also hypothesized that multiple myeloma patients who had shingles have a significantly lower ALC/AMC ratio on average than patients who did not have shingles. Methods: A retrospective chart review was conducted on 1,210 multiple myeloma patients treated at The Ohio State University Wexner Medical Center. Information on the presence of shingles after the diagnosis of multiple myeloma, medication and dosage of prophylactic antivirals, and compliance to medication was collected, along with demographic information. ALC/AMC ratios were estimated using ALC and AMC values taken near the time of multiple myeloma diagnosis. Patients with shingles were compared to an equal number of age- and gender-matched controls using a Wilcoxon rank-sum test. Results/Discussion: Shingles occurred in 10% of myeloma patients during the retrospective period. Only twenty percent of myeloma patients that suffered a shingles exacerbation were prescribed an antiviral, and, if they were prescribed an antiviral, only 6 of 127 (4.7%) patients who developed shingles were taking prophylactic antivirals as prescribed. Given a compliance rate of 20.7% among patients diagnosed with shingles, compliance more than dose should be emphasized in preventing shingles exacerbations. This highlights the value of patient education and compliance strategies to decrease patient morbidity in clinical practice.

Caitlin Coombes  
**Mentor:** Don Hayes Jr. MD  
**Poster:** 6  
**Project Title:** Investigating the Touch of Humanism in Medicine on Student Resilience in Medical School  
**Abstract:** Burnout disproportionately affects medical students, and is associated with depression, suicidal ideation, compromised academic performance, and long-term poor health. Our project is assessing if participation in student interest groups builds resilience among students at The Ohio State University College of Medicine. All OSU-COM medical students are being invited to complete a confidential, voluntary survey three times between August 2017 and May 2018. This study will help guide programming within Humanism in Medicine, medical education practices in supporting student wellbeing at OSU-COM, and act as a baseline for future evaluation.
Elana Curry  
**Mentor:** Alison Norris MD, PhD  
**Poster:** 31  
**Project Title:** Using Fetal and Infant Mortality Review (FIMR) Findings to Identify Contributing Factors to Infant Mortality in Ohio  
**Abstract:** Background: Infant mortality is used as an indicator of the health of a community. Despite efforts to improve infant survival, Ohio's infant mortality rate ranks 44th out of the 50 states. Methods: This study utilizes Fetal Infant Mortality Reviews, which consist of qualitative and quantitative data of infant mortality cases among very low birth weight infants (500-1500 grams) in two Ohio counties. A social ecological framework is used to assess the most common contributing factors and trends in family planning related to infant mortality in Ohio. Results: Women and infants faced risk factors at every level of the social ecological model. The majority of infants were born premature. Notable maternal characteristics included obesity, short inter-pregnancy interval, history of mental health conditions, and drug use. In terms of family and interpersonal factors, about half of women lacked support, had life-course risk factors, and had multiple stresses during pregnancy. Women faced a variety of community and socioeconomic risk factors, such as poverty, less than a 12th grade education, and unsafe neighborhoods. Importantly, the majority of the pregnancies were unplanned (62%), yet 61% of the women did not use contraception prior to the pregnancy. Conclusion: This study highlights that risk factors contributing to infant mortality in Ohio are highly prevalent at the individual, interpersonal, community, and institutional levels. More research is needed to understand the complex interplay of risk factors and to create targeted policies and interventions to mitigate infant mortality.

Bradley Disbrow  
**Mentor:** Heather Hampel PhD  
**Poster:** 5  
**Project Title:** Sunlight exposure is not associated with colorectal cancer in Lynch syndrome  
**Abstract:** Lynch syndrome is the leading cause of hereditary colon cancer in the world. A familial cancer syndrome with autosomal dominant inheritance, Lynch syndrome dramatically increases individuals' lifetime risk of developing colorectal and/or endometrial cancer. Numerous studies have attempted to characterize environmental, medical, and behavioral exposures that contribute to or protect against colorectal cancer risk in individuals with Lynch syndrome. These include sunlight exposure and Vitamin D, which have been shown in some studies in the general population to have protective effects against the development of colorectal cancer. This study uses a case-control design to investigate the potential association between sunlight exposure in both summer and winter in adulthood, teenage life, and in the past year and colorectal cancer diagnosis in Lynch-positive individuals enrolled in the Ohio Colorectal Cancer Prevention Initiative (OCCPI). Marginal logistic regression models that accounted for age, sex, race, state of residence at birth, and tobacco and alcohol usage were used to generate odds ratios. At a 95% confidence interval, no association between sunlight exposure and colorectal cancer risk was found for any season or life period. Although this study's null findings do not parallel the results of many other studies in the general population, null findings upon investigation of the purported relationship between sunlight exposure, vitamin D levels, and colorectal cancer are not unprecedented. This highlights the need for further and more detailed analysis to clarify the currently murky and complicated ties between sunlight exposure, vitamin D, and colorectal cancer.
Steven Elzein  
Mentor: Ginny Bumgardner MD, PhD  
Poster: 60  
Project Title: Effects of Calcineurin Inhibition on a Novel CD8+ T Cell Subset  
Abstract: Alloantibodies produced after transplant contribute to rejection and poor long-term graft survival. Our lab is first to report that alloantibody is downregulated by a novel CD8+ T cell subset (CD8+ TAb-sup cells) that kills alloprimed IgG1+ B cells and that this cytotoxicity is abrogated by calcineurin inhibition (CNI). I hypothesized that CNI critically impairs CD8+ TAb-sup cell acquisition of effector molecules. To investigate how CD8+ TAb-sup cells are suppressed by CNI, wild-type mice were transplanted with allogeneic hepatocytes and treated with CNI. Development of CD8+ TAb-sup cells following transplant was determined via flow cytometry and functional capability was measured via in vitro cytotoxicity and cell migration assays. I found that CNI inhibited the development of total CD8+ TAb-sup cells as well as IFN-γ+ and Lamp-1+ CD8+ TAb-sup cells. Additionally, CNI inhibited the development of CD8+ TAb-sup cell-mediated cytotoxicity to IgG1+ B cells as well as the development of normal chemotactic ability of CD8+ TAb-sup cells in a dose-dependent manner. Interestingly, CNI treatment resulted in increased numbers of germinal center B cells and IFNγ+CD4+ Tfh cells. We hypothesize this upregulation is the result of inhibiting CD8+ TAb-sup cells and their ability to inhibit humoral immunity. This data supports that CNI inhibits CD8+ TAb-sup cell acquisition of cytolytic phenotype and effector function. Understanding alloantibody regulation by CD8+ TAb-sup cells in conjunction with CNI may lead to novel immunotherapy regimens for transplant patients.

Nicholas Farrar  
Mentor: Paul Stoodley PhD  
Poster: 76  
Project Title: Persistent Cultures After Long-Term Antibiotic Release in Total Joint Arthroplasty  
Abstract: This project involves analyzing persister cells slow-growing, multi-drug tolerant populations of bacteria to expand the current knowledge of the formation and persistence of chronic biofilm infections associated with total joint arthroplasties (TJAs). Currently, popular bone cements poly(methyl methacrylate) (PMMA) spacers and calcium sulfate (CaSO4) beads are impregnated with antibiotics, and placed at the surgical site to kill these primary infections. It is known that antibiotics such as tobramycin and vancomycin inhibit the metabolic activity of in vitro lawn biofilms of these clinical species. However, persister cells slowly arise after long-term, local antibiotic elution at levels well above measured minimum inhibitory concentrations (MIC), and can form bacterial biofilms to increase their virulence. Other antibiotics, including Ciprofloxacin, Rifampin, and Gentamycin were studied with drug-tolerant mutants generated. To better understand the antibiotic concentration profile the lawn biofilm was being exposed to, a numerical model was generated to provide a theoretical equation of antibiotic concentration as a function of time and radius. The end-goal of the research is to identify antibiotic combinations and concentrations for specific clinical phenotypes from periprosthetic joint infections (PJIs) to preserve primary joints.
Nolan Farrell  
Mentor: Amanda Whitaker MD  
Poster: 61  
Project Title: Lower Extremity Surgery and Changes in GMFM-66  
Abstract: Purpose: The purpose of this study was to determine if ambulatory children with cerebral palsy have greater improvement in their Gross Motor Functional Measure 66 (GMFM-66) after lower extremity surgery compared with age, gender, Gross Motor Functional Classification System (GMFCS) level, and initial GMFM-66 score matched controls that did not undergo lower extremity surgery. Lower extremity surgery was expected to improve GMFM-66 outcomes compared to controls.  
Methods: This is a retrospective review of our Cerebral Palsy database for ambulatory children who underwent lower extremity surgery and age, gender, GMFCS, and GMFM-66 matched controls.  
Results: Twelve patients were identified who had lower extremity surgery with pre-operative GMFM-66 scores and post-operative follow-up GMFM-66 evaluation with twelve age, gender, GMFM-66, and GMFCS level matched controls. There was no significant difference between the surgical and the control groups at one or two years post-operatively (p>0.05), however the trend over time suggests a greater improvement in GMFM-66 in the surgery group. This was most notable in our GMFCS I group. The subgroup analysis suggests that patients who are older, male, GMFCS I, and have surgery at the level of their gastrocnemius-soleus complex have a greater increase in GMFM-66 compared to controls. The change in GMFM-66 in these subgroups differed from controls by greater than the minimally clinically important difference of 1.3.  
Conclusion: Lower extremity surgery in ambulatory children with Cerebral palsy may increase their GMFM-66 over time, especially in the older, male, GMFCS I patient with an equinus contracture.  
Significance: This retrospective data suggests lower extremity surgery in cerebral palsy can increase GMFM-66 scores especially in the GMFCS level I patients, and is unique in its inclusion of longer follow-up with matched controls, however larger numbers are needed for statistical significance in a unique matched cohort study.  

Michelle Feeney  
Mentor: Seuli Brill MD  
Poster: 70  
Project Title: Validation of a Novel EHR Patient Portal Advance Care Planning Delivery System  
Abstract: Background Advanced Care Planning (ACP) allows patients to articulate their future care preferences should they no longer be able to make decisions on their own. Early ACP in outpatient settings provides benefits such as less aggressive care and fewer hospitalizations.1 Yet, ACP remains rarely delivered due to barriers like provider time constraints and communication complexity. Novel methods, like patient portals, can provide a unique opportunity to conduct ACP pre-visit planning for outpatient care. Our intervention tested a pre-visit ACP questionnaire sent via secure Electronic Health Record (EHR)-linked patient portal2,3 in a real world clinical setting to determine its impact on frequency and quality of ACP documentation. Design We conducted a pragmatic trial in 2 sister clinical sites (with similar baseline ACP workflows) with site randomization to electronic pre-visit ACP planning and usual care over a 3-month study period. Baseline chart review at both sites was conducted 1 month prior. 200 patients received intervention and 219 usual care. Chart review was conducted at 1 week and 1 month post-visit to determine the presence and quality of ACP documentation.  
Results Intervention patients had a 27% increase in documentation rates and 25.4% higher quality scores compared to usual care. Individuals between 50-60 years of age and active portal users (>10 messages in one year) saw documentation rates increase by 37% and 33.5% respectively at the intervention site.  
Conclusions Sending patients a pre-visit questionnaire on their future care preferences yielded improvement in quality and presence of ACP documentation, with highest improvement in active patient portal users and patients aged 50-60. Targeted pre-visit patient portal ACP delivery in these populations can potentially improve the quality of care in these populations.
Samuel Frank  
**Mentor:** Terence Williams MD, PhD  
**Poster:** 47  
**Project Title:** Characterizing KRAS Mutant Mediated Radioresistance by Targeting Nuclear DNA Repair Intermediates  
**Abstract:** In many human cancers, the presence or absence of prominent oncogenic mutations are predictive of survival rates and response to treatments. In this project, we attempted to identify a possible mechanism by which a commonly mutated oncogene, KRAS, imparts radioresistance to cancer cells by upregulation of DNA damage response (DDR) proteins. To achieve this goal, we demonstrated the in vitro radiosensitizing effect of two novel inhibitors of the DDR, VX-970 and VX-984, in two separate colorectal cancer cell lines. Additionally, our data show that KRAS-mutant cancer cell lines are effectively radiosensitized at similar levels to KRAS-wt cells. We attempted to establish direct proof that the VX-970 and VX-984 were suppressing their target protein's levels (ATR and DNA-PKcs respectively), but Western blot analysis did not yield data to suggest this. Our findings show that VX-970 and VX-984 are able to effectively sensitize human colorectal cancer cells to ionizing radiation when pre-treated before radiation for 24h. The range of effective doses is approximately 1-5nM for VX-970 and 1-20nM for VX-984. These findings demonstrate that VX-970 and VX-984 significantly enhance cellular death following ionizing radiation exposure, and that these compounds may be clinically useful adjuvants to radiation therapy for human colorectal cancer treatment. Future directions for this research include further optimization of drug dose for our clonogenic survival assays and Western blotting for phospho-protein levels (instead of total protein), which may show that the DDR inhibitors exert their effects through functional inhibition rather than degradation.

Tim Grosel  
**Mentor:** Jonathan Barlow MD  
**Poster:** 77  
**Project Title:** Reverse total shoulder arthroplasty with a tumor megaprosthesis vs. hemiarthroplasty for proximal humerus tumors  
**Abstract:** Both malignant and benign tumors of the proximal humerus may necessitate resection of a substantial portion of the proximal humerus, making reconstruction options challenging. While hemiarthroplasty has been a classic treatment, reverse total shoulder replacement may provide better pain relief and function for these patients. 47 patients who underwent hemiarthroplasty or rTSA were reviewed. Surgical time, surgical margins, intraoperative complications and postoperative complications (infection, nerve damage, instability) were recorded. 16 hemiarthroplasty patients (42%) had a postoperative complication, while 2 (20%) of rTSA patients had a postoperative complication. Two patients required revision surgery (one hemiarthroplasty to rTSA, one revision rTSA). Reverse total shoulder replacement with long stem, modular components can reliably and reproducibly reconstruct the shoulder in patients with oncologic resections of the proximal humerus.
Naima Hashi  
Mentor: Michael Caligiuri MD  
Poster: 74  
Project Title: AHR ligand regulation of NK cell Development in Acute Myeloid Leukemia  
Abstract: Patients with acute myeloid leukemia (AML) experience an over production of immature myeloid cells. This leads to immune evasion and poor prognosis. Our lab specifically looks at the development of a subset of immune cells called natural killer (NK) cells, and their role in the progression of AML. NK cells are a type of innate cytotoxic lymphocyte, and have been shown to play an important role in detecting as well as controlling tumor growth and metastasis. Mature NK cells are characterized phenotypically by the expression of CD56 and the lack of other lineage-specific antigens. NK cells differentiate in a linear fashion through five stages; starting from hematopoietic stem cells (HSCs) to mature stage 6 CD56dimCD57+ NK cells. It was recently discovered that the NK cells have a reduction in one of the immature subsets in both a murine model of AML and in untreated AML patients. In humans, it was the stage 4b CD56bright NK cell population that was depleted. We hypothesize the downregulation is through an aryl hydrocarbon receptor (AHR) mediated mechanism. Our group has previously shown that the silencing of the AHR gene promoted NK cell differentiation in vitro (Hughes, 2014). In this project, we sought to determine the role of AHR regulation in mediating the reduced NK cell development observed in AML patients. We first evaluated the AML cell lines for the presence of AHR ligands, and determined soluble ligands are produced by all AML cell lines evaluated. We next co-cultured AML cells with stage 3 NK cells to determine if there is a reduction in mature NK cell development in the setting of AML. We discovered a significant reduction in mature NK cells when co-cultured with AML cells. Blockade of the AHR pathway appears to reverse this effect. Additional studies will further dissect the mechanism driving AHR dysregulation in AML.

Nina Hill  
Mentor: Julie Samora MD, PhD  
Poster: 54  
Project Title: Tibial shaft fracture with ipsilateral intra-articular distal tibia fracture: Impact on management and outcomes  
Abstract: BACKGROUND: Tibia fractures are exceedingly common in a pediatric population, and most are simple shaft fractures that can often be treated conservatively. However, this study aimed to investigate a more complicated fracture pattern that has not been previously described in the literature: ipsilateral, communicating tibial shaft and intra-articular ankle fractures. METHODS: Patients treated for a tibia fracture at a large pediatric tertiary care hospital from 2006-2016 were included in this retrospective chart review, as identified by eligible CPT codes and keyword search. Variables assessed included patient demographics, injury characteristics, follow-up time, weight bearing, and immobilization. Complications and secondary treatments were recorded when present. RESULTS: Of the 191 patients included in the study, 16 were identified with the ipsilateral tibial shaft and ankle fracture pattern. The mean age of patients with the shaft + ankle fracture pattern was 15.6 years, as compared to 12.3 years for the tibial shaft fracture only group. Additionally, immobilization was employed for the shaft + ankle fracture group for 12.3 weeks, significantly longer than the isolated shaft fracture group immobilization for 9.0 weeks. Despite risk of complications with fracture communication into the articular surface, patients in the shaft + ankle fracture group all had excellent outcomes. CONCLUSIONS: This study describes ipsilateral, communicating tibial shaft and intra-articular ankle fractures, an injury pattern that has not previously been well characterized in the literature. Specific patient characteristics (age, mechanism of injury) may contribute to development of this injury, and these patients may require different management than those with simple tibial shaft fractures. LEVEL OF EVIDENCE: Level IV. This study utilizes a retrospective chart review.
Khaled Himed  
**Mentor:** Safdar Khan MD  
**Poster:** 40  
**Project Title:** Effect of opioids on spinal fusion: A rabbit posterolateral lumbar fusion model  
**Abstract:** Opioid use is prevalent for management of pre- and post-operative pain in patients undergoing spinal fusion. Pre-clinical and in vitro studies suggest opioids have a negative effect on bone healing and turnover. However, the effect of opioids on healing of spinal fusion has not been previously explored. The objective of this study is to investigate the effect of systemic opioids on the healing of spinal fusion using a rabbit posterolateral spinal fusion model. We hypothesize that pre and post-operative opioid treatment will contribute to poorer fusion healing than the control group. 24 adult, New Zealand white rabbits were studied in two groups. The opioid group (n=12) received four-weeks pre-operative and six-weeks post-operative transdermal fentanyl. The control group (n=12) only received peri-operative pain control. All animals received a bilateral L5-L6 posterolateral spinal fusion using iliac crest autograft. Animals were euthanized at the six-week post-operative time point. Fusion was assessed by manual palpation, plain radiographs, micro-computed tomography (microCT), and histology. 12 animals in control group and 11 animals in the opioid group were available for analysis at the end. The fusion scores on manual palpation, radiographs, and microCT were not statistically different. Three-dimensional microCT morphometry found that the fusion mass in the opioid group had a lower bone volume (p=0.09), lower trabecular number (p=0.02) and higher trabecular separation (p=0.02) as compared to control. Histological analysis found delayed remodeling and maturation of new bone in the opioid group as compared to control. Less dense trabeculae on microCT correlate with histological findings of relatively immature fusion mass in the opioid group. These findings demonstrate that systemic opioids lead to an inferior quality fusion mass with delay in maturation and remodeling at six-weeks in this rabbit spinal fusion model.

Zachary Hodosevich  
**Mentor:** Henry Xiang MD, PhD  
**Poster:** 56  
**Project Title:** U.S. Adult Burn Patient Unplanned 30-Day Readmissions  
**Abstract:** This is the first study to characterize U.S. adult burn readmissions using a nationally representative hospital inpatient sample (22 U.S. states). The objectives of the present study are (1) to estimate the national 30-day unplanned hospital readmission rate for US adult burn patients, (2) to describe reasons for readmission, and (3) to identify patient and hospitalization risk factors for readmission. We queried the 2013 and 2014 Nationwide Readmission Database (NRD) for adult burn inpatients who were readmitted within 30 days of discharge. The data were weighted to estimate national readmission rates. Principal readmission diagnoses were sorted into burn-specific or other readmissions categories. We used multivariable logistic regression to assess the effects of patient and hospital stay traits on readmissions. An estimated 42,957 U.S. adult burn patients were discharged between January and November of 2013 and 2014. Of these patients, an estimated 3,203 had unscheduled readmissions within 30 days [All-cause readmission rate: 7.5%, 95% CI: 6.7 8.2]. The top three most frequent principal readmission diagnoses were burns (37.0%), septicemia (5.8%), and complications of devices/implants/grafts (4.2%). Burn-specific readmissions increased with both patient age and number of Elixhauser comorbidities. Patients whose length of stay was less than 1 day per 1% burn total body surface area (TBSA) were more likely to be readmitted [Burn-specific readmission adjusted odds ratio (AOR) = 2.10, 95% CI = 1.48 2.99]. The results of logistic regression models were similar for burn-specific readmissions and all-cause readmissions. Our analysis shows that about 1 in 13 U.S. adult burn patients suffered an unplanned readmission within 30 days of hospital discharge. We have described specific risk factors associated with readmission. Healthcare providers can use this information to identify at-risk patients, modify their treatment plans, and prevent readmissions.
**Kalyn Hoffman**  
**Mentor:** Ginny Bumgardner MD, PhD  
**Poster:** 50  
**Project Title:** Antibody-suppressing CD8+ T cells require IFN-g/IFN-gR interactions for effector function development  
**Abstract:** Antibody-mediated rejection continues to threaten allograft survival despite reduction in rates of cell-mediated rejection. We have discovered novel antibody-suppressing CD8+ T cells, CD8+ TAbsupp cells, that kill alloprimed B cells (FasL- and perforin-dependent mechanism) and inhibit IL-4+CD4+ T cells (IFN-γ-dependent mechanism). Further studies to understand the developmental requirements of CD8+ TAbsupp cells will be critical to investigate novel cell-based therapies. Interestingly, CD8+ T cells from IFN-γ KO recipient mice do not exhibit CD8+ TAbsupp cell characteristics including cytotoxic killing of alloprimed B cells. We hypothesize that CD8+ TAbsupp cell maturation or cytotoxic functions directly depends on IFN-γ/IFN-γR interactions. In vivo studies in which CD8+ T cells from wild-type, IFN-γ KO, or IFN-γR KO mice adoptively transferred into wild-type, IFN-γ KO, or IFN-γR KO hepatocyte transplant recipients were assessed for CD8+ TAbsupp cell development and cytotoxic molecules. While there were no significant changes in the total number of CD8+ TAbsupp cells, initial studies show an abrogation of FasL+CD8+ TAbsupp cells when CD8+ T cells are deficient in IFN-γ, a 4-fold reduction of FasL+CD8+ TAbsupp cells and a 2-fold reduction of IFN-γ+CD8+ TAbsupp cells when host mice are deficient in IFN-γ, and a 2-fold reduction of IFN-γ+CD8+ TAbsupp cells when host mice are deficient in IFN-γR, which is consistent with IFN-γ/IFN-γR involvement in the effector function of CD8+ TAbsupp cells. Further studies are needed to confirm these results and to explore specific cellular interactions critical for CD8+ TAbsupp cell development.

**Syed Hussaini**  
**Mentor:** Craig Hofmeister MD  
**Poster:** 14  
**Project Title:** B-cell lymphoma (MM, FL, CLL) patients have a 10% risk of shingles reactivation; 7% in CTCL  
**Abstract:** Viral infections in multiple myeloma patients have an increased incidence in the precancerous MGUS and smoldering myeloma states, can be part of defining newly diagnosed myeloma, and occur with an increased frequency in patients exposed to the proteasome inhibitor bortezomib (Velcade). We hypothesized that varicella reactivation in patients with myeloma occurs in a higher proportion than in patients with chronic lymphocytic leukemia (CLL), cutaneous T-cell lymphomas (CTCL), and follicular lymphoma, another indolent B-cell lymphoma. We tested this hypothesis through a retrospective review of 3,765 patients seen at OSU with hematologic malignancies MM (1,210), CLL (2,520), CTCL (434), or FL (809). Data on age, gender, length of survival, age at diagnosis of hematologic malignancy, and shingles incidence was collected. MM patients had the lowest median survival among the 4 malignancies. A significant association between malignancy type and shingles incidence was found, with CTCL patients having the lowest incidence; however, MM patients were not found to have a significantly higher shingles rate than CLL, CTCL, or FL as hypothesized. These results demonstrate the differences in VZV incidence between indolent lymphomas. Future work will involve studying the associations between the use of anti-cancer therapies like Bortezomib and viral infection incidence between different T and B-cell hematologic malignancies.
Ryan Ivancic  
**Mentor:** Quintin Pan PhD  
**Poster:** 46  
**Project Title:** The role of ETV5 in head and neck cancer  
**Abstract:** ETS transcript variant 5 (ETV5) is a transcription factor overexpressed in head and neck cancer and shown to activate the transcription of proteases and metalloproteases central to tumor invasion, angiogenesis, and epithelial-to-mesenchymal transition (EMT) in several cancers. In this project, we will explore the phenotype and mechanism of action of ETV5 in head and neck squamous cell carcinoma (HNSCC) cells. ETV5 knock out (KO) cell lines were established with the CRISPR/Cas9 gene editing system in three established HNSCC cell lines, UMSCC47, UPCI:SCC090, and Cal27. We will assess cell motility, invasion, and adhesion and measure the expression of ETV5 transcriptional targets in the ETV5 KO cell lines. The goal is to explore the possibility of ETV5 as a targetable oncogene in HNSCC.

Aashish Katapadi  
**Mentor:** Loren Wold PhD  
**Poster:** 15  
**Project Title:** Effects of Exercise on Cardiac Dysfunction of Obese Mice Exposed to PM2.5  
**Abstract:** It has been shown repeatedly that there is a strong link between air pollution and cardiovascular diseases (CVD). Additionally, there is also a strong link between obese individuals and occurrence of CVD. The role of exercise in obesity is widely accepted because of its favorable outcome on improved cardiac and associated functions yet studies suggest exacerbation of CVD in particulate matter exposure. However, the cumulative effects of exercise on particulate matter (PM) exposed obese mice are still unknown. Accordingly, the goal of the project is to evaluate how exercise impacts cardiac function of obese mice exposed long-term to particulate matter. The project involved exposing obese mice to PM2.5 (particulate matter; diameter < 2.5 Åμm) for 9 months followed by 8 weeks of exercise training and comparing the cardiac function both in vivo via echocardiography and in vitro by measuring cardiomyocyte functions. Echocardiography results demonstrated decreased %FS for PM2.5 (26.54 ± 1.429) compared to FA (37.37 ± 2.411; P=0.0092), increased LVESD (3.080 ± 0.1248 (PM2.5) compared to 2.747 ± 0.2434 (FA); P=0.0485) and no change in LVEDD (4.198 ± 0.1815 (PM2.5) compared to 4.267 ± 0.2107 (FA); P=0.8133), suggestive of systolic dysfunction. This indicates that exercise did not result in improved outcomes and PM exposure continues to induce cardiac dysfunction.

Samuel Kennedy  
**Mentor:** Jonathan R. Honegger MD  
**Poster:** 83  
**Project Title:** Epidemiology of Maternal and Child Hepatitis C Virus in Ohio  
**Abstract:** The annual prevalence and trend of Hepatitis C virus infection between mother and child in Ohio will be analyzed to determine if sufficient screening is being performed on infants. This will be accomplished by utilizing the Ohio Department of Health Disease reporting system and Vital Statistics births database to identify women infected with Hepatitis C and the children at risk of acquiring the infection. These lists of individuals, collected from 2003 to 2015, will provide a twelve-year snapshot of the reported vertical transmission rate of Hepatitis C virus in Ohio. The Partner’s for Kids billing database will be analyzed to determine if proper diagnostic testing is being performed for Hepatitis C virus in infants. Additional patient information will be analyzed to determine trends associated with their demographic and socioeconomic status.
**Saher-Zahra Khan**  
**Mentor:** Sergio Bergese MD, Nicoleta Stoica MD, PhD MD  
**Poster:** 71  
**Project Title:** Perioperative Opiate Consumption and Hemodynamic Variability Predictors of Postoperative Delirium in Orthopedic Patients  
**Abstract:** Postoperative delirium (PD) is a predictor of negative outcomes in orthopedic patients. Studies linked several factors to the likelihood of developing PD such as patient hemodynamics and opioid consumption. We hypothesized that there is a significant variability in perioperative [preoperative, intraoperative, and in the post-anesthesia care unit (PACU)] hemodynamics [mean arterial pressure (MAP), heart rate (HR), and respiratory rate (RR)] and increased opioid consumption in orthopedic patients experiencing PD when compared with non-delirious patients. The study included 49 adult patients aged 36 to 82 years old with an American Society of Anesthesiologists (ASA) physical status of I, II, or III that underwent hip arthroplasty. Perioperative and postoperative (on the floor) units of morphine consumption were recorded. Perioperative mean systolic and diastolic blood pressure (SBP and DBP), mean HR, and mean RR were recorded as well. Out of 49 patients, nine patients were diagnosed with PD. Based on our data analysis, opioid consumption was significantly increased in patients diagnosed with PD when compared with the non-delirious group (p = 0.03). Perioperative MAP, mean HR, and mean RR analysis showed no significant differences between delirious and non-delirious groups. Opioid consumption was increased in patients < 60 years old (p = 0.0001) and potentially in males (not significant, p = 0.069), but there were no significant differences in age or gender of patients experiencing PD. This study thus showed that perioperative opioid consumption is associated with the increased incidence of PD. Hemodynamic variability was not significantly associated with PD.

**Aaron Koenig**  
**Mentor:** Kalpana Ghoshal PhD  
**Poster:** 22  
**Project Title:** A comprehensive analysis of the interactome of miR-21, an established oncomir, by Argonaute-CLIP analysis identifies novel conserved and species-specific targets of miR-21 in human liver and hepatocellular carcinoma  
**Abstract:** MicroRNAs are ~22 nucleotide RNAs that regulate gene expression at the post-transcriptional level by binding messenger RNA transcripts. MicroRNA (miR)-21 participates in carcinogenesis in hepatocellular carcinoma (HCC) and other malignancies. Here we analyze the miR-21 interactome in HCC by high-throughput sequencing of RNA isolated by Argonaute cross-linking immunoprecipitation (Argonaute-CLIP) in nine HCC cases with matched livers. Argonaute-CLIP identified miR-21 bound to 580 target sites on coding transcripts, of which 332 were located in the coding sequences, 214 in the 3'-untranslated region, and 34 in the 5'-untranslated region, introns or downstream sequences. Overall, 403 target sites (68.5%) enriched for miR-21 in HCCs relative to liver. We compared expression of miR-21 targets in 377 patients with liver cancer registered in The Cancer Genome Atlas. Ago-CLIP miR-21 enrichment score in HCC distinguished expression of miR-21 targets by their correlation with miR-21 expression. Comparison of the miR-21 interactome in mouse and human livers identified common and species-specific targets. Among targets of miR-21, 27.6% were downregulated in HCC. The miR-21 interactome was predicted to regulate tumor metabolism by inhibiting PPARα/RXRα and LXR/RXR signaling. To identify targets of miR-21, we matched Ago-CLIP targets to genes previously reported as aberrantly expressed after anti-miR-21 overexpression in HCC. RMND5A, an E3 ubiquitin ligase, was identified as a potential target of miR-21 regulation and was variably expressed in HCC. Three predicted miR-21 targets, CAMSAP1, DDX1, and MARCKSL1, correlated with HCC patient survival. Collectively, our analysis biochemically identified novel targets of miR-21 likely to play a causal role in hepatocarcinogenesis.
Morgan Kohls  
Mentor: Safdar Khan MD  
Poster: 43  
Project Title: What are the Rates and Causes of 90-Day Hospital Readmission After Lumbar Discectomy? An Institutional Experience  
Abstract: Introduction: Reducing complications and readmissions after elective spine surgery is important from a cost and quality perspective. Several studies have reported complications and readmissions after spine surgery but only a couple of studies focus specifically on lumbar discectomy. The aim of our study was to identify the rate, causes, and risk factors for 90-day readmissions following lumbar discectomy from a large academic medical center. Methods: A retrospective cohort study was performed on patients who underwent a lumbar discectomy during the years 2013 and 2014 at a large academic institution. Patients between the ages 18 and 85 who underwent a lumbar discectomy for unrelieved symptoms of herniated disc were included. Chart review was performed to record demographic and clinical patient profile. Hospital readmission within 90-days was identified, and the causes and management was recorded. Descriptive analysis of patient profile has been given. Binary logistic regression analysis was done to study risk factors for readmission. Demographics, comorbidities, procedure- and discharge related factors served as covariates in the analysis. Results: A total of 356 patients met inclusion criteria. The 90-day readmission rate was 5.3% (19/360); the 30-day readmission rate of 3.7% (13/356). The top two causes for readmission included back and/or leg pain(42.9%) and CSF leak or seroma (25.0%). On adjusted analysis, risk factors associated with higher risk of readmission included intra-operative durotomy (OR 26.20, 95% CI: 5.29-129.91, p=0.000) and discharge to skilled nursing facility/inpatient rehabilitation (OR 25.239, 95% CI: 2.71-235.21, p= 0.005). Conclusion: We have identified the rates, causes, and risk factors for hospital readmission specific to lumbar discectomy at an academic institution. Meticulous operative technique to prevent a dural tear represents the most important surgeon controlled factor in reducing the risk of readmission after discectomy.

Daniel Konstantinou  
Mentor: Ciro Rodriguez PhD  
Poster: 18  
Project Title: Dimensional Optimization of 3D Printed Scaffolds for Ideal Fluid Perfusion and Cell Culture of Mandibular Implants  
Abstract: The purpose of this research project is to study 3D printed scaffolds and their use in mandibular implants. The use of 3D printed scaffolds for mandibular implants offers numerous benefits over autogenous bone grafting. Namely, 3D printed scaffolds offer a standardized geometry that can avoid issues such as uneven degeneration, tissue ingrowth and stress distribution. When using 3D printed scaffolds there first needs to be the seeding of cells, followed by the delivery of nutrients and the removal of waste products. Our primary question is what scaffold length requires the transition from static media to dynamic perfusion in order to provide a microenvironment that is viable for cell life throughout the scaffold. At a certain critical size, one end of the scaffold may not have an appropriate microenvironment in a diffusion-based media. At this point, perfusion will need to be employed and it is our goal to answer this question. Two studies have been developed to analyze the effects of perfusion on negating the development of a necrotic core in a 3D printed scaffold. The first study was a cell viability assay, which compared the viability of cell line L929 in static culture and a perfusion bioreactor. This study showed that there was no statistical difference in cell viability in static media versus a perfusion bioreactor. The second study developed was a necrotic core study, which would analyze the development of a necrotic core in static culture versus a perfusion bioreactor over 21 days, which is currently in pre-experimentation.
Peter Lancione  
Mentor: Peter Mohler PhD  
Poster: 41  
Project Title: Role of alpha II spectrin in cardiomyocyte excitability and arrhythmogenesis  
Abstract: The cellular mechanisms underlying human cardiac arrhythmia remain largely unclear, and only recently have cytoskeletal proteins been implicated in arrhythmogenesis. Spectrins are a family of cytoskeletal proteins involved in membrane stabilization. Destabilization of the cardiomyocyte membrane by defective non-ion channel proteins is an emerging mechanism for hereditary arrhythmia syndromes that commands further investigation. In this study, we attempted to advance the understanding of the molecular mechanisms underlying arrhythmias, specifically the role of alpha II spectrin as a potential cause of inherited disease. Patch-clamp electrophysiology was used to assess action potential and sodium current properties in isolated murine ventricular alpha II spectrin knockout (cKO) cardiomyocytes. These values were compared to wild-type control cells in an attempt to determine the role of alpha II spectrin in cardiac electrophysiology. A significant decrease in sodium current density in was observed in the alpha II spectrin knockout cells compared to WT cardiomyocytes. There was also a significant increase in action potential upstroke velocity and amplitude, measured by dV/dt and APA, seen in the cKO cells. Action potential durations were elongated in the experimental group, suggesting a greater potential for arrhythmogenesis. Our data show aberrant sodium current properties in alpha II spectrin knockout cardiomyocytes. Interestingly, the decrease in Na current density is proportional to the reduction in Nav1.5 observed in previous immunoblots. This study suggests the relationship between alpha II spectrin, Nav1.5, and sodium signaling could be a potential mechanism for human arrhythmia requiring further investigation.

Allison LaRocco  
Mentor: Adrienne Dorrance PhD  
Poster: 17  
Project Title: Investigating antiEGFL7 antibody as an acute myeloid leukemia treatment  
Abstract: Epithelial Growth Factor Like Domain 7 (EGFL7) is a protein secreted from endothelial cells that is known to regulate angiogenesis. Increased expression of this protein has been seen in solid tumor cancers, and its expression has been correlated with poorer prognoses. It has been recently revealed that EGFL7 expression is up-regulated in cytogenetically normal acute myeloid leukemia (AML) and associated with the poor prognosis of patients. More intriguingly, EGFL7 has been found to be up-regulated in leukemia stem cells (LSCs), suggesting that targeting EGFL7 is a promising strategy for the treatment of AML. A common site of mutation in AML is in the gene for FLT3, a tyrosine kinase receptor. Internal tandem duplication (ITD) mutations of this gene are especially correlated with a poor prognosis, being associated with increased leukocyte counts and short disease-free survival. We hypothesized that blocking EGFL7 with an antibody would decrease survival of AML cells, and that cotreatment with both an antiEGFL7 antibody and a FLT3 inhibitor would show a synergistic effect. In this study, I quantified apoptosis in a human FLT3-ITD positive AML cell line and in a sample of AML patient blasts after treatment with 5 doses of antiEGFL7 antibody, the FLT3 inhibitor gilteritinib and a combination of the two. Using Annexin V staining and flow cytometry to quantify apoptosis, I found an increase in apoptosis with increasing dose of each single drug. I also found that the two drugs exhibit synergistic effect, causing more apoptosis when combined than the additive sum of the effects of each. In the future we plan to confirm this in vivo.
Melissa Le Roux  
**Mentor:** Yousef Hannawi MD  
**Poster:** 39  
**Project Title:** Cerebral small vessel disease, collateral scores and their effect on the outcome of acute ischemic stroke  
**Abstract:** We investigated the relationship of the total burden of cerebral small vessel disease (CSVD) features on MRI at time of presentation and its relationship to stroke therapy outcome and collateral blood flow in 25 patients with either an M1 middle cerebral artery (MCA) or intracranial internal carotid artery (ICA) acute ischemic stroke. We hypothesized that increased severity of SVD would predict poor leptomeningeal collateral status, poor outcomes, and treatment complication. We hoped the results would provide a novel tool for appropriately selecting patients to receiving acute stroke treatment. With preliminary analysis, we found collateral scores to be significantly associated with NIH stroke score on admission and functional outcome. Moreover, we found age at the time of stroke affects the CSVD score and collateral score. However, a direct relationship between CSVD and collateral score was not seen.

Grace Lee  
**Mentor:** Motao Zhu MD, PhD  
**Poster:** 11  
**Project Title:** Child Passenger Fatalities: Child Safety Seat and Contributing Factors  
**Abstract:** Motor vehicle crashes remain among the leading causes of preventable unintentional injury and death in children. The objective of this study is to evaluate factors that contribute to child safety seat (CSS) use among child passengers under 4 years old who sustained a fatal injury. The Fatality Analysis Reporting System (FARS) database was used to obtain fatality data from 2013-2015. Analysis of this data will provide better understanding of factors involved in child safety seat fatalities, and provide recommendations to help reduce the number of child passenger fatalities in this specific age group.

Michelle Manious  
**Mentor:** Irene Mikhail MD  
**Poster:** 42  
**Project Title:** Peanut Allergy Documentation in Electronic Medical Records  
**Abstract:** Food allergy is an increasing public health concern that has no cure. Allergy to specifically peanuts is usually lifelong and is the leading cause of fatal and near-fatal food allergic reactions. Presentations of peanut allergy range from cutaneous manifestations to hypotension and arrhythmias. The prevalence of peanut allergy is increasing and currently affects 4-8% of the pediatric population. Currently, the disease is only managed through strict food avoidance and regulating symptoms with epinephrine. While many allergists are comfortable with these guidelines, there is no data recorded on how comfortable pediatricians are with them. This study aims to examine how food allergies are managed at well child visits, isolate discrepancies in how pediatricians and allergists manage allergies, and identify children who would benefit most from a referral to see an allergist.
Sean McDermott  
Mentor: Lawrence Shirley MD  
Poster: 78  
Project Title: Neutrophil to Lymphocyte Ratio Predicts Outcomes After Transarterial Chemoembolization for Neuroendocrine Tumor Liver Metastases  
Abstract: Background: The neutrophil to lymphocyte ratio (NLR) has been shown to be predictive of outcomes in various cancers, including neuroendocrine tumors (NETs), and cancer related treatments, including transarterial chemoembolization (TACE). Methods: After IRB approval, we reviewed 262 patients who underwent TACE for metastatic NET at a single tertiary medical center from 2000 to 2016. NLR was calculated from the pre-TACE CBC the post-TACE CBC drawn 3 to 9 months after the treatment. Results: The median post-TACE survival of the entire cohort was 30.1 months. Mean NLR for patients who survived less than 3 years was 4.4 while the mean NLR for patients who survived more than 3 years was 3.3. Median overall survival of patients with a pre-TACE NLR > 4 was 33.3 months vs 21.1 months for patients with a pre-TACE NLR > 4 (p = 0.005). The median survival for patients with post-TACE NLR higher than pre-TACE NLR was 21.4 months vs 25.8 months for patients with post-TACE NLR less than or equal to pre-TACE NLR (p = 0.007). NLR values from one day and one week post-TACE did not correlate with outcome. Discussion: An elevated NLR pre-TACE, as well as an NLR value that has not returned to its pre-TACE value several months after the TACE, are associated with worse survival in patients with NET and liver metastases. This value can easily be calculated from the CBC routinely obtained from patients as part of their pre-procedural and post-procedural care, and may impact treatment strategies.

Mariel McGuiness  
Mentor: Dr Ann McAlearney PhD  
Poster: 63  
Project Title: Healthcare Provider Perspectives on the Implementation of an Inpatient Portal  
Abstract: Context: Studies on ambulatory patient portals have shown that access to real-time health information aids patients suffering from chronic diseases manage their care. Technologies such as inpatient portals, portals used by patients in the hospital setting, have been developed to engage patients at the point-of-care following an acute exacerbation. Few studies exist currently that analyze the impact of inpatient portals, and fewer still that consider provider perspectives. Objective: To explore healthcare provider perspectives on the impact of an inpatient portal, MyChart Bedside (MCB), on the patient-provider relationship, workflow, and communication. Design: Repeated cross-sectional interviews were conducted 1-month and 6-months post-implementation with healthcare providers who cared for patients using MCB. A total of 224 interviews were conducted, with interviewees questioned on their perception of the implementation of MCB. Interviews were transcribed and analyzed using grounded theory and emergent themes were identified. Intervention: MyChart Bedside, an inpatient portal developed by Epic Systems. MCB features real-time vitals, lab results, medications, daily schedules, health education, care team information, meal service, and bi-directional secure messaging with providers. Results: Three emergent themes were identified with regards to the impact of MCB on the provider including 1) provider frustration with the impact of MCB on workflow; 2) the discrepancy between patient and provider expectations, in particular with regards to messaging, schedules, and medications; and 3) the potential for MCB to improve patient engagement and communication with providers. Conclusions: Healthcare provider buy-in is crucial to ensure that MCB and similar technologies are used to their fullest potential. Discrepancies between patient, provider, and administrative expectations for MCB use must be mitigated to facilitate provider buy-in.
Rohit Menon  
**Mentor:** David Bahner MD  
**Poster:** 82  
**Project Title:** GATES: Global Assessment Tool Echocardiography Simulation  
**Abstract:** Cardiac ultrasound training and competency criteria remain variable. The Global Assessment Tool Echocardiography Simulation (GATES) is a standardized assessment tool designed on the HeartWorks Cardiac Ultrasound Simulator Student Assessment and Review Tool (START) to address this problem. START records image acquisition throughout a twenty-four point normal simulated exam and two randomly assigned fourteen-point pathological exams. Prior to GATES administration, participants completed a demographic survey which categorized them by cardiac ultrasound experience and level of training, a five-point likert scale questionnaire on what their self-perceived echocardiography competency was, and a ten-question multiple choice pre-knowledge assessment. Participants acquired scans and identified anatomy, calculated measures of cardiac function, uploaded clips or images, and answered customized questions throughout the exam. This pilot study correlated demographic data from all learners with their GATES score out of fifty-two points to draw statistical conclusions on the validity of GATES. Fifty-four participants completed GATES and were sorted by level of training into groups of thirty-one junior medical students and twenty-three senior medical students and postgraduate trainees. Junior medical students perceived their competency in echocardiography to be a 2.82 out of 5, while senior medical students and trainees averaged a 3.71. Junior medical students averaged 5.29 out of 10 on a pre-knowledge assessment, while the second group averaged a 7.52. Finally, in the overall GATES exam, the first cohort averaged 21.79 out of 52, while the more experienced group averaged 34.85. GATES was developed to assess ultrasound competency across the educational spectrum. This pilot data shows that GATES scores correlate with level or training. Therefore this can be a useful tool to standardize cardiac ultrasound assessment.

Lindsay Mlynarek  
**Mentor:** Maristella Evangelista MD  
**Poster:** 58  
**Project Title:** Enhancing Resident Education with Operative Planning Mobile Application  
**Abstract:** Lindsay Mlynarek B.S., Maristella Evangelista M.D. Aim 1: Assessment of current state of surgical education. We hypothesize that there are still gaps in plastic surgery education that can be enhanced by the implementation of novel mobile technology. By leading focus groups to identify potential gaps and surveying current residents and fellows in plastic surgery, we will attempt to elucidate the current challenges in plastic surgery education and identify areas of need. Aim 2: Evaluate the impact of novel mobile application software. We hypothesize that the A surgical case planning mobile application, BrainPadd, will improve resident preparedness for operations and increase resident autonomy in the operating room. We also hypothesize that the improved communication will enhance physician, resident, and staff satisfaction during surgical cases. The mobile application, BrainPadd, was developed by the senior author to address a perceived need for an operative planning tool. Residents and fellows in ACGME-accredited training programs were sent anonymous surveys to assess need and interest. Residents at the senior author's institution were given access to a beta version of the mobile application. Residents were surveyed after 1 month of access for usability and interest. Though early implementation showed low usage, national survey response and pilot group feedback show high interest in a mobile application for surgical case planning. We believe that with full implementation and further study, this technology has the potential to enhance plastic surgery education by optimizing communication, efficiency, and collaboration.
James Moley  
**Mentor:** Paul Stoodley PhD  
**Poster:** 33  
**Project Title:** Mapping of Bacterial Biofilms on Orthopaedic Implants  
**Abstract:** While the medical, economic, and social effects of periprosthetic joint infections (PJIs) are well known, the process of biofilm formation on orthopaedic hardware is currently unclear. Biofilms have been shown to be more tolerant of antibiotics than planktonic bacteria and play a critical role in the development of infection. Previous work has shown that encasement and incubation of infected explant hardware in agar can aid in identifying biofilm location on the explanted material, but utility was limited by opacity of the agar. The present study tests the utility of the novel "candle dip" method in mapping biofilm formation, and hypothesized that it would successfully identify bacterial outgrowth from components. The method involves submerging components in molten agar followed by incubation with visual confirmation of colonies in the agar. Ten surgical cases were followed yielding 37 separate components that were treated with either agar encasement or candle dip method. None of the components from the three non-infected received showed positive signs of growth in contrast to outgrowth from components from three of the six positively infected patients. Mapping was completed for a femoral head component, and bacterial colonies were identified on the circular rim and internal notches. Various complications included reduced visibility of bacterial colonies on certain surfaces, difficulty applying agar without spreading bacterial growth, and drying of agar over time with the candle dip method. Additional testing, specifically of hip components, is needed to standardize technique and identify possible anatomical regions of orthopaedic components that may be more likely than others to harbor biofilm.

Nikitaa Nath  
**Mentor:** Yousef Hannawi MD  
**Poster:** 49  
**Project Title:** Cerebral Small Vessel Disease and its Link to Cerebral Arterial Calcifications and Stenosis  
**Abstract:** Cerebral small vessel disease (CSVD) is thought to contribute to increased risk of stroke, and is a common finding on imaging studies of elderly patients. Affected vessels cannot be evaluated in vivo, but changes seen on brain MRI can be used as surrogate for this disease, and have recently expanded to include microbleeds, lacunes, perivascular spaces, and white matter hyperintensities. Large vessel atherosclerosis can cause calcification and stenosis of major cerebral arteries. The link between CSVD and atherosclerotic changes in large vessels has been in debate. We aim to address this problem through a novel approach by estimating the total burden of CSVD from all 4 types of lesions, and assessing the degree of calcification at various carotid artery segments, both intra- and extra-cranially. CTA was used to measure extracranial internal carotid artery (ICA) and common carotid artery (CCA) calcification and stenosis. Non-contrast cranial CT was used to quantify calcification of the intracranial ICA segments. CSVD was measured by the extent of white matter changes present on brain MRI. Preliminary hypothesis testing of 145 ischemic stroke patients demonstrated that total burden of CSVD score positively correlates with the degree of intracranial calcifications. Additionally, CSVD score, intracranial ICA calcification score, and age at stroke are significantly positively correlated. Our study helps clarify conflicting results and demonstrates that these disease processes do indeed coexist to a significant manner in ischemic stroke. We are still in the process of analyzing radiographic variables including stroke size and extra-cranial calcifications. Multivariate logistic regression analysis will be used to correlate carotid artery calcification, stenosis, and CSVD with clinical variables such as initial clinical presentation, past medical history, and stroke outcomes. Our final results will provide insights into the link between large and small vessel pathologies.
Aroh Pandit  
**Mentor:** Wiliam Vasileff MD  
**Poster:** 4  
**Project Title:** Osteoarthritis Risk Factors - Correlating Cam Lesion Size and Chondral Damage  
**Abstract:** Femoroacetabular impingement syndrome (FAIS) is a clinical condition that can affect the quality of life of patients by producing pain and reducing functionality, and may progress to degenerative joint disease. Cam lesions may contribute to FAIS and constitute a loss of femoral head-neck offset, resulting in soft tissue damage related to bony impingement. Cam lesions can be quantified by measuring the Î±-angle. Although cam lesions have been associated with higher grades of chondral damage when compared to the general population, it is not known if the size of the lesion is associated with severity of the chondral damage. This study aimed to find a correlation between cam lesion size and degree of chondral damage. Consented participants were included in the study if they had a cam resection procedure as part of a primary hip arthroscopy. Lateral radiographs of the surgical hip obtained preoperatively were utilized to determine the native Î±-angle. Chondral damage was recorded intraoperatively using the Outerbridge system. Patients with poor quality radiographs or who had bilateral arthroscopy procedures were excluded from the study. Data were then assessed using an ordinal probit regression model. The linear regression was not statistically significant (y = -0.006x + 2.927, R^2 = 0.0051). Each probability of a given Î±-angle being classified into each Outerbridge grade did not vary significantly with size. This study found no significant correlation between the Î±-angle and Outerbridge score at the time of hip arthroscopy. These data all suggest that acetabular chondral damage observed at the time of hip arthroscopy is multi-factorial. It is possible that other patient factors such as age, sex, weight, or activity level may also affect the status of the articular cartilage. Further studies can evaluate possible influences of these variables and may elucidate algorithms with predictive power which can be used for improved clinical decision making and patient counseling.

Jenna Patterson  
**Mentor:** Dr. Tamar Gur MD, PhD  
**Poster:** 20  
**Project Title:** The Role of Innate Immunity and Stress in Preterm Birth  
**Abstract:** Psychosocial stress elicits immune responses and alterations in the gut microbiome composition. Using a murine model of prenatal stress, our recent studies demonstrated a possible link between dysbiosis within the intrauterine environment and psychosocial stress. This dysbiosis has been shown to increase production of pro-inflammatory cytokine, IL-1Î², subsequently leading to a pro-inflammatory intrauterine environment and long term behavioral alterations in the offspring. Using Immunohistochemistry (IHC) and PCR, we show an increase in placental chemokine ligand 2 (CCL2), which recruits monocytes to the site of infection, as well as placental macrophages in response to prenatal stress. Previous studies have shown that psychosocial stress in mice leads to an increased production of bone marrow-derived myeloid cells which traffic to various organs, including brain and lung, leading to upregulation of pro-inflammatory cytokine production. Therefore, it is possible that prenatal stress increases production of myeloid cells in the maternal bone marrow which then traffic to the intrauterine environment, causing intrauterine inflammation and subsequent PTB. The origin of these macrophages, whether maternal or fetal, will be better characterized in our future experiments using Green Fluorescent Protein (GFP)+ bone marrow chimera dams, which would fluorescently label maternally derived placental macrophages. Lastly, we plan to label for CD45 (lymphocytes) via IHC as well as CD14 (macrophages) and CD45 via flow cytometry to further characterize the intrauterine immune profile in response to prenatal stress.
John Patton  
Mentor: Robert Baiocchi MD, PhD  
Poster: 44  
**Project Title:** Characterization of Immunosuppressive Macrophage in EBV-Driven Lymphoproliferative Disease  
**Abstract:** Epstein-Barr virus (EBV) is an oncogenic herpes virus associated with the development of a range of B-cell lymphomas with poor outcomes. Traditional chemotherapy has significant effects on a patient's immune system, leading to immune suppression and increased risk of EBV reactivation and the development of lethal opportunistic infections. These complications make it essential to identify novel therapeutic approaches that promote anti-tumor immune responses. In order to elicit an immune response, the immune system needs to be released from the suppressive effects of cancer. The smoldering inflammation displayed by cancer has been shown to alter the surrounding immune cells. Here, macrophages play an important role dampening the normal immune responses that targets and kills the tumor. Specifically, a suppressive subset of macrophages known as M2-macrophages have been shown to suppress T cell apoptosis and are a negative prognostic indicator in many cancers. Our group has shown the interaction of tumor cells cultured with normal lymphocytes results in the release of soluble factors that drive the development of M2-like macrophages that exhibit potent immunosuppressive activity. While these findings suggest a novel macrophage-induced tumor immune escape model we have yet to elucidate the molecular mechanism by which this occurs. Importantly, we hypothesize targeting the polarization pathways of these suppressive, M2-like macrophages, will re-establish the EBV-specific anti-tumor immune response. To this end we propose a research plan to further elucidate the mechanisms by which macrophage differentiation occurs in this setting. Understanding the mechanism by which these cancers avoid immune detection will ultimately inform treatment for these patients in the future.

Hilary Pitner  
Mentor: Patrick Walz MD  
Poster: 13  
**Project Title:** Assessment of Accuracy of Ultrasound in Pre-Operative Diagnosis of Midline Neck Masses in Children  
**Abstract:** Thyroglossal Duct Cysts (TGDC) and Dermoid Cysts (DC) are frequent causes of pediatric midline neck masses. Distinguishing between them is important for avoiding postoperative complications, improving preoperative counseling, and improving operating room logistics. The goal of this study is to retrospectively determine the accuracy of clinical evaluation, ultrasound, and SIST scores at preoperatively diagnosing midline neck masses and to discover demographic or clinical associations that may aid in diagnosis. An electronic medical record query generated 83 patients whose histopathologic diagnosis was either TGDC or DC. Patient charts were reviewed for demographic and clinical features. A radiologist blindly reviewed patients' ultrasounds for SIST score components (internal septae, irregular walls, and solid components). Statistical analyses were conducted to determine if TGDC and DC pathology diagnoses were associated with demographic or clinical variables. McNemar tests were performed to test diagnostic specificity, sensitivity, and predictive values of clinical, ultrasound, and SIST score diagnosis. There were 47 TGDC and 36 DC. Male gender, older age, mass tenderness, positive history of clinical infection, and deep or plane transgressing masses relative to strap muscles were associated with TGDC. Female gender, younger age, no mass tenderness, negative history of clinical infection, and superficial masses relative to strap muscles were associated with DC. SIST scores were more accurate than either clinical evaluation or ultrasound at diagnosing neck masses, with 80.7% accuracy. SIST score was the most accurate predictor of pediatric midline neck masses preoperatively. Various demographic and clinical findings may be able to help guide preoperative diagnosis.
Sarah Poland  
**Mentor:** David Flanigan MD  
**Poster:** 73  
**Project Title:** Age Over 40 Does Not Affect Meniscus Repair Failure Rates at 5-Years  
**Abstract:** Background: Meniscal tears are one of the most common orthopedic injuries and are increasingly being treated with surgical repair. Currently, there is no conclusive evidence regarding repair failure rate in the over 40 age group when compared to younger patients. The purpose of this study is to determine failure rates of the over 40 patient population compared to the under 40, and to present long-term clinical outcomes of both groups.  
Methods: A total of 221 patients with 80% follow-up underwent meniscus repair with a single surgeon with an average 5-year follow-up. Of the 221 patients, 56 patients were over 40 years of age (mean 47.19 yrs, SD 5.34) and 165 were under 40 (mean 24.74 yrs, SD 6.74). Failure of the meniscus repair was determined for each patient. Failure was defined as meniscectomy, repeat meniscus repair, or TKA on the original surgically repaired meniscus. All had patient-reported outcomes in the form of IDKC, KOOS, and Marx scores. Risk of failure and average patient-reported outcomes due to age group were determined with logistic regression modelling after controlling for confounding variables including weight, sex, ACL status, number of implants utilized, tear pattern, and chondral status at the time of procedure.  
Results: The overall meniscus repair failure rate was 20% (45/221). Among patients less than 40 years of age the failure rate was 21% (35/165) and over 40 years of age was 18% (10/56). After adjusting for confounding variables, age over 40 was not associated with risk of meniscus repair failure (adjusted OR 0.83, 95% CI 0.36, 1.81; p=0.65). The older patient population progressed to failure more quickly, as average time to failure for the over 40 age group was 14.10 months (SD 4.43) while the under 40 age group was 28.13 months (SD 22.99). On average, IKDC scores for the over 40 group age group (mean 66.88, SE 3.34) were significantly lower than those for the under 40 age group (mean 78.87, SE 2.34, p=0.001).

Franklin Privette  
**Mentor:** Motao Zhu MD, PhD  
**Poster:** 10  
**Project Title:** Factors Affecting Restraint Use in Motor Vehicle Crashes in Children  
**Abstract:** Motor vehicle accidents are a leading cause of death among children. Booster seats have been shown to reduce the risk of injury and fatality in children when they are used. In 2008, the State of Ohio passed the Child Passenger Safety Law with the intent of decreasing the risk of childhood fatalities by mandating that all children under eight years old sit in a booster seat while riding in a car unless they are taller than 4’ 9”. Similar laws have been adopted across the nation. However, booster seats continue to go unused and used improperly. The purpose of this research is to gain an understanding of the extent of current booster seat usage and proper usage among childhood motor vehicle fatalities from a public health perspective. The goal is to promote further safety recommendations and public education to prevent future fatalities in pediatric populations.
Mayuran Ravindran  
**Mentor:** David Stukus MD  
**Poster:** 38  
**Project Title:** Reduction in Asthma Related Emergency Department Visits and Hospitalizations Among Children Evaluated in a Specialty Asthma Clinic  
**Abstract:** Asthma is the most common chronic disease among children, and is the leading cause of emergency department visits and hospitalizations for children in the United States. There are multispecialty programs aimed at targeting high risk populations of children with asthma, but most are based in the community setting. Since 2011, there has been a complex asthma clinic at Nationwide Children’s Hospital that provides specialty care to children with severe or poorly controlled asthma. Our goal is to determine if children with prior emergency department visits due to asthma benefit from evaluation in this clinic. In order to achieve this, a patient registry will be created to evaluate asthma-related health care utilization before and after treatment in the Complex Asthma Clinic at Nationwide Children’s Hospital.

Kasey Rawlins  
**Mentor:** Lawrence Shirley MD  
**Poster:** 36  
**Project Title:** The Role of a Multidisciplinary Tumor Board in Management of Patients with Pancreatic Cystic Lesions  
**Abstract:** Introduction: Pancreatic cystic lesions are being increasingly discovered due to use of axial imaging. Since risk of malignancy varies greatly based upon lesion type, we sought to examine whether case presentation to a multidisciplinary tumor board was associated with changes in working diagnosis and treatment plan.  
**Methods:** We reviewed all patients who were presented to our institution’s tumor board with a pancreatic cystic lesion from 2012-2015. Patients were divided into six categories based upon lesion type. Pre-discussion diagnosis and treatment plan were compared to post-discussion diagnosis and plan. Corresponding change in diagnosis and plan were examined according to lesion type. Changes in plan were assessed by whether the change was from a less aggressive to a more aggressive treatment option or vice versa.  
**Results:** 208 cases were presented to the tumor board representing 169 individuals who met study criteria. Types of disease included branch-duct Intraductal papillary mucinous neoplasm (BD-IPMN) (32.7%), serous cystadenoma (14.4%), main-duct IPMN (MD-IPMN) (13.9%), pseudocyst (5.8%), mucinous cystic neoplasm (MCN) (3.8%), and other/unknown cystic lesions (29.3%). Overall, post-tumor board diagnosis differed from preliminary 9.6% of the time. Tumor board recommendations differed from the proposed treatment plan for 44.2% of presented cases. Of those with a change in plan, 64.8% were from a less aggressive to more aggressive treatment option.  
**Conclusion:** Presentation to this tumor board is associated with a change in both diagnosis and treatment plan in a number of cases, suggesting that tumor board discussion has a substantial effect on patient care for individuals with pancreatic cystic lesions.
Casey Ren  
**Mentor:** William Carson MD  
**Poster:** 23  
**Project Title:** Analysis of MicroRNA Patterns in Ulcerated Melanoma Primaries to Guide Treatment Decisions  
**Abstract:** MicroRNAs are small RNA molecules that post-transcriptionally regulate the expression of genes. The dysregulation of miRNAs has been implicated in many diseases, including cancer, and the degree of upregulation or downregulation of miRNAs often correlates with the severity of disease. In this study, we investigate the prognostic value of miRNAs in ulcerated melanomas. Ulcerated melanomas have poor but clinically heterogeneous outcomes. Presently, the prognosis for this type of melanoma is determined using light microscopic markers such as lesion depth and mitotic rate. We propose using miR-21 and miR-155 expression levels within melanoma to define prognosis more accurately. miR-21 has been identified as an inhibitor of tissue inhibitor of metalloproteinases 3, leading to increased proliferation, invasion, and metastasis. miR-155 targets the tumor suppressor gene TP53 and its upregulation has been implicated in many types of cancers. We hypothesized that miR-21 and miR-155 would be upregulated in melanoma, and particularly in ulcerated melanomas which show aggressive behavior. We determined miR-21 and miR-155 expression levels using real-time PCR after isolation of RNA from tissue samples. Ulcerated melanoma samples showed statistically significantly higher expression of miR-21 than nonulcerated melanoma samples. However, for miR-155, the difference in expression level between ulcerated and nonulcerated samples was not significantly different. These findings demonstrate that miR-21 has the potential to be a good prognostic marker for melanoma, whereas miR-155 does not. Furthermore, we consider other miRNAs that could be useful diagnostic and prognostic markers for future studies.

Cole Rodman  
**Mentor:** Alexa Meara MD  
**Poster:** 8  
**Project Title:** Understanding Vasculitis Patients' Ability to Work with Numbers  
**Abstract:** Background: Vasculitis is a complex and chronic disease that requires physician and patient to work together to successfully manage. There is little literature that has looked at the skills patients must rely on to effectively engage in and benefit from patient-centered care and shared decision making (SDM). In this paper, we examined the impact of patient numeracy (numerical skill), as well as health literacy and patient activation, on vasculitis damage and activity. Methods: Participants (N=43) were recruited from the Ohio State University Lupus, Vasculitis, and Glomerulonephritis (LVG). Subjects completed the following measures: patient activation (PAM), a measure of patient engagement, objective numeracy (ONS), a measure of objective math skills, subjective numeracy (SNS), a measure of self-reported math skills, health literacy (sTOFHLA), the Brigham Vasculitis Activity Score (BVAS), and the Vasculitis Damage Index (VDI), measures of activity and damage respectively. Results: We found a strong correlation between patient activation and both disease damage and activity in agreement with the established literature. Additionally, ONS demonstrated a positive correlation with VDI score, while SNS showed no correlation. Discussion: The relationship between ONS and disease damage contradicts previous work in Lupus patients and merits further investigation. Future work is aimed towards increasing the sample size, with a stated goal of 85 patients. Additionally, any results should be compared to preliminary data from a Lupus patient population showing a negative correlation between subjective numeracy (perceived skill with numbers) and lupus disease damage.
**Hussam Salhi**  
**Mentor:** Brandon Biesiadecki PhD  
**Poster:** 19  
**Project Title:** Troponin I Tyrosine Phosphorylation Modulates Cardiac Function  
**Abstract:** Contraction and relaxation of the heart are regulated by many molecular mechanisms including the protein interactions at the myofilament. Within the myofilament, the troponin complex is a critical protein switch involved in transducing the calcium chemical signal into cardiac contraction and relaxation. Troponin I (cTnI), the inhibitory subunit of the complex, is phosphorylated as a key regulatory mechanism to alter this process. Recent work identified a novel phosphorylation of cTnI at Tyrosine-26 that is significantly decreased during heart failure with unknown functional effects. Our biochemical data demonstrates that TnI Tyr-26 phosphorylation decreases calcium sensitivity and accelerates cardiac cell relaxation. These findings led us to hypothesize that elevation of Tyr-26 phosphorylation in the heart will accelerate cardiac muscle relaxation to enhance diastolic filling. We utilized cardiac-specific AAV9 expression of Tyr-26 pseudophosphorylated cTnI in mice to assess in vivo myocardial effects of TnI Tyr-26 phosphorylation. We found that although AAV9 expression of Tyr-26 pseudophosphorylated cTnI was successful in cultured myocytes, expression in the in vivo murine heart was limited. Thus, following this pitfall, we alternatively used transgenic mice containing Tyr-26 phosphorylated cTnI to measure changes in cardiac function by echocardiographic and hemodynamic analyses in the presence and absence of a myocardial infarction. Our data demonstrate that Tyr-26 phosphorylation in mice exhibited a trend of faster relaxation with lower contractility than WT mice. These data suggest that Tyr-26 phosphorylation, by depressing contraction but enhancing relaxation, may be beneficial or harmful depending on the disease state.

**Nikolas Sarac**  
**Mentor:** James Borchers MD  
**Poster:** 53  
**Project Title:** Epidemiology of Mental Health Conditions in Incoming Division I Collegiate Athletes  
**Abstract:** This study will review the medical history screening questionnaire completed by all first-year student-athletes at The Ohio State University. Data from about 1000 student-athlete questionnaires have previously been collected, and has been entered into the secure REDcap database provided by the Center for Clinical and Translational Science Biomedical Informatics Core at The Ohio State University. The remaining uncollected data consists of that from the incoming class of 2016, and will be collected during the spring of 2017. The purpose of this review is to gain a better understanding of the types of injuries student-athletes are entering college with. This will be done by analyzing trends in injuries by gender, sport, and year. Particular areas of interest include athletes with sickle cell trait, or a history of psychosocial issues. Trends will be analyzed using STATA statistical software.
Nayan Shah  
**Mentor:** Rajan Thakkar MD  
**Poster:** 75  
**Project Title:** Systemic Immune Dysfunction and PD-1 Expression are Observed Following Pediatric Thermal Injury  
**Abstract:** Every three hours a child in this country dies from thermal injury. The most common cause of morbidity and mortality after burn injury is infection. Studies demonstrate immune dysfunction after thermal injury. The aim of the Thakkar laboratory is to characterize immune function after pediatric thermal injury. PD-1 is a co-inhibitory receptor expressed on the surface of T cells that downregulates the immune response. Activation of PD-1 is associated with acquired immune suppression following trauma in adults. This has not been evaluated in pediatric burn patients. We hypothesized that systemic immune function would be impaired following severe pediatric burn injury and that this acquired immune suppression would be a risk factor for adverse outcomes including nosocomial infection (NI). Furthermore, we hypothesized that PD-1 upregulation would contribute to immune dysfunction following pediatric thermal injury and that this relationship may be useful as a predictor of adverse outcomes. This pilot study prospectively evaluated the immune function of a cohort of children with acute burn injury. Patient whole blood was used to measure innate and adaptive immune function via LPS-induced TNFα production capacity and PHA-induced cytokine production capacity respectively. Flow cytometry was used to evaluate HLA-DR expression on monocytes, along with PD-1 expression on T cells. TNFα production, monocyte HLA-DR expression and PHA-induced IL-10 production were all lower (p < .05) in children who developed NI. Furthermore, pediatric patients who developed NI showed a trend toward (p = .05) higher T cell PD-1 expression. Pediatric patients that went on to develop NI had lower measures of immune function compared to those who did not develop NI. PD-1 expression trended higher in patients who developed NI. A larger study examining these trends is needed to further characterize the role of the PD-1 pathway on immune system dysfunction after pediatric thermal injury.

Rachel Shain  
**Mentor:** Courtney Lynch PhD  
**Poster:** 66  
**Project Title:** Sleep-related ideals and practices among African American mothers in Columbus, Ohio  
**Abstract:** Sleep-related infant death constitutes one of the major causes of infant mortality, and infant mortality rates are substantially higher among African American infants. Columbus, Ohio, experiences disproportionately high rates of infant mortality. The current project involves conducting in-depth, semi-structured interviews with African American women with infants under the age of one year and seeks to generate hypotheses with respect to the following: the practices and ideals of infant sleep among African American mothers, the barriers African American women experience in implementing safe sleep guidelines, and the attitudes of African American women regarding their interactions with the healthcare system on the subject of safe sleep. The study aimed to interview women until thematic saturation was reached likely 20-30 interviews. Researchers have recruited women through the Moms2B program, the Black Lactation Circle, and St. Stephen's Community Center. Additional participants were interviewed via a snowball recruitment methodology. Currently 13 women have been interviewed. Preliminary results suggest that women who report difficulty getting their infant to sleep resort to a variety of ad-hoc presumed risk mitigation strategies in an effort to follow as much of the ABCs of safe sleep as they feel is feasible for their family. Furthermore, women tend to be responsive when they understand the mechanism of the advice they are given; many women prefer a "realistic" conversation with their healthcare provider about safe sleep; and the African American women interviewed hold specific beliefs about what constitutes comfortable sleep, such as how much the sleep situation mimicked the womb and softness of a surface. Frequently personal factors played a large role in determining sleep situation. The next steps are to finish the remaining interviews and to use content analysis (an inductive approach for qualitative data) to code and analyze themes.
Diana Shao  
Mentor: Simon Lin MD  
Poster: 30  
Project Title: Comparing manual and automated approaches for determining diagnoses based on patient note narratives  
Abstract: For clinicians, locating relevant literature is often difficult and time-consuming. Thus, an algorithm that automatically queries keywords and presents articles would be useful. The 2016 TREC-CDS challenge was a competition among algorithms developed by data science teams across the United States. The algorithms extracted keywords from de-identified patient notes and then used those keywords to search for relevant articles. Human clinicians working for TREC then rated the actual relevance of the articles. The algorithms submitted by Nationwide Children's Hospital (NCH) performed well among most of the 30 topics but underperformed in a few topics, even with a "gold standard" algorithm in which the keywords were determined by NCH clinicians and medical students instead of a machine. I qualitatively examined the TREC judges' evaluations of the "gold standard" algorithm results and found that the judges seemed to have made human errors, such as premature closure. This gives the NCH data science team reason to regard human evaluations of clinical decision support systems with more caution while still understanding their value.

Simranpreet Singh  
Mentor: Peter Shields MD  
Poster: 21  
Project Title: Association of alcohol and tobacco use with MLH1 hypermethylation in colorectal cancer patients  
Abstract: Background: Alcohol intake has been associated with higher CRC risk in patients and a higher level of promoter methylation for various CRC genes including MLH1, however data are limited and conflicting. In contrast, tobacco use has been associated with increased CpG island methylation in patients with colorectal cancer (CRC), but no study has examined associations with MLH1 methylation. Methods: CRC patients (n=1,146) from the Ohio Colorectal Cancer Prevention Initiative completed an extensive self-administered questionnaire, which included questions on alcohol and smoking. Tumors were tested for microsatellite instability (MSI) and further analyzed for MLH1 promoter methylation (mMLH1). Results: Use of alcohol was not associated with mMLH1 (OR 0.83, 95% CI: 0.52-1.36). Smoking was positively associated with mMLH1 (OR 1.50, 95% CI: 1.03-2.21), but only among females. Conclusions: Our case-only study found no evidence for an association between alcohol and mMLH1. We found evidence that smoking is positively associated with mMLH1, specifically in women. Impact: This study provides an initial look at mMLH1 in regards to alcohol and tobacco use. Further studies are needed to elaborate on these findings.
Chelsea Skinner  
Mentor: Nilay Shah MD  
Poster: 25  
**Project Title:** CRISPR/Cas9-mediated Screening of Critical Tumor Suppressors in 11q-loss Neuroblastoma  
**Abstract:** Neuroblastoma is an embryonal childhood cancer that has striking variability in outcomes, with particularly poor survival for patients with a loss of heterozygosity in chromosome 11q. To elucidate the driver pathways in this type of neuroblastoma, we proposed to use a clustered regularly interspaced short palindromic repeats (CRISPR) library screen to identify which genes on 11q have the strongest effect on neuroblastoma cell growth and chemotherapy resistance. We produced four neuroblastoma cell lines that stably express the cas9 endonuclease, as well as a Lentiviral library of single guide RNAs (sgRNAs) targeting 19,114 genes, including each coding gene within the human genome. In the future, we will infect the cas9-expressing neuroblastoma cell lines with the Lentiviral library at a titer of a single sgRNA per cell and evaluate the effects of individual mutations on each coding gene within 11q. The cells will then be selected for proliferative and chemoresistant phenotypes and sequenced to identify the corresponding CRISPR-targeted gene. Candidate genes will then be validated for their tumor-suppressive phenotype in neuroblastoma. This work will lead to development of novel therapeutics for patients with high-risk neuroblastoma.

Matthew Smyke  
Mentor: Orlando Simonetti PhD  
Poster: 69  
**Project Title:** Optimization of a Non-linear Multi-parameter Method of Measuring Blood Oxygen Saturation Using MRI  
**Abstract:** Venous blood oxygen saturation (SvO2) measured in the heart and vessels is useful in the assessment of patients with cardiopulmonary disease, but currently requires right heart catheterization (RHC) which is invasive and involves radiation. A new non-linear multi-parameter method of estimating SvO2 using MRI has been developed that requires only hematocrit (Hct) and pulse oximeter (SpO2) readings, in addition to the acquisition of multiple T2 maps. However, single plane scan time is currently about 90 seconds, which may be problematic when multiple locations must be interrogated. The purpose of this study was to demonstrate that a lower total scan time can be achieved by reducing the number of source images without sacrificing the accuracy of the SvO2 estimation. Eighteen adult patients clinically indicated for RHC underwent an MRI exam. Hct was measured from a blood sample; SpO2 was obtained during MRI. A total of eighteen images using Malcolm-Levitt (MLEV) T2-preparations with both four and eight refocusing pulses (MLEV4/8) were acquired in a short-axis view of the heart including the right and left ventricle. Measurement of signal in the venous and arterial blood, together with Hct and SpO2, were jointly processed to estimate SvO2. A subset of six images using eight refocusing pulses (MLEV8*) only, was also evaluated. SvO2 estimated with the optimized MLEV8* scheme showed a significant correlation with SvO2 estimated by MLEV4/8 (r=0.76, p < 0.001). SvO2 estimated by MLEV8* also showed only minimal bias relative to SvO2 obtained by RHC (-1.2±6.8%) with no significant difference between the measurements (p=0.45). A 67% reduction in scan time was achieved with MLEV8* from 90 seconds to 30 seconds. In this optimization study, we have demonstrated a significant reduction in scan time without compromising on the accuracy of SvO2 estimation, thus highlighting clinical feasibility of the non-invasive MR-based technique to estimate blood oxygen saturation in the heart.
**Deepa Subramaniam**  
**Mentor:** Michael Caligiuri MD  
**Poster:** 29  
**Project Title:** Investigating the Role of CD4+ T Cells in the Development of EBV-related PTLD  
**Abstract:** Post-transplant lymphoproliferative disease (PTLD) is a severe complication of organ or stem cell transplantation that is associated with a poor prognosis. Most cases of PTLD are associated with the presence of Epstein-Barr virus (EBV), a ubiquitous gamma herpes virus that affects the vast majority of the adult population. Severe combined immune deficient (SCID) mice, when engrafted with EBV+ peripheral blood mononuclear cells (PBMCs) either go on to develop an analog of PTLD (classified as HIGH-incidence donor) or do not (classified as NO-incidence donor), and these outcomes can be predicted. Investigation of host factor differences that determine potential to develop PTLD is the focus of this research. CD4+ T cells were isolated from engrafted SCID mice splenocytes from both HIGH- and NO-incidence donors for CyTOF analysis. Additionally, investigation of in vitro methods of stimulating PBMCs was investigated for efficacy and accuracy to host response. Transcriptome analysis of HIGH- and NO-incidence donors reveals significant CD4+ T cell gene expression differences between samples. Further studies will investigate the role of these genes and which ones most closely correlate with the development of PTLD in order to eventually develop a screening tool.

---

**Anirudh Tarimala**  
**Mentor:** Jingzhen Yang PhD  
**Poster:** 2  
**Project Title:** The Effect of Legislation on Emergency Department Utilization for Concussions among Children with Medicaid  
**Abstract:** Every state in the US passed a youth concussion law between 2009 and 2014 to help mitigate the negative consequences of concussions among children and adolescents. As the first laws written to address a specific injury and require clearance from a healthcare professional, previous studies have demonstrated an increase in healthcare utilization as a result of the laws. However, no studies have analyzed these trends within a Medicaid population or its impact on follow-up care for the treatment of concussions. We hypothesized that the rate of initial emergency department encounters for concussions among children with Medicaid would increase following enactment of the Ohio concussion law. We also hypothesized that the proportion of follow-up visits to specialists, the number of medical encounters per injury, and the number of treatment days per injury would increase following enactment of the Ohio concussion law. The study queried the Partners for Kids database to analyze concussion-related medical claims submitted from January 1, 2008 to December 31, 2016. The rate of initial ED encounters for concussions increased from 8.65 per 100,000 in 2008 to 20.04 per 100,000 in 2016. There was a shift in the pattern of follow-up care from radiology and ambulance services to primary care providers after enactment of the law. In addition, the number of medical encounters per injury and the number of treatment days per injury significantly increased after enactment of the law. These findings demonstrate that the Ohio concussion law had a palpable impact on the treatment course of concussions within a Medicaid population. Future studies should analyze these trends within an inpatient and outpatient setting and compare the findings to children and adolescents with private insurance to determine if the Ohio concussion law is impacting all socioeconomic groups equally.
Tyler Tate  
**Mentor:** Samantha King PhD  
**Poster:** 65  
**Project Title:** Investigation of Residue Contribution to the Function of SP0845 in *Streptococcus pneumoniae*  
**Abstract:** Investigation of Residue Contribution to the Function of SP0845 in *Streptococcus pneumoniae* burden of disease throughout all parts of the world. The current effort to combat pneumococcal disease is lacking due to increasing antibiotic resistance and limited serotype vaccination coverage. Lipoprotein SP0845 has been identified as a novel therapeutic target.8 This protein makes up the substrate binding subunit of an ATP-binding Cassette (ABC) transporter that functions in the uptake of nucleoside bases. Immunization with recombinant SP0845 conferred a protective effect on mice challenged intraperitoneally. Mutation of SP0845 in *S. pneumoniae* prevented killing by a toxic nucleoside analogue 5-fluourouridine (5FU). There is currently a lack of understanding regarding the mechanism by which SP0845 binds its substrate. Structural analysis of SP0845 predicted seven residues to be critical to the function of the binding pocket. Strains of *S. pneumoniae* in which one of the seven residues was mutated were generated. Two of the predicted seven amino acids displayed a very similar phenotype to that of SP0845 when grown in the presence of 5FU. This study has demonstrated the importance of some amino acids to the ability of SP0845 to function in the transport of nucleoside bases in *Streptococcus pneumoniae*.

Toacca Taylor  
**Mentor:** Vibhor Krishna MD  
**Poster:** 68  
**Project Title:** Micro-lesion induce changes in network dynamics predicts outcome of deep brain stimulation.  
**Abstract:** Deep Brain stimulation is an efficacious treatment for refractory essential tremor. However, only 10-15% of ET patients undergo DBS. Patients are often uncomfortable with remaining awake during surgery. Therefore, DBS can now be performed under general anesthesia with magnetic resonance imaging (MRI) guidance. Although transformative, this technique is not widely used due to the absence of clinical feedback during surgery. Stimulation-induced resting state fMRI (rs-fMRI) changes can provide the ideal feedback, but current DBS electrodes are not MRI compatible. The 'micro-lesion' effect, phenomena of immediate transient effects in patients before stimulation, has been postulated as a biomarker for good long-term patient outcomes. We hypothesize that rs-fMRI is able to detect changes in tremor network dynamics associated with micro-lesioning during asleep DBS surgery. All patients underwent unilateral MRI-guided VIM DBS. Two receiver-only head coils were placed in parallel to the patient's head just below the fixation pins of the head frame. In addition to the T1 anatomical MRI scan, two identical 8 minutes resting state fMRI scans were performed immediately before and immediately after insertion of the ceramic brain cannula and used as a guide for the final DBS electrode implantation. To analyzed local connectivity changes, a regional homogeneity (ReHo) study was performed on each individual patient on pre-operative and post-operative imaging. The preliminary analysis on patients confirms the feasibility of acquiring rs-fMRI during asleep DBS. The initial results suggest that changes in local connectivity at the level of the dentate nucleus of cerebellum may be a marker of micro-lesioning induced changes in rs-fMRI during DBS for tremor. We conclude based on this exploratory analysis, that rs-fMRI during DBS is feasible and it represents a potential intraoperative surrogate for optimal electrode placement.
Starling Tolliver  
**Mentor:** Benjamin Kaffenberger MD  
**Poster:** 79  
**Project Title:** A Descriptive Study of African American Women with and without Hair Loss and their Perception of Dermatologists  
**Abstract:** Social media platforms like YouTube, Facebook, and Haircare forums have become a reservoir of information on how to care for Afro textured hair. Yet, it is unclear where dermatologists and physicians stand to provide information on hair health and similar issues. We conducted a cross-sectional study using a survey questionnaire to understand how women having issues of hair loss usually receive care, if they seek dermatologic intervention and if not, why. The procedures for this study was to first identify possible participants for the study using various churches, hair salons, student organizations, and social media. Participants were informed on the goals, length, confidentiality, researchers contact information, participant's anonymity, and participant's ability to refuse the survey. The survey was then recorded, participant information de-identified and then data was analyzed using descriptive analysis and Wilcoxon rank sum test. We found that in congruence with other studies, over 50% of participants suffered from hair loss, however, over 80% had never received care for this issue. Most of the women received information to deal with hair loss and hair care from online mediums. Moreover, black women cited reasons such as lack of awareness of dermatologist being hair specialist as well as thinking that dermatologist weren't educated enough on black hair care as reasons why they did not see a dermatologist. It is imperative for the field of dermatology to find new ways of reaching out to and building trust of Black women experiencing hair loss to improve patient health outcomes.

Sally Trout  
**Mentor:** Amanda Whitaker MD  
**Poster:** 72  
**Project Title:** Long-Term Outcomes of Neonatal Intensive Care Unit Patients with Congenital Talipes Equinovarus  
**Abstract:** The Ponseti method is the standard of care for management of idiopathic congenital talipes equinovarus (clubfoot) in the outpatient setting, but there are no guidelines for treatment of clubfoot in the neonatal intensive care unit (NICU) when present alongside complex medical needs. This retrospective cohort study examined the management and outcomes of clubfoot patients who spent time in the NICU to those who did not. We hypothesized that NICU patients with clubfoot had a significant delay in treatment initiation, making them more difficult to treat and leading to poor functional outcomes. We reviewed the charts of all patients with clubfoot treated at Nationwide Children's Hospital in a 9-year period for demographic data. Number of casts required to achieve initial correction, number of relapses, and number of extensive procedures were used as metrics of how difficult the deformity was to treat. Independent walking age and range of motion data were used as functional outcome measures. NICU patients presented for treatment significantly later than non-NICU patients. There was no difference in number of casts needed to achieve initial correction or number of extensive surgeries. NICU patients experienced a higher number of relapses per foot. There was no difference in final range of motion. NICU patients began to ambulate independently at a later age than non-NICU patients. These inconsistencies suggest that these patient populations do not behave independently. The lack of difference in age at treatment initiation when adjusted for gestational age indicates that there may be other factors beyond treatment delay that influence clinical course. More work is needed to determine factors affecting clubfoot management and outcomes so that evidence-based clinical practice guidelines can be developed. Despite some differences in clinical course, clubfoot patients in the NICU can still achieve good functional outcomes at long-term follow-up.
Lauren Ulsh  
**Mentor:** Lawrence Kirschner MD, PhD  
**Poster:** 37  
**Project Title:** Prevalence of Cushing Syndrome in Medullary Thyroid Cancer: A Retrospective Analysis of the OSU Experience  
**Abstract:** Although medullary thyroid cancer's ability to cause Cushing syndrome has been known for many years, little has been studied about the prevalence of the condition. The objective of this study was to establish the prevalence of Cushing syndrome in patients with medullary thyroid cancer. With a better understanding of frequency and risk factors for this complication, the condition can be detected earlier, leading to better treatment outcomes. A retrospective chart review of all patients seen at OSUWMC/James Cancer Hospital from Jan 1, 2007 through July 1, 2017 (a 10 year interval) with a diagnosis of medullary thyroid cancer was conducted. Of the 130 patients identified as part of the study, 3 (2.3%) were diagnosed with Cushing syndrome. 34 patients underwent serum ACTH or cortisol testing, indicators of adrenal function, and 13 of these patients underwent these tests for an evaluation for Cushing syndrome. Overall, the prevalence of Cushing syndrome in medullary thyroid cancer was slightly higher than the previously reported 0.6%. This prevalence could underestimate the true prevalence since the evaluation rate for Cushing syndrome was low and the clinical presentation of medullary thyroid cancer can mask the complication. Finally, descriptive statistics indicated that there was no difference between Cushing syndrome vs non-Cushing syndrome patients in regards to age at diagnosis, calcitonin and CEA at diagnosis and Calcitonin and CEA after thyroidectomy. Therefore, a prospective study to evaluate all patients with medullary thyroid cancer for Cushing syndrome is needed to clarify the prevalence rate.

Reena Underiner  
**Mentor:** Dr. Mohamed AbdelBaki MD  
**Poster:** 67  
**Project Title:** Meta-analysis of treatment modalities in metastatic atypical teratoid/rhabdoid tumors in children.  
**Abstract:** Atypical teratoid/rhabdoid tumors (AT/RT) are rare, aggressive central nervous system tumors that present during early childhood. Due to rarity and frequency of poor outcomes, there are currently no treatment guidelines for AT/RT. Furthermore, when metastatic, these tumors are even more difficult to treat, and no research currently exists regarding the best treatments for metastatic patients specifically. Using a 3-part approach involving a literature analysis of past metastatic AT/RT cases, a chart review of AT/RT patients at Nationwide Children’s Hospital, and a multicenter retrospective analysis of unpublished AT/RT cases around the country, I will evaluate the treatment modalities used in metastatic AT/RT and establish those which promote the best patient outcomes in terms of overall survival and progression-free survival. These conclusions will be a step toward the creation of standard treatment guidelines for metastatic AT/RT patients around the world.
Jordan Vajda  
**Mentor:** Lara Mckenzie PhD  
**Poster:** 45  
**Project Title:** Pediatric Cosmetic-Related Injuries Treated in US Emergency Departments: 2002 through 2016  
**Abstract:** Background. Cosmetics are regularly found in homes and young children are at risk for unintentional exposures to these products. The objective of this study was to describe the epidemiology of cosmetic-related injuries among young children.

Anthony Vargas  
**Mentor:** Lauren Southerland MD  
**Poster:** 3  
**Project Title:** An Emergency Department Observation Unit is a feasible setting for Multidisciplinary Geriatric Assessments in compliance with the Geriatric Emergency Department Guidelines  
**Abstract:** We have investigated whether the observation (obs) unit in the emergency department is a viable setting for providing geriatric patients multidisciplinary assessment and the effects it has on patient outcomes. Evaluation was conducted using a retrospective chart review of random patients 65 years old were screened from our IRB approved, monthly obs unit quality database from October 2015-March 2017. This was done to assess the frequency and rate of consult use and interventions made by various consulting specialties, which included: geriatric consultants, physical therapists, case managers, and/or pharmacists. The quality database consisted of 221 geriatric patients over the span of 18 months. Patients selected had an average age of 73.3 years (range 65-96) and 44.8% were men. The vast majority of patients placed in the obs unit were discharged (74.3%) directly from the obs unit, and 72 hour ED recidivism was 3.6%. In 40.3% (N=89) of patients screened, at least one of the multidisciplinary consultant services were ordered. Further interventions were recommended in 80.0% of patients evaluated by physical therapy (32 of 40), 100% of those evaluated by a pharmacist (5 of 5), 38% of those evaluated by case management (27 of 71), and 100% of those evaluated by a geriatrician (8 of 8). Multidisciplinary geriatric assessments is a feasible option for older patients placed in the obs unit. This retrospective chart review has shown that the timeframe from which a patient is placed in the obs unit provides adequate time to offer services in compliance with the geriatric ED guidelines. Further evaluation of the overall population that has been placed in the obs unit will also be performed. Emphasis will be placed on identifying modifiable factors that can help to decrease patient length of stays in the obs unit, decrease 72 hour recidivism and improve overall patient outcomes.
Yalan Vu  
**Mentor:** Cynthia Sieck PhD  
**Poster:** 52  
**Project Title:** Provider Perspectives of Inpatient Portal Benefits to Patients  
**Abstract:** Context: Patient portals show promise in improving patient self-management of chronic illness through facilitating patient access to health information and patient-provider communication. Despite this potential, portal usage in the United States has been low. Introducing patient portals within the inpatient setting may increase patient usage through engaging patients during periods of acute crisis, when patients may be more concerned with their health. However, no studies have assessed the perceived benefits and reasons patients decline portal usage. Objective: To assess provider-perceived benefits and reasons for declining MyChart Bedside (MCB). Design: Qualitative interviews regarding perceived benefits to patients and reasons for declining were audio-recorded and transcribed. Grounded theory qualitative analysis performed to identify common themes. Setting: The study took place at 6 general medicine units within the OSUMC hospital system. Participants: 224 interviews conducted with healthcare team members who interacted with patients utilizing MCB. Intervention: MyChart Bedside provided to hospitalized patients on a tablet computer. MCB features include real-time vitals, lab results, medications, schedule, health education, provider identification, and bi-directional secure messaging with staff. Upon discharge, MCB connected with ambulatory MyChart patient portal. Results: 5 MCB benefits to patients identified: increased patient engagement, patient more informed, patient's family more informed, reduced anxiety associated with admission, and enhanced communication with care team. 3 key reasons for declining MCB identified: disinterest or discomfort with technology, patient time constraints/other priorities, possession of another electronic device. Conclusion: Providers perceive MCB as a tool that can improve the inpatient experience and engage patients in their care. Implementation of solutions that address reasons for declining MCB can encourage patient portal usage.

Colleen Waickman  
**Mentor:** Heather Frey MD  
**Poster:** 9  
**Project Title:** A Comparison of Vaginal and Intramuscular Progesterone for the Prevention of Preterm Birth in Women with a History of Premature Delivery  
**Abstract:** Women with a history of preterm delivery are at increased risk of future preterm delivery. Progesterone prophylaxis is one intervention used to reduce this risk. Progesterone can be administered via vaginal or intramuscular delivery, but the efficacy of specific routes is unclear in the literature. The goal of this study was to determine if vaginal progesterone is not inferior to intramuscular progesterone in preventing spontaneous preterm delivery in women with a history of spontaneous preterm birth. This project uses a retrospective cohort design to study women with a history of spontaneous preterm birth who received prenatal care at The Ohio State Wexner Medical Center from 2011 through 2016. Participants in the study were identified based on ICD9/10 codes for history of preterm birth through the Information Warehouse. To determine if vaginal progesterone is not inferior to 17-OHPC in preventing recurrent preterm birth, the rate of recurrent preterm birth in women receiving vaginal progesterone and 17-OHPC will be compared once data on 900 patients is gathered. In this patient population, we expected 30-40% of 900 women to have received vaginal progesterone and 60-70% of women to have received 17-OHPC. Data on 483 patients has been gathered to date. Once all data has been gathered, the average treatment effect, evaluated by the difference in p-values between vaginal and intramuscular progesterone administration (p vaginal - p 17-OHPC), and associated 90% confidence intervals will be estimated. We will determine that vaginal progesterone is non-inferior if the lower bound of the confidence interval does not extend beyond 9%. Because not all of the data has been collected to date, treatment groups were not compared at this time. Preliminary descriptive analyses show that 37.70% of patients received vaginal progesterone (n = 182), 54.20% of patients received intramuscular progesterone (n = 262), and 8.10% of patients received both treatments (n = 39).
Tyler West
Mentor: John Ryan MD
Poster: 55
Project Title: The Effect of Cam Lesion Size on Self-Reported Outcome Scores After Arthroscopic Surgery
Abstract: Femoroacetabular impingement (FAI) is one of the most common mechanisms of early cartilage damage in nondysplastic hips. Several structural abnormalities can cause FAI, including camtype lesions, pincer-type lesions, and combined impingement deformities. The purpose of this study is to investigate if there is a negative correlation between cam lesion size and outcomes after surgery. A database of 700 patients who have undergone hip surgery has been collected and includes patient demographics, imaging data, and self-reported outcomes up to 2 years after surgery. Data will be extracted from patients who were noted to have cam lesions based on pre-operative X-Rays. The size of the cam lesion will be measured by calculating the alpha angle on the patient’s X-ray. Collected patient outcomes contain many parameters including functional limitations and pain. The size of the cam lesions will be compared to the patient outcome scores to find if any correlations exist.

Jess Wolf
Mentor: Michel Torbey MD
Poster: 35
Project Title: Optimization of the geographical placement of the mobile stroke unit in the city of Columbus
Abstract: Mobile Stroke Unit (MSU) technology has been shown to be an effective method for reducing time to treatment for patients experiencing an acute ischemic stroke (AIS). The concept that "time is brain" in strokes is widely accepted in the field of vascular neurology. It is anticipated that the time saved for AIS patients who are treated on the MSU will lead to improved outcomes. This technology has been tested in a few cities in the United States with positive preliminary results. Although the city of Columbus has been considering purchasing a MSU, no studies have yet been performed to identify the best geographic location for it. This study's goal is to optimize the geographic placement of a MSU in the city of Columbus. We will perform an in-depth literature review. In addition, we will calculate time saved for AIS patients and consider the cost-effectiveness of this strategy. Our results show that with an off-central placement, the MSU could save patients as much as 27 minutes from alarm to treatment time. This time saved is significant for patients and significant for the local healthcare system. In order to outweigh this benefit, hospital performance would have to significantly improve the door-to-needle time, from 60 minutes to 30 minutes. We conclude that the MSU could be an effective solution to reduce the time to treatment for AIS patients in Columbus. Its cost-effectiveness remains to be tested and compared to shorter door-to-needle time in the hospital.
Jacqueline Yurkoski  
**Mentor:** Abigail Norris Turner PhD  
**Poster:** 32  
**Project Title:** Somali Women's Health Project  
**Abstract:** To better understand Somali women's health needs, in-depth interviews (IDIs) with local health care providers were conducted, recorded, transcribed, and coded for emergent themes using NVivo software to better understand how healthcare professionals perceive the Somali patient population, to analyze the forms of care being administered to Somali women, and how qualitative analysis draws the two together. Joining this project, I hypothesized that negative stigma associated with Female Genital Mutilation (FGM) contributes to Somali women's unwillingness to seek attention from medical professionals and contributes to their distrust of the western healthcare system in general, thus, negatively impacting health outcomes among Somali women. After organizing the transcripts of provider interviews into categories based on an inclusive coding scheme, I found that even when prompted, commentary on FGM does not appear to be a contributory factor to Somali women's unwillingness to seek care. Instead, very interesting results surrounding the themes of patient's trust of medical providers, patient's trust of the medical system, provider level cultural competency, and structural level barriers to care are predominating perceptions of why Somali patients are non-compliant in their care, or do not seek it regularly. Originally perceived to be a smaller piece of a narrative characterizing impact on care seeking, these findings offer great direction to areas that need further investigation through focus group discussions (FGDs) and through provider's resource access; subsequently leading to systematic change to better serve patients. With care reform for immigrant populations as the ultimate goal, sharing of our results through a community meeting with providers and Somali women in Columbus is in our plan, as well as publication of two separate manuscripts outlining our team's findings from IDIs and FDGs, respectively.

Alexander Zha  
**Mentor:** Mitchell Grayson MD  
**Poster:** 16  
**Project Title:** The Effect of Concentrated CD49d+ Neutrophil Supernatant on the Expression of High Affinity IgE Receptor on Murine Lung Dendritic Cells  
**Abstract:** The development of asthma in children is strongly associated with respiratory viral infections. We used a Sendai virus (SeV) infected mouse model to investigate the pathogenesis of viral-induced asthmatic disease. Expression of the high affinity IgE receptor (FceRI) on murine lung dendritic cells (DCs) is necessary for our model to develop disease. FceRI expression requires a soluble protein factor secreted by CD49d+ neutrophils. We hypothesized that concentrating the soluble protein factor from CD49d+ supernatant will result in an increase in FceRI expression. CD49d- neutrophils and DCs were cultured together in different concentrations of CD49d+ supernatant. After co-culturing for 48 hours, the cells were stained, and the expression of FceRI was measured using flow cytometry by determining the mean fluorescence intensity (MFI) and change in percent positivity. The expression of FceRI on DCs demonstrated a direct relationship with increasing concentration of CD49d+ supernatant. Compared with the negative control, DCs co-cultured in 1x CD49d+ supernatant (positive control) showed a 3.96% increase in number of cells expressing FceRI and a 28% increase in MFI. The DCs co-cultured in 2x CD49d+ supernatant had 34.6% increase in the number of cells expressing FceRI and a 46.5% increase in MFI. On the other hand, DCs co-cultured in 2x CD49d- supernatant showed no significant expression of FceRI. This study suggests that the soluble factor might be a target of interest to prevent virally-induced asthmatic disease. Future studies will focus on identifying the soluble protein factor.
Charles Zhang  
**Mentor:** David Dean PhD  
**Poster:** 24  
**Project Title:** Bone Extracellular Matrix (ECM) Deposition on Thin Film and 3D Printed Poly(propylene fumarate) Tissue Engineering Scaffolds  
**Abstract:** The standard of care treatment for the reconstruction of segmental bone defects is the transfer (i.e., grafting) of autologous tissue which is associated with donor site morbidity, infection, in some cases insufficient donor tissue, and high cost. We have previously produced bone-like extracellular matrix (ECM) from bone marrow derived human mesenchymal stem cells (BM-hMSCs) differentiated along the bone lineage after attachment to resorbable polymer Poly(propylene fumarate) (PPF) thin films and/or 3D printed scaffolds. This project aims to characterize that ECM. The 3D printed, porous scaffolds used in this study were pre-soaked in basal media + RoosterBio (Frederick, MD) GTX to provide a protein coating for BM-hMSC attachment. The seeding density was 750 cells per mm. Scaffolds were initially cultured in media with proliferation growth factors. After 3 days, different growth factors were added to promote osteogenic differentiation. Biochemical assays (PrestoBlue®, Alkaline Phosphatase, and Alizarin Red S) were performed at each time point (i.e., days 1, 3, 7, 14, and 21) to confirm that the mineralized coating was consistent with bone ECM. Additionally, micro-CT and SEM imaging was performed to visualize the ECM and to confirm that the samples were fully coated. Lastly, to further characterize the ECM, bulk mechanical compression tests were performed. Initially we found poor BM-hMSC attachment. Therefore, we conducted a cell attachment study which showed that pre-soaking the scaffolds in 100% FBS, compared to our earlier pre-soak of basal media + GTX, resulted in a 30% increase in seeding efficiency. We are repeating our original experiment using a 100% FBS pre-soak group to validate the observed improvement of cell attachment. Assays such as nano-indentation, immunohistochemistry, histology, and qPCR are expected to additionally confirm that the ECM produced by differentiated BM-hMSCs on these porous, 3D printed PPF scaffolds are expressing key bone-ECM markers.