



# SCHOLARLY PATHWAYS

CLASS OF 2020  
SCHOLARSHIP FORUM





## Director of Scholarly Activities: David Brousseau, MD, MS

*Director of Scholarly Activities Pat Lye, MD retired on May 15, 2019*

### Scholarly Pathway Directors

Bioethics	Cynthiane Morgenweck, MD, MA Arthur Derse, MD, JD
Clinical & Translational Research	David Brousseau, MD, MS Joseph Carroll, PhD
Clinician Educator	Joseph Budovec, MD
Global Health	Kirsten Beyer, PhD, MPH Megan Schultz, MD Stephen Hargarten, MD, MPH
Health Systems Management & Policy	John Meurer, MD, MBA William Hueston, MD
Molecular & Cellular Research	Jennifer Strande, MD, PhD
Quality Improvement & Patient Safety	Catherine Ferguson, MD
Urban & Community Health	Linda Meurer, MD, MPH Rebecca Bernstein, MD, MS

### Scholarly Pathway Coordinators

Meaghan Hayes, MEd

Jen Kraus

Sarah Leineweber

**Scholarly Pathways** are a required component of the M1 and M2 year of the Discovery Curriculum. Students select an area of concentration through which they enrich and individualize their medical training, while exploring an area of interest. Students can apply to participate during M3 year, of which 146 Class of 2020 students were accepted to participate.

Each Pathway course features a structured curriculum with monthly learning sessions (core), and an experiential component (noncore) that follows an Individual Learning Plan (ILP) guided by a faculty advisor.

Students must complete a faculty-mentored Scholarly Project which meets *Glassick Criteria for Scholarship* by the end of M3 year regardless of M3 Pathway participation. Current M3s and their Scholarly Projects are featured here.

CLASS OF 2020

# SCHOLARLY PATHWAYS SCHOLARSHIP FORUM

THURSDAY, JUNE 27 2019

1:00 PM

## WELCOME

KERRIGAN AUDITORIUM

Devashish Joshi Junior Medical Student, Emcee

### Opening Remarks

Stephen Hargarten, MD, MPH

1:15 PM

## PODIUM PRESENTATIONS

KERRIGAN AUDITORIUM

**Sarah Brink**

**Bioethics Pathway**

*Bioethics of intraoperative decision-making: A clinical case*

**Crystal Graff**

**Clinician Educator Pathway**

*An analysis of differing perspectives whereby medical students tailor resources to advance learning*

**Janessa Snippen**

**Quality Improvement & Patient Safety Pathway**

*Exercise as a vital sign for pediatric cardiology patients*

**Kelly Staricha**

**Molecular & Cellular Research Pathway**

*High glucose conditioning induces overactive astrocytic glucose metabolism*

**Trent Taylor**

**Health Systems Management & Policy Pathway**

*Expanding psychiatric treatment in primary care settings: The child psychiatric consultation program*

**Sidhant Varma**

**Clinical & Translational Research Pathway**

*Localizing neural correlates of speech articulation speed in chronic stroke patients*

**Christopher Wagner**

**Global Health Pathway**

*The Rohingya: Milwaukee's newest neighbors*

**Andrew Zolot**

**Urban & Community Health Pathway**

*Barriers to follow-up care in an underserved community based tele-ophthalmology screening program*

Student Moderators: Sivani Aluru, Michelle Botts, Peter "AJ" Capelli, Lyall Glait

2:45 PM

## POSTER PRESENTATIONS

ALUMNI CENTER

Refreshments served

4:30 PM

## ADJOURN

### BIOETHICS



**Cynthiane Morgenweck, MD, MA**  
**Arthur Derse, MD, JD**

Enables students to integrate knowledge and tools of bioethics as an essential part of the physician career.

### CLINICAL & TRANSLATIONAL RESEARCH



**David Brousseau, MD, MS**  
**Joseph Carroll, PhD**

Offers instruction of essential research skills in the area of clinical and bench-to-bedside research.

### CLINICIAN EDUCATOR



**Joseph Budovec, MD**

Provides students with the core principles and knowledge to be academic and educational leaders.

### GLOBAL HEALTH



**Kirsten Beyer, PhD, MPH**  
**Megan Schultz, MD**  
**Stephen Hargarten, MD, MPH**

Designed for students seeking to understand the causes of, and finding solutions to, the challenges and disparities in the health status of worldwide populations.

### M3 SCHOLARSHIP FORUM



The M3 Scholarship Forum celebrates the Scholarly Projects completed by each member of the graduating Class of 2020. Projects not listed as POSTER or PODIUM were presented previously. "H" posters are special featured projects.

### HEALTH SYSTEMS MANAGEMENT & POLICY



**John Meurer, MD, MBA**  
**William Hueston, MD**

Enables students to engage in the changes shaping our health care system.

### MOLECULAR & CELLULAR RESEARCH



**Jennifer Strande, MD, PhD**

Students acquire core research skills in the area of basic sciences to encourage a career as a Physician Scientist.

### QUALITY IMPROVEMENT & PATIENT SAFETY



**Catherine Ferguson, MD**

Provides students with the core principles and skills necessary to understand and analyze the systems-based aspects of patient care and safety.

### URBAN & COMMUNITY HEALTH



**Linda Meurer, MD, MPH**  
**Rebecca Bernstein, MD, MS**

Prepares students to effectively care for patients in urban communities, promote community health and reduce health disparities.

***Improving the Transition Process for Hydrocephalus Patients -- from pediatric to adult providers*****Authors:** Acosta M, Kaufman B**Project Mentor:** Bruce Kaufman, MD

**BACKGROUND:** Pediatric neurosurgery has been treating hydrocephalus in children for decades in pediatric-focused facilities. Transitioning patients to adult-focused facilities has been required for multiple reasons. However, this process has failed to address several issues that can ultimately lead to uncoordinated care resulting in tragic outcomes. Therein lies the need for the process to be improved to ensure successful transition.

**METHODS:** A literature search was performed to define transition plans that have been employed in hydrocephalus/neurosurgery, but no consistent or generally accepted plans were found. Therefore, a template from "GotTransition.org" was used for developing our own process. The elements of the process were identified and outlined. Scheduled meetings were made with potential persons responsible for those elements to help revise them. To measure the success of this project, a survey was created to assess providers' knowledge of the transition process at the Children's Hospital of Wisconsin (CHW) before and after the project.

**RESULTS:** No defined transition process was found to exist in the CHW/Neurosurgery division. The Children's Hospital administration approach to transitioning patients has undergone continual evolution that can affect the proposed process. Some elements require parallel but similar pathways -- such as with guardianship. Different components of the process may be controlled by groups or individuals outside of Pediatric Neurosurgery, complicating the implementation of the new process. The post-process development survey and how it can be used to amend the process will be discussed.

**CONCLUSIONS:** The lack of a formal transition process for hydrocephalus patients has presented multiple problems and requires agreement by those inside and outside of neurosurgery, creating further barriers to implementation.

***Needs assessment for creating a patient-centered, community-engaged health program for homeless pregnant*****Authors:** Ake T, Diehr S, Ruffalo L, Farias E, Fitzgerald A, Good SD, Howard LB, Kostelyna SP, Meurer LN**Project Mentor:** Sabina Diehr, MD

**Purpose:** Women who experience homelessness during pregnancy have poorer birth outcomes than the general population. This exploratory research describes the needs assessment of homeless women currently living at a shelter in Milwaukee, Wisconsin, to identify unmet needs related to maternal and infant perinatal health as the first step in designing a mutually beneficial patient-centered service-learning program for medical students to address these needs.

**Methods:** Two 1-hour focus groups were held at a shelter for women who are homeless and/or victims of domestic violence. A total of 13 women participated in each session; four medical students and a physician served as facilitators and scribes at each session. The facilitators alternated asking predetermined open- and close-ended questions, followed by discussion among participants. Questions elicited experiences during pregnancy, what went well, what women living in the shelter struggled with, and what support they wished for but did not have. Scribes captured the conversation through hand-written notes and used content analysis in order of frequency.

**Results:** Thirteen themes were identified. The 5 most frequently identified themes were a need for pregnancy education, access/transportation, baby care, advocacy, and material necessities. Participating shelter residents and the medical students expressed interest in working with one another and forming a long-term partnership with the shelter.

**Conclusions:** Results of this needs assessment will inform the creation of a new shelter-based medical education program that will meet homeless women's needs while preparing medical students for patient-centered, community-responsive care.

***Clinical Decision Making Regarding HSV in Febrile Neonates*****Authors:** Hadjiev J, Swartz S, Chou E, Yan K, Kolinski J**Project Mentor:** Jennifer Hadjiev, MD

When febrile neonates present to the hospital, the goal is timely and accurate diagnosis while keeping invasive testing and unnecessary treatment to a minimum. Herpes simplex virus is often a challenging diagnosis to make due to its subtle presentation. Although HSV PCR testing is widely available, guidelines for standardization of testing and treatment are lacking.

This study aimed to gain insight into the decision-making process of local physicians regarding testing for and empirically treating HSV in febrile neonates and to compare physicians' perceived versus actual clinical practice.

Thirty survey responses were gathered from pediatric hospitalists and ED physicians. The survey consisted of 28 historical, examination, or laboratory/imaging findings that may prompt physicians to test for HSV and/or start empiric therapy in febrile neonates. Results were compared to a retrospective review of 536 neonates. Inclusion criteria were documented/reported fever of  $\geq 38$  degrees C and lumbar puncture with a minimum of CBC and culture.

Significant positive associations in regards to HSV testing/empiric therapy found in both the survey results and chart review were seizure, history of maternal vaginal lesion, postnatal HSV contact, vesicular skin lesions on exam, and focal CSF abnormality. Significant positive associations that were found on chart review but not in physician responses include bulging fontanelle as well as season of hospitalization and whether enteroviral PCR was sent.

There seems to be a high concordance with the perceived decision-making process of local physicians compared to actual practice regarding HSV management in febrile neonates. However, clear clinical practice guidelines are lacking yet necessary in order to prevent the increased costs and risks to patient health associated with both inappropriate testing/treatment and increased length of stay.

***Role of PKG in the Regulation of Mitochondrial Morphology in Fetal Pulmonary Artery Endothelial Cells*****Authors:** Sivani Aluru, BS, Ru-Jeng Teng, MD, Ujala Rana, PhD, Sara Zemanovic, BS, and Girija G Konduri, MD.**Project Mentor:** Girija G Konduri, MD

Persistent Pulmonary Hypertension of the Newborn (PPHN) occurs when pulmonary vascular resistance of the neonate's lungs fails to decrease at birth, causing multi-system organ failure. Based on our preliminary studies, we believe Protein Kinase G (PKG) regulates changes in mitochondrial shape, contributing to cellular dysfunction. Healthy cells balance mitochondrial fission (splitting apart) and fusion (merging together). We hypothesize that downregulation of PKG in PPHN pulmonary artery endothelial cells (PAEC) contributes to altered mitochondrial morphology with increased fission and decreased fusion. The objectives are to determine whether PKG regulates the expression of proteins that mediate mitochondrial fission (MFN1, 2) or mitochondrial fusion (pDrp1), and if pharmacological regulation of this pathway can lead to potential therapeutic development.

Fetal lamb PAEC were harvested from normotensive and hypertensive lambs with PPHN induced by prenatal ductus arteriosus constriction from 128-136d gestation (term=140 days). PKG activity was inhibited or enhanced by transfection with an according plasmid in the first experimental groups and treatment with pharmacological agents in the second experimental groups. Western Blots assessed PKG activity and fusion and fission protein expression. All cells were imaged using TOM20 dye and observed through confocal microscopy. The imaging demonstrated activated PKG mitochondria changing shape from nuclear-centric clumps to wide-spread filaments, resembling healthy normotensive mitochondria. Based on our imaging and blotting, we can conclude that PKG affects the control of mitochondrial morphology. We plan to further investigate the effects of pharmacological treatments, as this has direct therapeutic implications for PPHN patients and may lead to future new treatment options.

## Amos, Angela

### ***Improving Abnormal Pap Follow-up for Underserved Women in Milwaukee***

**Authors:** Amos A, Broekhuizen F, Navarrete E

**Project Mentor:** Fredrik Broekhuizen

**Community Partner:** Progressive Community Health Center - OB/GYN Department

The purpose of our project was to improve patient follow-up rates following abnormal Pap test results within the Progressive Community Health Centers. Many barriers prevent patient follow-up within the community health center environment. Our goal was to monitor these high-risk patients and try to ensure that they received timely follow-up within the clinic after receiving abnormal Pap test results. In order to do this, we kept an Excel spreadsheet of all of the abnormal test results Progressive Community Health Centers received from the ACL Laboratories testing center. After logging patients with abnormal results into the excel spreadsheet, we then attempted to call patients via telephone or certified mail in order to schedule the appropriate follow-up appointment. Between January 2015 and September 2017, 277 women receiving care with Progressive Community Health Centers received abnormal Pap testing results. Of these 277 women, 131 women (47.3%) were in need of immediate follow-up. Of the 131 women in need of immediate follow-up, 95 (72.5%) went to their scheduled follow-up appointment. Further work is needed to increase this rate to Progressive Community Health Centers' goal of at least a 90% follow-up rate. This further improvement may be achieved through further investigation into barriers to care, better recording of up-to-date patient contact information, and patient education to improve understanding of the importance of timely follow-up following an abnormal Pap testing result.

## Anderson, Eric

## Poster 3

## Quality Improvement and Patient Safety

### ***Novel Surgical Approaches to Neo-Umbilicoplasty in the Setting of Bladder Exstrophy***

**Authors:** Anderson E, Goetz J, Frazier J, Sack B, Groth T, Canning D, Shukla A, Weiss D, Mitchel M, Borer J, Kryger J, Roth E.

**Project Mentor:** Elizabeth Roth, MD

#### BACKGROUND

Achieving a long-term aesthetically pleasing neo-umbilicus (NU) remains a challenge in the bladder exstrophy (BE) patient population as long-term maintenance of pleasing characteristics has yet to be consistently demonstrated. We present three novel and easily reproducible NU techniques for BE along with short-term surgical outcomes for each technique.

#### METHODS AND MATERIALS

Patients with BE presenting at a member institution were prospectively consented and enrolled in the Multi-Institutional Bladder Exstrophy Consortium (MIBEC). MIBEC institutions recorded surgical video during classic BE repair to include representative NU techniques. Our three most implemented techniques (Circular Free-Graft, S-Flap and Rhomboid Flap) were described. We conducted a literature search to identify current techniques described in the literature. We recorded short-term outcomes data including times utilized and revisions required (with indications) for our described techniques.

#### RESULTS

Our consortium has performed thirty-two Free-Graft NU, seven S-Flap NU, eleven Rhomboid flap NU and three NU with a different technique. Two Free-Grafts required revision due to dysmorphic neo-umbilici. No other technique required revision. In all cases, NU creation was successful, no procedures were aborted and there were no reported immediate postoperative complications such as hematoma, seroma, infection or necrosis of the NU.

#### CONCLUSIONS:

These three novel NU techniques are simple, minimally invasive techniques which produce minimal amounts of scarring and, based on short-term outcomes data, reproducibly produce aesthetically pleasing NU.

***Validation of Delsys Trigno sensors for use in biomechanical running models*****Authors:** Andrews C, Fritz J, Cross J.**Project Mentor:** Janelle Cross, PhD

The gold standard for biomechanical data collection is high speed 3D motion capture; however, this system has several limitations—cost, fixed laboratory setup, and limited acquisition volume due to increased post processing time. Inertial measuring units (IMUs) overcome these limitations. This study aims to validate the use of IMU sensors in collecting biomechanical running data through direct comparison of Delsys Trigno IMUs to 3D motion analysis using Statistical Parametric Mapping (SPM). This study includes data from thirty-four subjects. The motion capture and IMU data was collected during treadmill running. Fifteen reflective markers and eight Delsys Trigno IMU sensors were placed on the runner's lower limbs, pelvis, and back. A twelve camera Vicon MX system was used to collect and process motion analysis data. IMUs were placed according to and processed with the Delsys EMMA software. Each subject was asked to run at 70-80% of their maximum heart rate on a treadmill while at least five strides, defined as initial contact to initial contact, were recorded during each of three trials. Due to the lack of an automated synchronization between the systems, each subject was asked to perform a split jump off the treadmill belt (hip abduction) before each trial to provide a manual synchronization point between the IMU and the motion systems. Statistical analysis was conducted using SPM, a conceptually identical statistical test to a univariate t-test, that corrects the threshold value by considering set size and smoothness and corrects for regional bias by considering the entire data set. Each runner's hip, knee, and ankle angles throughout their strides were aggregated from all three trials. Over the entire data set of runners, 0.4%, 2.2%, 16.0%, and 69.7% were similar over 76-100%, 51-75%, 26-50%, and 0-25% of the gait cycle, respectively. 11.7% were unable to be compared due to gimbal lock. This study concluded that IMU system used is not a valid method for measuring biomechanical running data.

***Impact of body mass index on pelvic inflammatory disease.*****Authors:** Ashrafian S, Nugent M, Simpson P, Uyar D.**Project Mentor:** Denise Uyar, MD**OBJECTIVE:**

To compare pelvic inflammatory disease (PID) between women with body mass index (BMI)>30 and <30 and evaluate how obesity affects infection management. We hypothesize that obese PID patients have increased morbidity.

**METHODS:**

Retrospective study of patients ages 18-40 admitted to Froedtert Hospital for PID treatment between January 2010 and July 2017. Patients were stratified as obese versus non-obese, defined by BMI>30 vs. BMI <30. Data reviewed included diagnosis, age, past medical history, length of stay, readmissions, antibiotic use, and procedural interventions. N (%) was used to describe categorical variables and median (range) was used to describe continuous variables.

**RESULTS**

Seventy-two patients met inclusion criteria. Thirty-eight patients had BMI>30 and 34 patients had BMI<30. Women with BMI>30 had a higher incidence of TOA (66% v. 38%,  $p=0.033$ ), were older with median age of 31(18-40) versus 24(18-39)  $p=0.009$ , more likely to be diabetic (24% v. 3%,  $p=0.015$ ), had longer hospital stays 5(2-24) v. 3(2-10) days ( $p=0.002$ ), and more procedures performed (50% v. 15%,  $p=0.002$ ). BMI>30 patients also had more antibiotics used during admission 6.5 (3-13) v. 5(2-10) ( $p=0.001$ ) and greater antibiotic duration 35(8-83) v. 32(7-54) days ( $p=0.047$ ). However, BMI>30 patients had less readmissions (24% v. 41%),  $p=0.134$ , though this was not statistically significant.

**CONCLUSIONS:**

Among women admitted for PID treatment, obesity was associated with greater morbidity demonstrated by greater incidence of TOAs, longer hospital stays, more antibiotic usage, and more invasive interventions. Elevated BMI is a risk factor to consider when treating women with PID, as obese patients are more likely to have more severe PID and more rapid TOA progression. Early recognition may allow for expedited interventions, morbidity reduction, and possibly cost reduction.



***Caregiver perceptions, observations, and documentation of pediatric hospital discharge education*****Authors:** Baker A, Millen H, Player B, Gage S, Porada K.**Project Mentor:** Brittany Player, DO, MS

Discharge education (DE) is a key component of safe transition from inpatient to outpatient care in the pediatric population. Project IMPACT (Improving Pediatric Patient-Centered Care Transitions) is a multi-site quality improvement project developed to improve care transitions for pediatric patients using a transition bundle. One bundle element focuses on thorough DE and the use of teach back (TB) to confirm caregiver understanding of discharge instructions. The objectives of this study were: (1.) To determine and compare the accuracy of TB documentation and caregiver perception of occurrence with observed performance and (2.) To assess caregiver attitudes about the use of TB for DE and to compare other components of nursing communication during the session along with caregiver perceptions. Observation of DE occurred on the pediatric hospital medicine service at Children's Hospital of Wisconsin using a hospital-approved observation tool to assess use of TB and communication components. Caregivers completed a survey to ascertain perceptions of the DE received. Retrospective chart reviews were done to determine if TB use was documented by the discharging nurse.

Of 70 discharges observed, TB occurred 61% of the time. The use of TB was associated with increased perception of effective DE by caregivers and caregiver perception of TB was a more reliable predictor of occurrence than nursing documentation. Caregivers that perceived that TB had been done found it helpful. Further work is needed to identify barriers to nursing staff performing TB during DE as well as accurate documentation.

***Inappropriate antibiotic prescribing driven by provider burnout?*****Authors:** Baker A, Blommel G, Wainaina J, Remy C.**Project Mentor:** Gregory Blommel, MD

Background: Inappropriate antibiotic prescribing harms patients and communities by contributing to antibiotic resistance infections, unnecessary costs, and adverse drug side effects. This is compounded by provider burnout, affecting providers at rates >50%. Health care providers play an integral role in the healthcare system; the effects of burnout have far reaching consequences.

Purpose of the Project: 1) To examine the rates of inappropriate antibiotic treatment for acute bronchitis at Froedtert & Medical College of Wisconsin (FMCW) clinics before and after several interventions and 2) to determine the rates of provider burnout at FMCW clinics.

Methods: A four question survey was administered to providers to assess their level of burnout. Statements were adopted from the Maslach Burnout Inventory. Responses were calculated on a five point scale and summed scores were organized to correlate with categories of "mild burnout," "moderate burnout", and "severe burnout."

Results: Most providers responded to the survey such as to place them in the category of moderate burnout (75%). Mild burnout (12%), severe burnout (6%) and no burnout (4%) followed in succession. Providers responded more positively to patient-centric statements, with negative responses towards questions that were formatted to gauge workplace stressors.

Conclusions and Implications: Provider burnout is a real issue in the healthcare world with consequences that affect patient care, best practices and quality medicine. Although nearly all providers experience some level of burnout, the majority still find meaning in their career and enjoy spending time with patients.

***Long term outcomes in conservative management of giant omphalocele with topical povidone-iodine*****Authors:** Joseph Bartoletti, BS; Jose H. Salazar, MD; Melissa Lingongo, BS, CCRC; and Amy J. Wagner, MD**Project Mentor:** Amy J. Wagner, MD

**INTRODUCTION:** Omphalocele is classified as small or giant omphalocele. Because of inadequate abdominal domain, the fascial defect in giant omphalocele is not amenable to primary closure. A variety of delayed closure techniques exist with the primary goal of a gradual reduction of abdominal contents to prevent complications associated with increased intraabdominal pressure. Given this lack of consensus, a retrospective chart review of patients who underwent conservative management of giant omphalocele with desiccation using topical povidone-iodine followed by staged surgical closure was performed to better delineate their long-term outcomes, including quality of life. We hypothesized that this technique demonstrates favorable long term outcomes including low complication rates and high quality of life.

**METHODS:** This study is a retrospective chart review. All subjects born with the diagnosis of omphalocele and managed at a tertiary referral center were reviewed. Patients were classified as having a small or giant omphalocele and an isolated omphalocele or omphalocele with other anomalies. Giant omphalocele was defined as the diameter of the defect is greater than 5cm or the sac containing the liver.

**RESULTS:** Of 60 total patients, 28 were excluded as they had cloacal extrophy, ruptured omphalocele sac, management of omphalocele sac with silo and sequential reduction, deceased before repair, or lack of long term data due to age and incomplete repair. 15 patients were diagnosed with giant omphalocele and managed with conservative management with topical povidone-iodine prior to delayed closure of the defect.

**CONCLUSION:** Through descriptive statistics and cohort characterization, this technique was observed to have favorable long term outcomes including low complication rates and high quality of life. Larger prospective studies comparing long term outcomes of delayed and early closure are needed to determine the optimal method of management for patients with omphalocele.

***Vacant lot greening and crime in Milwaukee*****Authors:** Beam D, Olson J, Beyer K**Project Mentor:** Kirsten Beyer, PhD, MPH, MS**Community Partner:** Groundwork Milwaukee

We performed a difference-in-differences analysis of the effect of community greening on nearby crime using a network of formerly vacant lots that have been transformed into community gardens under the management of Groundwork Milwaukee. Following random matching of greened lots with control vacant lots in a 1:3 ratio based on city neighborhood, crime rate change was compared using multiple spatial buffers over various time periods. Greening was negatively associated with theft crime within 100 m ( $P < 0.005$ ) and consistent, but nonsignificant, reductions in violent crime within 250 m using the Independent t Test. There were substantial differences in greening effect over time and space dependent on crime type. Community engaged greening efforts may produce greater impact over time on reducing certain crime outcomes.

***Evaluating the Learning Curve of the Anterior Approach to a Total Hip Arthroplasty with a Co-Surgeon*****Authors:** J. Schwab, MD, J. Bauwens, MD, B. Becker, N. Redlich**Project Mentor:** Gregory Schmeling, MD

**Background:** The direct anterior approach is a viable alternative to the gold standard posterior approach of a total hip arthroplasty due to this approach's well-delineated intermuscular and internervous plane. Through analysis of current literature, the proposed learning curves have ranged between 25-100 cases before statistically significant reduction in complications. We hypothesized that the use of a co-surgeon in the learning curve would lead to earlier proficiency with an associated low complication rate during the first 50 cases.

**Methods:** Data from 299 cases was obtained with Group A corresponding to the first 50 cases with a co-surgeon and Group B consisting of the remaining 249 cases by a sole surgeon. 19 post-operative complications were measured as defined by Sink et al, as well as other surgery specific data.

**Results:** A strong linear decreasing trend over time was found for length of stay, surgical time, blood loss, post-operative complications and # of complications between Group A and B. Group A had a 28% complication rate compared to Group B of 10.4%. The most significant complication was neural deficits with 12% in Group A and 0.4% in Group B.

**Conclusion:** The addition of co-surgeon did not result in an earlier proficiency in the learning curve in the anterior approach. The number of complications during the learning curve was more than doubled compared to Group B. A future direction would be to evaluate the impact of the learning curve by operating with an experienced co-surgeon.

***Role of Race and Racial Segregation in Liver Cancer Survival Disparities*****Authors:** Bermanian A, Saeian K, Cassidy LD, Fraser R, Laud PW, Beyer KMM.**Project Mentor:** Kirsten M. Beyer, PhD, MPH, MS

**Introduction:** Liver cancer incidence and mortality has significant racial disparities in the United States. Black/African-Americans have 1.4 times the liver cancer incidence relative to non-Hispanic Whites, while Hispanics, Asians and Pacific Islanders (APIs), and American Indian/Alaskan Natives (AI/ANs) have nearly two times the incidence. Liver cancer survival is poor with a five-year survival rate of 18%, but differences in survival across race remain understudied. This study investigated racial differences in liver cancer survival and how these differences are affected by social and environmental variables.

**Methods:** A retrospective analysis of 733 liver cancer cases was conducted. Patients were classified as either White (i.e. non-Hispanic White), Black/African-American, or Other (APIs, AI/ANs, or Hispanics of any race). These cases were geocoded to their home census tracts and linked to racial segregation, socioeconomic status, and rurality of the tract. Cases were also linked to their history of chronic liver disease, cancer stage at diagnosis, and treatment history. Survival was estimated using the Kaplan-Meier method and differences across race were tested using the log-rank test. Multivariate survival analysis was conducted using a Cox proportional hazards regression.

**Results:** Survival was found to be significantly different across races ( $p = 0.041$ ). In the multivariate analysis, the proportional hazards were stratified by stage and treatment. Other race patients were found to have significantly better survival relative to White patients. Patients who lived in neighborhoods with higher concentrations of Blacks/African-Americans were found to have significantly higher risk of mortality. Neighborhood socioeconomic status and rurality were not found to be significantly associated with liver cancer survival.

***Role of anorectal manometry in children with defecation disorders*****Authors:** Kapavarapu P, Kovacic K, Sood M**Project Mentor:** Manu Sood, MD

**Background** The most common indication for anorectal manometry (ARM) in children is the evaluation of rectoanal inhibitory response (RAIR) (absent in Hirschsprung disease (HD) and anal achalasia). ARM is helpful in assessing defecation problems post-operatively in patients with HD and anorectal malformations and for studying defecation dynamics.

**Methods** We retrospectively reviewed charts of 32 children (18 females) referred for ARM studies for evaluation of chronic constipation (50%), constipation and fecal incontinence (34%), defecation problems after HD (9%). 1 patient had rectal prolapse and 1 non-retentive fecal incontinence. Studies were performed using a Medical Measurement Systems (Netherlands) solid state pediatric ARM catheter. Studies were done in left lateral position after minimum 5 min rest to acclimatize after catheter insertion. Subsequently, resting anal pressure, RAIR in response to rectal balloon distention, squeeze pressure (data not shown) and defecation dynamic were evaluated.

**Results** The mean (SD) age was 10.0 (4.5) years; range 2-17 years. 4 patients required sedation due to study anxiety or inability to lie still. The mean (SD) resting anal pressure was 59 (21) mmHg; significantly lower in sedated children compared to awake children: 32 (18) mmHg vs 63 (19) mmHg (p-value=0.03). 5 patients had no RAIR (n=3 were known HD patients), 2 required rectal biopsy to exclude HD and had a subsequent diagnosis of anal achalasia. 9 patients (28%) had dyssynergic defecation, 4 required pelvic floor biofeedback. Other recommendations made based on ARM evaluation were: change in laxatives (43%) and initiation of rectal saline enemas (19%).

**Conclusion** In a cohort of children evaluated in a tertiary motility center for defecation disorders, ARM resulted in altered medical management in almost half of the patients. The remaining patients required changes to their laxative therapy and the diagnoses of functional constipation made prior to ARM did not change.

***Food Doctors: Measuring One-year Retention of Nutrition Education*****Authors:** Bobel E, BS; Otto PE, BS; Brichta C MD; Quinn C, MD; Tuomela K, MD; Nelson D, PhD**Project Mentor:** David Nelson, PhD**Community Partner:** Milwaukee Academy of Sciences

**Food Doctors** is a nutrition education program that provides lessons to third grade students. The program focuses on a student population that is majority African-American and majority living below the federal poverty line. This study focused on assessing knowledge retention one year removed from the intervention. The study also includes a survey that was used to assess the students' opinions of the intervention. Literature has shown that lectures that included hands on activities had better knowledge retention and an improved attitude towards the subject matter. This was an intervention based study at Milwaukee Academy of Science and St. Marcus Lutheran School in Milwaukee, WI. N =210. Three lessons integrate healthy recipes and approach students through cultural references and the creation of a healthy snack. Past data has shown that the lessons successfully educate third graders in the short-term. In this new study, a cross-sectional one year-post assessment will be administered to the students who participated in the intervention. The assessment is the same pre and post-test administered during their third-grade year. Class performance was assessed using t-test statistical analysis. Students showed an increase in knowledge a year removed from the intervention, especially on questions that directly related to the snacks made in class. Students also claimed to enjoy past lessons and a desire for more education in their curriculum. Hands on nutrition education interventions may result in long-term knowledge gains and attitude shift. This study proves that the Food Doctors program is an example of successful education intervention and can be used to create future interventions.



***Despensa de la Paz Nutrition Education*****Authors:** Bodnar D, Nelson D.**Project Mentor:** David Nelson, PhD, MA**Community Partner:** Friedens Community Ministries - Despensa de la Paz

Despensa de la Paz is a food pantry for families in the Muskego Way neighborhood of Milwaukee. The pantry is open to all but many who attend experience poverty. Approximately 150 families are provided with food every Saturday with the opportunity to make their own food choices rather than receiving a standardized food package. Families can come to the pantry two times per month. Nutrition and health education are often lacking in a large portion of the United States as a whole and are further decreased in low income individuals. The goal of this project is to increase nutrition knowledge, which may lead to healthier food choices by providing education at multiple intervention points. Similar studies in the past have shown that after nutrition related interventions, behaviors have gone back to those before the intervention and thus a major goal is to determine the most effective methods of nutrition education intervention in the unique setting of the Despensa de la Paz and make them available permanently. Three educational interventions were introduced, educational poster, a booth manned by a medical professional and point of purchase signage. Patrons were asked to fill out a survey measuring their attitudes, behaviors, and opinions toward the interventions.

***Does a Centralized Scheduling Process Improve Referral Timeliness and Equity?*****Authors:** Bongers Q, Crotty B**Project Mentor:** Bradley Crotty, MD, MPH

**Purpose:** Timely, necessary specialist care is associated with better patient health outcomes and lower costs. This assessment looks at the effects of centralized scheduling (CS) as well as patient and referral level factors on referral completion rates. We hypothesized that centralized scheduling changes at Froedtert & MCW increased access to specialty care, as evidenced by higher referral completion rates.

**Methods:** We analyzed Froedtert data for specialty referrals to cardiology, nephrology, gastroenterology, and neurology from six months before to six months after implementation of a centralized scheduling system. We considered a referral complete if an appointment occurred within 3 months following an order for service.

**Results:** Gastroenterology was the only specialty where CS implementation was associated with a significant increase in odds of referral completion, driving an overall significant increase in referral completion rate from CS. Other specialties saw either no significant change (neurology, nephrology) or a decrease (cardiology). Within our specialty-specific models, CS was only associated with a significant increase in odds of a completed referral in gastroenterology.

**Conclusions:** Our hypothesis that CS changes would be associated with higher referral completion rates saw mixed results. CS was only associated with significant differences in rates for gastroenterology (positive) and cardiology (negative). Further analysis of specialty scheduling practices, pre- and post-CS, and patient populations is needed to better contextualize observed differences in outcome measures. Additional analysis is also needed to identify whether other potentially confounding variables, such as socioeconomic status and health care accessibility, might better explain observed differences.

***Implementing Virtual Reality in Medical Education and Training*****Authors:** Botts M, Joshi D, Ramamurthi A, Joyce D.**Project Mentor:** David Joyce, MD

Our project aims to create immersive virtual reality modules to help healthcare professionals provide better care for our communities. By allowing medical professionals to practice in a 3D environment, medical professionals will be better equipped to provide care to patients without putting them at risk. This will also reduce the amount of medical error costs experienced in the industry today.

Studies show that 25% of surgeons who graduate from residency are not confident in performing surgeries on their own. Complication rates increase by 300% when attempting procedures for the first time. Virtual reality can pose a solution to this dilemma by providing medical professionals an environment to practice procedures on their own time - thereby increasing confidence and competence.

Additionally, many incoming medical students enter medical school unsure of the field of medicine they want to pursue. The first decision they have to make is whether they want to pursue the clinical side or the surgical side of medicine. However, the first two years of medical school are spent learning the basic sciences in the classroom, with sparse clinical exposure. Clinical rotations begin in their third year, but a decision for their career has to be made within 9 months of the rotations starting. We hope to make an impact here through the use of virtual reality (VR) by exposing students to different medical fields through a variety of VR modules.

The overall goal is to determine if exposing medical students to VR clinical and surgical modules can assist in their career decision making. Additionally, we will compare surgical performance between medical professionals who learned procedures via lecture vs virtual reality based teaching methods.

***Ketogenic Diet Mitigates the Effects of Renal Ischemia-Reperfusion Injury in Rats*****Authors:** Bowen E, Regner K, Holl K**Project Mentor:** Kevin Regner, MD

**Background:** The ketogenic diet (KD) has treated epilepsy and prevented neurodegeneration from cardiac arrest-induced cerebral ischemia. Acute kidney injury (AKI) is a common sequela of renal ischemia-reperfusion injury (IRI). AKI severity is influenced by the inflammatory response. KD increases plasma ketones which modulate this inflammatory response. We aim to determine if KD confers protection from renal IRI.

**Methods:** 3 groups of Sprague-Dawley rats were studied. Group 1 had a standard lab rodent diet (5L0D) for 4 wks. Group 2 had a KD for 2 wks and Group 3 had a KD for 4 wks. Rats underwent sham surgery or renal IRI through bilateral occlusion of the renal pedicles for 30 min. Blood and kidneys were harvested after 24 hr recovery. Renal function was assessed by serum creatinine (sCr) levels. Tubular injury (TI) was assessed by CD68 immunostaining histologic analysis. **Results:** Creatinine sCr differed significantly between the 4-wk IR/KD group (avg 1.72) and the 4-wk IR/5L0D group (avg 3.82;  $P < 0.05$ ). It did not differ significantly between the 4-wk Sham/KD control (avg 0.28) and the 4-wk Sham/5L0D control (avg 0.29;  $P > 0.05$ ).

H&E Average total damage (ATD) differed significantly between the 4-wk IR/KD group (34.22%) and the 4-wk Sham/KD control (21.46%;  $P < 0.05$ ). It did not differ significantly between the 4-wk IR/KD group (34.22%) and the 4-wk IR/5L0D group (41.32%;  $P > 0.05$ ).

CD68 ATD differed significantly between the 4-wk IR/KD group (2.43%) and the 4-wk Sham/KD control (0.98%;  $P < 0.05$ ). It did not differ significantly between the 4-wk IR/KD group (2.43%) and the 4-wk IR/5L0D group (4.27%;  $P > 0.05$ ).

**Conclusion:** Results for sCr levels suggest that a 4-wk KD is correlated with significantly lower sCr after IRI, and therefore more resistance to AKI, than a 4-wk standard rodent diet. H&E and CD68 immunostaining did not show significant differences between diets, but extrapolation of this data may be limited due to manual analysis of stained

***Respiratory Events, Patient's STOP-Bang Scores and Obstructive Sleep Apnea Comorbidities*****Authors:** Lauer K, Bowman C**Project Mentor:** Kathryn Lauer, MD**INTRODUCTION**

The STOP-Bang questionnaire is a simple set of questions that effectively screens patients for Obstructive Sleep Apnea (OSA). OSA oftentimes remains undiagnosed, and these patients are also at an increased risk for postoperative respiratory depression which leads to numerous adverse outcomes. As a result, OSA screening establishes a foundation for preoperative risk stratification and targeted postoperative monitoring.

**HYPOTHESIS**

Patients with continuous monitoring should be less likely to have adverse post-surgical events, i.e. mortality, ICU admission, increased length of stay or discharge to a Skilled Nursing Facility (SNF).

**SPECIFIC AIMS**

To examine the relationship between STOP-Bang scores and patient outcomes in the presence as well as the absence of continuous monitoring using 292 inpatient observations.

**STUDY METHODS:**

A retrospective cohort approach was conducted for this study. The data was derived from a respiratory safety report concerning patients who had a Rapid Response Team intervention. Analysis looked specifically at the relationship between STOP-Bang scores and overall outcome.

**RESULTS**

Patients with continuous monitoring generally had a slightly higher prevalence of adverse outcomes when compared to the patients without continuous monitoring. They were 3.61 times more likely than those without monitoring to have been admitted to an ICU, and risk of mortality was increased as well. These relationships were slightly altered when focusing only on the groups with higher STOP-Bang scores, i.e. four or greater.

**CONCLUSIONS**

This study was a validation of the significant relationship between STOP-Bang score and adverse postoperative outcomes. However, our study also demonstrates that continuous monitoring by itself cannot entirely prevent adverse outcomes resulting from events of respiratory distress.

**THE NEXT STEPS**

Future studies should look into the effects of standardized training protocols on patient outcomes.

***Teaching Empathy: Improving Emotional Expression and Perception in Medical Education*****Authors:** Breiland M, Jotterand F.**Project Mentor:** Fabrice Jotterand, PhD, MA

Empathy is the ability to understand and share another person's perspective or emotions. It plays an important role in many human behaviors, including language and communication, imitation, perspective-taking, and learning. Empathy is an essential component of patient care and remains a cornerstone for building a meaningful patient-physician relationship. A physician must understand the perspective of the patients they will treat to better foster trust, respect and understanding. It is therefore worrying that during the course of medical training, studies have shown a decline in empathy scores in medical students and residents. There is a clear need for the improvement in empathetic learning in medical education, both in retaining a student's initial enthusiasm and in cultivating compassion and humanism within the medical field. The goal of this project is to gain a better understanding of the neuroscience behind empathetic behavior and utilize these findings to discuss future directions for research and educational improvement in empathetic learning for medical student, residents, and physicians.

***Bioethics of intraoperative decision-making: a clinical case*****Authors:** Brink SM, Morgenweck CJ**Project Mentor:** Cynthia J. Morgenweck, MD, MA

To use a clinical case to explore intraoperative decision-making considering the law, professionalism, and bioethics. While under general anesthesia, patients cannot consent for themselves. Who makes decisions for the anesthetized patient when an unanticipated intraoperative finding is encountered? Considering the patient's temporary incapacitation, we must focus on the patient's best interests while balancing the law, professionalism, and bioethics. There is no substituted judgement under Wisconsin law, meaning that absent a healthcare power of attorney, next of kin cannot make decisions for the incapacitated patient. Physicians have a legal and professional duty to protect patient confidentiality, but physicians may use their professional judgement to share information in the patient's best interests. The principles of bioethics should also guide our decision-making. Autonomy means that patients have the right to make informed decisions; surgical consents may allow the surgeon to perform non-explicit procedures deemed necessary based on intraoperative findings. Beneficence and non-maleficence, in this case, mean performing the procedure with the greatest benefit to the patient without undo harm. The surgeon must use his professional judgement to decide for the patient in the patient's best interests.

***HEART score analysis: inter-provider reliability of suspicion for acute coronary syndrome by history*****Authors:** Pappademos DC, McDonald WR, Brooks JM, Lerner EB, Hoogstra R.**Project Mentor:** Robert Hoogstra, MD

The HEART score is a diagnostic tool used to risk-stratify patients presenting to the emergency department with concerns for acute coronary syndrome (ACS). The history component is the only subjective element of the score, allowing for potential discrepancies. To our knowledge, no study has quantified the inter-observer reliability among physicians evaluating the same patient for ACS. We hypothesize that upper level Emergency Medicine (EM) residents have higher rates of inter-observer agreement with attending physicians when evaluating for ACS in the same patient. A cross-sectional observational study was performed in real time in the emergency department. EM residents evaluating a patient with a chief complaint of chest pain, chest pressure, or shortness of breath provided their assessment of the patient's history prior to presenting the patient's case to the attending physician. Their ACS suspicion was graded following the HEART score design. A weighted kappa coefficient was used to determine the inter-observer reliability of the score assessment, which showed a moderate level of agreement between residents and attendings at 0.452. From intern level to third-year residents, the weighted coefficients were 0.261, 0.457, and 0.52, respectively. This showed an increased level of agreement as training progressed with the maximum value only reaching a moderate level of agreement. Additionally, correlation analysis showed that other elements had a significant effect on the history score. Most significantly, ACS risk factors showed a statistically significant small-to-medium effect on resident and attending history scores (Pearson R .239, .222 respectively,  $p < .01$ ). Many healthcare professionals use the HEART score and it is important to mitigate discrepancies in scoring. The moderate level of agreement and variable correlations we found show that more work needs to be done in establishing clearer guidelines for history rating when utilizing the HEART score.



***Prematurity, nutrition and outcomes: ancillary study to the third pediatric international nutrition study*****Authors:** Buch K, Panchal A, Mikhailov T, Bechard L, Mehta N.**Project Mentor:** Theresa Mikhailov, MD, PhD

Preterm birth accounts for 28% of neonatal deaths globally. While studies have investigated the association between preterm birth and poor nutritional status and between poor nutritional status and outcomes in patients admitted to the pediatric intensive care unit (PICU), no studies have evaluated the direct association between preterm birth and outcomes.

Clinicians prospectively recorded data on all patients admitted to the PICU who required mechanical ventilation and who had an anticipated length of stay (LOS) longer than three days. Data included demographic and clinical factors as well as LOS in PICU and in hospital, nutritional status based on final weight at hospital discharge, number of ventilator free days (VFD) in the first 28 days after PICU admission, incidence of hospital-acquired morbidities and 60-day mortality. We compared outcomes for subjects under two years of age. Of the 1914 patients in the study, 1000 were under two, of which 269 were premature and 731 were term. Final weight was significantly lower in preterm ( $p < 0.001$ ) compared to term children adjusting for age, gender, malnutrition, and PRISM3. However, when adjusted for weight at admission, the difference between the two groups ( $p = 0.583$ ) was not significant. Hospital-acquired morbidity was higher in preterm as compared to term children ( $p = 0.042$ ), adjusting for age, gender, and PRISM3. PICU and hospital LOS, number of VFD, and mortality did not differ between the two groups when adjusted for age, gender, malnutrition, respiratory comorbidities, and PRISM3 scores.

In conclusion, preterm children admitted to PICU are smaller and have more hospital-acquired morbidity than term children.

***Identifying Factors to Optimize EMS Triage of Patients to Freestanding Emergency Departments*****Authors:** Byun A, Chinn M**Project Mentor:** Matthew Chinn, MD**Background:**

Freestanding Emergency Departments (FSEDs) have recently been a rapidly growing area in healthcare. While their presence can improve care access and waiting times, they are typically not as well-equipped as traditional Hospital-Based Emergency Departments (HBEDs), sometimes necessitating patient transfers to higher levels of service. Despite the rapid growth of FSEDs, there is still very little literature establishing concrete guidelines on triage of patients to these facilities by EMS.

**Purpose:**

This study seeks to review and identify objective markers that may be used to improve EMS triage to FSEDs

**Methods:** Patient data was retrospectively reviewed from all patients that were transported to a single FSED by ambulance during a 12-month period. A report was generated consisting of patient demographics, vital signs, and disposition. Continuous measures were summarized using mean/standard deviation and compared by t-test. Categorical measures were assessed with Chi-square or exact Chi-square tests.

**Results:** 289 patients were brought by ambulance to the FSED for the 12-month period of September 2016 - August 2017. 255 patients were discharged home directly, and 34 were transferred to a full-service hospital for admission or specialty care. There was a statistically significant difference between these two groups in age (54 years vs. 73 years;  $p = 0.001$ ), but there was no statistically significant difference in initial FSED pulse rate, pulse oximetry, systolic blood pressure, or temperature.

**Conclusions:**

The data supports that older patients are more likely to require transfer and/or admission after evaluation at an FSED. Initial vitals taken at FSED upon triage were not reliable predictors of requiring higher level care. At this point, further investigation is needed to develop objective guidelines for effective FSED triage.

***The Efficacy of a Student-Organized Workshop Series on Low Resource Medicine*****Authors:** Sanders J, Cohen A, Capelli P**Project Mentor:** Jim Sanders, MD, MPH

Despite the growing sophistication and coverage of the United States emergency medical system, the need for low resource medical (LRM) education within medical school settings is large and growing. This need is driven by a growing risk of injury in low resource settings, increased reliance on medical professionals to provide LRM care, and the many additional benefits of LRM education outside its direct scope. A growing number of institutions nationwide have recognized the increasing need for medical professionals proficient in LRM care and have responded by providing medical students with educational opportunities accordingly. Although LRM education programs were once limited largely to campuses near hubs of outdoor and wilderness recreation, recent years have seen a marked increase in urban campuses offering education in LRM topics. Although these courses provide education using different methods and with differing resources, nearly all efforts to evaluate these programs show positive effects on student confidence and competence as well as extremely high levels of student satisfaction. The purpose of this study is to evaluate if a student-organized course on treatment in low resource settings has a positive effect on student confidence and competence. This study will provide several blocks of instruction to participating students then evaluate their progress through both written examination and scenario. Ideally, student participation in this course will greatly increase both the knowledge and skills needed to provide basic medical care in low resource settings.

***Leech Therapy for Digital Replants and Revascularizations: Anticipating Transfusion Needs*****Authors:** Carpenter N, Whitlock R, Lineberry K, Slocum A, Hoben G.**Project Mentor:** Gwendolyn Hoben, MD, PhD

Hypothesis: Leech therapy is often used when there is venous congestion in a replanted or re-vascularized digit. The benefits of leech therapy are largely due to hirudin in the leech saliva, the most potent natural inhibitor of thrombin. We hypothesize that most patients treated with leeches will require blood transfusions, and those on additional blood thinners will require more blood normalized to leech-days. Methods: This case series was an IRB-approved retrospective review; we identified all patients who underwent digital replantation or revascularization with the Plastic Surgery Hand Service at our institution over the past 10 years. Inclusion criteria were successful index operation and need for leech therapy. Exclusion criteria included use of leech therapy for other surgical locations, or surgery for hand trauma without the need for leech therapy. An analysis of transfusion needs, leeching frequency, and additional anticoagulant therapy was performed. Results: 34 patients were identified as either having leech therapy or presenting with hand trauma. 18 of those patients met inclusion criteria with an average age of 41.6 years. Three patients were already anticoagulated. Post-op anticoagulation varied among aspirin, Lovenox, dalteparin, subcutaneous heparin, or a combination. The average units transfused was 3, most often around POD#3. The average length of leech therapy was 4.6 days; 9 patients (50%) required at least one blood transfusion, and three required multiple transfusions. The rate of salvage or return to function in this case series was 56%, with 44% of patients progressing to revision amputation. Summary: Leech therapy can have a significant impact on the need for blood transfusions. All patients were anti-coagulated post-operatively, and based on our cohort half of patients requiring leech therapy will need at least one transfusion. As such, this must be included as a critical component of the discussion with any patient considering replantation.

***Factors Contributing to Poor Outcomes in Ewing Sarcoma Adolescent Young Adults*****Authors:** Chan GC, Szabo A, McGinley E, Charlson JA.**Project Mentor:** John A Charlson, MD

Background: Ewing Sarcoma (ES) is the third most common bone sarcoma; however, it is the second most common in adolescent young adults (AYA). Additionally, AYA represents 47% of ES patients compared to pediatrics (31%). Despite improvements in overall survival in both pediatric (0-14y) and adolescent young adults (15-39y), there remains a discrepancy between the two groups with AYA experiencing worse outcomes.

Purpose: Elucidate factors in AYA that may lead to overall worse outcomes compared to pediatric and adult populations.

Methods: Retrospective cohort-study utilizing Truven Marketscan database from 2008-2015 to identify Ewing sarcoma patients. Pediatric and AYA were defined as 0-18 and 19-39 respectively. Chemotherapy regimens, supportive care, and adverse events were examined to find differences in care and outcomes between the two groups.

Results: A total of 199 patients met inclusion criteria with 49 and 150 patients in the 0-18 and 19-39 year old groups respectively. There were no significant characteristic differences between the two groups in terms of medications used, time between diagnosis and first treatment cycle, number of cycles, or treatment length. The 0-18 year old group had significantly more blood counts, IV anti-emetics, and clinic visits compared to the 19-39 year old group ( $p < 0.05$ ). AYA patients had significantly less hospitalizations and inpatient days relative to the pediatric patients ( $p < 0.001$ ).

Conclusion: Despite receiving less supportive cares, AYA did not have more adverse events compared to pediatric patients. Additionally AYA patients received similar high intensity therapy regimens and is unlikely to be a major contributory factor for worse AYA overall survival compared to pediatric and adult populations.

***Impact of Epic best practice advisory on C. diff diagnostic testing and management*****Authors:** Chen J, Pfeifer K**Project Mentor:** Kurt Pfeifer, MD

A Best Practice Alert (BPA) was implemented across Froedtert Health System sites with the goal of reducing the number of Clostridium difficile (C diff) diagnostic orders in situations where a diagnostic order was placed within 24 hours of a laxative. The goal of this project was to assess the effectiveness of the BPA by checking if providers are appropriately selecting indications supported by documentation to proceed with order, if there is any impact on patient safety, and if the BPA is reducing the number of C Diff tests ordered as intended. A list of BPAs triggered over a three month period was generated. For each instance of the BPA the patients chart was evaluated for what the action taken on the BPA was, if that action was clinically supported by chart documentation, and the outcome of the C diff test if ordered. A separate report of total C diff orders over a month period along with test results was generated to provide a baseline comparison. The BPA was triggered 64 times. The C diff order was still placed 53 times, with 41 times being supported by chart documentation. Overall there were 8 positive C diff test out of those orders. In a one month period there were 453 C diff orders placed with 47 positive results. The BPA was found to not have a negative impact on patient safety, but the overall impact on total C diff orders has been minimal, which suggests that providers may already be limiting C diff testing in situations that the BPA was designed to limit.

***Sequential compression device compliance in pregnant women requiring antepartum admission*****Authors:** Chen M, Palatnik A**Project Mentor:** Anna Palatnik, MD

**Introduction:** Venous thromboembolism (VTE) is one of the leading causes of maternal mortality in the Western world. Sequential compression devices (SCD) are recommended for all obstetric hospitalizations from admission until time of discharge. Past studies have shown that SCD compliance is low, with noncompliance rates ranging from 21-42%. Recently, the department of obstetrics and gynecology at the Medical College of Wisconsin implemented a quality improvement protocol where each antepartum admission order set included pre-checked order for SCDs. The purpose of this study was to evaluate whether this change has led to increased utilization of SCD among pregnant women.

**Methods:** This was a prospective observational trial and included all pregnant women with a viable pregnancy admitted to Froedtert Hospital for inpatient management of their obstetric or medical complications between May 2017 and February 2018. Demographics and clinical maternal characteristics information were collected through chart abstraction. During daily morning rounds the study investigators assessed whether the SCD was in the room and whether the SCD was in use.

**Results:** During the study period a total of 82 rounding encounters were documented on 76 eligible admissions. Seventy six of admissions had a documented order set placed for SCD with 77.6% of these orders being placed on hospital day 1 and additional 13.8% orders placed on hospital day 2. Among women who had documented order set for SCD, SCDs were observed being in the room 72.4% of admissions and were used in only 32.8% of admissions. During repeat encounters, SCD were observed in room in 62.6% of total encounters, and being used in only 18.1% of total encounters during inpatient rounds.

**Conclusion:** Although pre-checked order set for SCDs among antepartum patients increased the number of SCD orders it did not result in an increased utilization of SCDs among hospitalized pregnant women.

***Quality Adjusted Life Year (QALY) in Subjects with and without HIV-infection Enrolled in the HIV UPBEAT Cohort Study*****Authors:** Chen R, Alvarez E, Cotter A, Sabin C, Babu S, Macken A, Brady J, Kavanagh E, McCarthy G, Compston J, Mallon PWG.**Project Mentor:** Kajua Betsy Lor, PharmD

QALY, a generic measure of disease burden, is used in health economics as a measure of health outcome, capturing both quality (QoL) and quantity of life lived. With emerging focus on HIV prevention, assessing the impact of living with HIV on QALY will help inform cost-effectiveness of prevention interventions. We aimed to compare QALY between HIV-positive (HIV+) and HIV-negative (HIV-) subjects.

QoL and QALY, assessed at year-5 in HIV+ and HIV- subjects enrolled in the HIV-UPBEAT cohort, were derived from SF-36 and SF-6D, respectively, with QALY calculated by multiplying SF-6D values with the expected remaining lifespan (life-expectancy estimates 79.3 years for men and 83.5 years for women (<http://www.cso.ie>)). Between-group comparisons were assessed using Mann-Whitney/Student's T test and Chi-square test.

Of the 449 enrolled subjects, 181 (67 HIV+) completed year-5 follow-up, with 164 (90.6%) providing full data for QALY estimates. Subjects' characteristics summarized in Table 1. All HIV+ were on antiretroviral therapy (ART); 97% had undetectable HIV-RNA; median CD4+ count was 674 (513-853) cells/mm<sup>3</sup>. HIV+ had lower QoL for all sub-domains, with the largest between-group differences in General-Health and Social-Functioning. Despite no differences in predicted survival between HIV+ and HIV- (31.8 (7.9) vs 32.5 (9.5) years), HIV+ subjects had a loss of 2 QALYs compared to HIV- (24.3 (6.7) vs 26.3 (8.3)).

In our cohort, HIV+ subjects on effective ART had lower QALY than HIV- despite similar estimated survival. Thus, prevention of HIV could contribute to 2 years' improvement in QALY while avoiding additional lifetime HIV-associated treatment and medical care costs.



***Deglutitive Biomechanics Improvement after SALR-Exercise Predicts Oropharyngeal Dysphagia Alleviation*****Authors:** Cheng C, Agrawal D, Shaker R**Project Mentor:** Reza Shaker, MD

According to Dysphagia Research Society, dysphagia affects 1 in 25 adults in the US. Oropharyngeal dysphagia (OPD) represents a common type that develops following stroke, radiation therapy, and aging, etc. Agrawal et al's 2017 study investigated a swallow against laryngeal restriction (SALR) exercise technique that improves clinical outcomes (functional outcome assessment of swallowing score "FOAMS" and Rosenbek's airway penetration-aspiration scale score "PAS") and objective biomechanics measures on fluoroscopic swallow study (hyoid and larynx anterior and superior excursions, hyoid anterior "AH", hyoid superior "SH", larynx anterior "AL", larynx superior "SL"). This study further hypothesizes that improvement in the biomechanics measures on fluoroscopy swallow study predicts improvement in clinical swallowing outcomes. 29 OPD patients age  $65 \pm 10$  years underwent a 6-week SALR-based exercise, during which they performed 3 repetitions of 30 swallows against 40 mmHg pressure applied to laryngeal prominence by the exercise device daily. All underwent video-fluoroscopic evaluation of 1-ml and 3-ml 40% w/v Barium bolus swallowing before and after the exercise. Spearman correlation and simple logistic regression analysis were used to identify if any of the AH/AL/SH/SL increase after exercise correlate with/predict improvement in FOAMS/PAS. The results demonstrate that post-exercise increase in AH and AL correlates with FOAMS improvement and predicts PAS improvement. In other words, OPD patients who show improved AH or AL excursion measures have better prognosis in terms of alleviation of aspiration symptoms and recovery of oral feeding. In addition to prognostic utility, this knowledge will also devise interventions that enhance deglutitive musculatures' performance of these excursions.

***Biomechanical Effects of Capsulotomies and Repairs on Hip External Rotation Responses*****Authors:** Douros D, Smith S, Choi M, Easterday P, Birmingham P, Wang M.**Project Mentor:** Mei Wang, PhD

Hip arthroscopy is a minimally invasive procedure used to gain access to the hip joint. During arthroscopy, the hip capsule must be cut (capsulotomy) to properly visualize the joint, with two common approaches including interportal capsulotomy (IC) and T-capsulotomy (TC). There has been debate whether the capsulotomy should be completely, partially, or not repaired. Complete repair is thought to improve post-op joint stability, while patients with unrepaired capsulotomies have not experienced significant negative outcomes. Few biomechanical studies exist to evaluate this concern, with most decisions made based on surgeon preference. Our study aimed to evaluate the biomechanical effects of IC, TC, and partial or complete repair on joint stability. Cadaver hemi-pelvises were tested in a neutral position with torque applied in external rotation. Range of motion, neutral zone motion (NZ), and stiffness were measured to assess joint stability. Each specimen was tested in five conditions: intact, IC, TC, partial repair, complete repair. Results showed a statistically significant increase in mean NZ with TC (12.7) compared to intact (6.8). Partial repair of the TC and complete repair of the TC showed a non-significant decrease in mean NZ compared to intact (12.5 and 11.4 respectively). Overall, the joint stability of the specimen after complete repair was improved when compared to the IC state, but the difference was not statistically significant. These findings indicate that capsulotomy procedures decrease joint stability, and complete repair improves joint stability but does not restore stability to the intact state.

***Pain and anxiety in pediatric populations in a Milwaukee emergency department*****Authors:** Yvonne Chow. Amy L. Drendel, DO, MS.**Project Mentor:** Amy L. Drendel, DO, MS

Pain is one of the most common complaints for patients who present in the emergency department. The American Academy of Pediatrics (AAP) Committee on Pediatric Emergency Medicine recommend that proper training and education in pediatric pain assessment and management should be provided to all those involved in the child's care. Indeed, implementation of both nonpharmacologic and pharmacologic analgesia protocols has been well documented in the literature for pain and anxiety management in pediatric populations during procedural settings such as venipuncture or surgical operations. However, the exact relationship between anxiety, specifically state anxiety, and pain has not been well-delineated in pediatric populations, particularly in non-procedural settings. In addition, studies documenting the nature of the relationship between pediatric pain and parental state anxiety have turned up conflicting and unclear conclusions. A prospective study was designed to survey pediatric populations and their parents in a Milwaukee pediatric emergency department using well-researched assessments to evaluate state anxiety and pain scores. A total of 80 patients and their parents were surveyed. Data analysis will focus on assessing whether a higher child state anxiety correlates to a higher pain score, whether a higher parent state anxiety correlates to a higher child state anxiety and/or pain score, and any differences in state anxiety of child and parent prior to and after physician contact.

***Does Advanced Airway Type and Placement Affect CPR Chest Compressions In Out-Of-Hospital Cardiac Arrest?*****Authors:** Cihla J, Aufderheide T.**Project Mentor:** Tom P. Aufderheide MD, MS

**Introduction:** An endotracheal airway (ET) during out-of-hospital cardiac arrest (OHCA) may compromise CPR quality compared with a King LT™ (KLT).

**Methods:** Pragmatic Airway Resuscitation Trial (PART) randomized patients (> 18 years) with OHCA to ET versus KLT. We analyzed chest compression (CC) rate, depth, and fraction throughout resuscitation in 5 groups: 1 = bag-valve-mask only, 2 = KLT first-pass success (FPS), 3 = ET FPS, 4 = KLT multiple attempts (MAs), and 5 = ET MAs. In a subset, one minute prior through one minute following placement were analyzed in: A = KLT FPS, and B = ET FPS.

**Results:** 331 patients (median age=60 [18-100]; 209 [63.1%] male) were analyzed throughout resuscitation. In groups 1-5, CC rate was  $114 \pm 11.4$ ,  $117 \pm 7.7$ ,  $117 \pm 6.8$ ,  $121 \pm 9.1$ , and  $117 \pm 7.3$  CCs/minute, p=NS; CC depth was  $5.7 \pm 1.2$ ,  $5.8 \pm 0.8$ ,  $5.7 \pm 0.9$ ,  $5.3 \pm 0.9$ , and  $5.7 \pm 0.9$  centimeters, p=NS; fraction was  $83 \pm 0.1$ ,  $86 \pm 0.1$ ,  $86 \pm 0.1$ ,  $86 \pm 0.1$ , and  $84 \pm 0.1$  %, p=NS. 20 patients were analyzed one minute prior to one minute after placement. In groups A and B, CC rate was  $118 \pm 9.5$  and  $121 \pm 10.8$  CCs/minute, p=NS; CC depth was  $5.6 \pm 0.9$  and  $5.7 \pm 1.0$  cm, p=NS; fraction was  $86 \pm 7.1$  and  $86 \pm 11.7$  %, p=NS.

**Conclusion:** The type of advanced airway used during OHCA was not associated with a decline in any measured CPR metric.

***Mistrust, the Obstruction of Medicine: The Breach between Medical Research and the Milwaukee Community*****Authors:** Clark A, Spellecy R, Holt M, Thomas D, Thomas C, Mathias A**Project Mentor:** Ryan Spellecy, PhD**Community Partner:** House of Grace Ministry, and Pastors United Milwaukee

Participation rates in cancer clinical trials among African Americans are unacceptably low. While the reasons for this in Milwaukee are currently unknown, such low participation raises ethical concerns related to not only justice, but also respect for persons if refusals to participate are not informed refusals. To address this, we conducted focus groups with pastors and church members from African American churches in Milwaukee to understand and document the reasons for low participation in cancer clinical trials in the African American Community. 12 pastors were included in the study and 24 church members were interviewed. In addition, we documented the factors that participants believed would positively influence their participation in cancer clinical trials.

We found that 1) Trust is key for positive interactions with the healthcare system, including participation in clinical research. 2) There is an enduring fear that abuse, mistreatment and dishonesty still exist in healthcare and research. 3) The community recognizes the value of being included in research, and how it may improve cancer screening, diagnosis, treatment and overall health for them. Lastly, 4) Many participants were not aware of what clinical trials are. We also found that the language used in education and discussion around clinical trials is very important.

Moving forward, the conversation about clinical trials must be part of a larger, holistic focus on building a healthy community and overall health equity in Milwaukee. Focusing the conversation only on research, to the exclusion of a focus on holistic and community health, will cause more mistrust.

***The Efficacy of a Student-Organized Workshop Series on Low Resource Medicine*****Authors:** Sanders J, Cohen A, Capelli P**Project Mentor:** James Sanders, MD, MPH

Despite the growing sophistication and coverage of the United States emergency medical system, the need for low resource medical (LRM) education within medical school settings is large and growing. This need is driven by a growing risk of injury in low resource settings, increased reliance on medical professionals to provide LRM care, and the many additional benefits of LRM education outside its direct scope. A growing number of institutions nationwide have recognized the increasing need for medical professionals proficient in LRM care and have responded by providing medical students with educational opportunities accordingly. Although LRM education programs were once limited largely to campuses near hubs of outdoor and wilderness recreation, recent years have seen a marked increase in urban campuses offering education in LRM topics. Although these courses provide education using different methods and with differing resources, nearly all efforts to evaluate these programs show positive effects on student confidence and competence as well as extremely high levels of student satisfaction. The purpose of this study is to evaluate if a student-organized course on treatment in low resource settings has a significant positive effect on student confidence and competence. This study will provide several blocks of instruction to participating students then evaluate their progress through both written examination and scenario. Ideally, student participation in this course will greatly increase both the knowledge and skills needed to provide basic medical care in low resource settings.

***A Measure of Impulsivity and Firearm-related Suicide in Wisconsin*****Authors:** Collier W, Hargarten S.**Project Mentor:** Stephen Hargarten MD**Community Partner:** Wisconsin Department of Health Services**Introduction:**

Firearms were the agent responsible for 49% the suicides in Wisconsin in 2013-2014. Lack of impulse control has been implicated in multiple other comorbidities, such as substance abuse and gambling, but it has been weakly investigated in firearm suicide. Previous investigations have defined several parameters as indicators of impulsivity associated with suicide such as age, loss of an intimate relationship, school/work/legal problem, poor health diagnosis, impulsive-mental health diagnosis (ADHD/Bipolar), premeditation, previous suicide attempt, and positive toxicology at death. We hypothesize that there is a significant association between impulsivity and firearm suicide when compared with other methods of suicide.

**Methods:**

This investigation utilized the Wisconsin Violent Death Reporting System, which provided data regarding suicides in Wisconsin from 2008-2015. We conducted descriptive statistical analysis and ANOVA ( $\alpha=0.05$ ) means testing for each impulsivity measure between methods of suicide: firearm, chemical/overdose, asphyxiation. Groups were further subcategorized to identify age-related differences based upon database predeterminations: 12-24, 26-65, >65).

**Results:**

Ethnic/racial differences were detected from the analysis. African-American youth (12-24 N=322) ( $p<0.009$ ) and Caucasians >65 (N=501) ( $p<0.02$ ) were significantly more likely to complete suicide by firearm than other methods. Additionally, loss of an intimate partner ( $p<0.01$ ) and school/work/legal problems ( $p<0.04$ ) were also significantly associated with firearm suicide in the youth group.

**Conclusion:**

Our research demonstrates that future surveillance of impulsive firearm suicide may best be accomplished in the African-American youth and Caucasian >65 groups. Specific screening and intervention should be targeted towards loss of an intimate partner ( $p<0.01$ ) and school/work/legal problems.

***JMJD1C JmjC and ZFD domains are required for human MLLr Leukemia Cell Proliferation*****Authors:** Chistiansen L, DeJong J, Zhu N**Project Mentor:** Nan Zhu, PhD

JMJD1C is a member of the lysine demethylase 3 (KDM3) family that is over-expressed in mouse MLL-AF9 leukemic stem cells (LSC) and in human MLL-rearranged leukemias (MLLr). It was also shown that JMJD1C is required for AML LSC but dispensable for normal hematopoietic stem cell (HSC) self-renewal. Recently, using a CRISPR/Cas9 approach, the catalytic Jumonji domain (JmjC) and Zinc finger domain (ZFD) were identified as being required for mouse MLL-AF9 leukemogenesis. To confirm that these same domains of JMJD1C are required for human MLLr leukemias, we mutated these domains via CRISPR/Cas9 in primary patient AML cells and examined the effect on cell proliferation. Several MLLr AML patient samples were attempted with the best viral transduction efficiency found in relapsed instead of de novo AML cells. Our preliminary results demonstrate depletion of leukemia cells harboring sgRNA against ZFD and JmjC domains suggesting that these domains are required for AML cell proliferation. We will further investigate the requirement of these domains in human AML by expanding to a larger cohort of samples and by examining whether mutating these domains will prolong survival in xenotransplant model of human MLLr AML. Overall, our research will justify the potential to therapeutically target these domains in human AML.

***Prevalence and Risk Factors of Obstructive Sleep Apnea in Adults with Congenital Heart Disease*****Authors:** Drake M, Sowinski J, Reinhardt E, Saleska E, Katzmark L, Nolin K, Bartz P, Cohen S, Ginde S, Earing M**Project Mentor:** Stephen Hargarten, MD, MPH

**Introduction:** Obstructive Sleep Apnea (OSA) is a common condition that can lead to multiple cardiovascular complications. The relationship between adults with Congenital Heart Disease (ACHD) and OSA is not well characterized. We sought to determine the prevalence, risk factors, and impact of OSA in ACHD.

**Methods:** One hundred and forty-nine consecutive patients seen in the ACHD Program were screened for obstructive sleep apnea using the Berlin Questionnaire (BQ). Medical Records were reviewed and relative variables were analyzed to determine risk factors and associated outcomes.

**Results:** Mean age was 32 yrs (range 18-74). There were 77 (52%) females. Most common diagnoses were conotruncal defects (29%), left sided obstructive lesions (26%), transposition of great arteries 15%), and single ventricle S/P Fontan (9%). Overall, 47 (31%) had a positive screen for OSA. Of these, 20 had a positive sleep study. The remaining 27 have been referred but have yet to complete sleep studies. Compared to patients with a negative screen, patients with a positive screen were likely to be heavier (mean 98 vs 71 kgs,  $p<0.001$ ) and have higher BMI (31 vs 25,  $p<0.001$ ). Age, gender, diagnosis, and substance abuse were not found to be risk factors. Patients with a positive OSA screen were more likely to have diabetes ( $p<0.04$ ), hypertension ( $p<0.05$ ), depression ( $p<0.002$ ), decreased exercise capacity ( $p<0.01$ ), and were more likely to have a defibrillator ( $p<0.007$ ).

**Conclusion:** OSA is common in ACHD patients and is associated with increasing weight and BMI. ACHD patients with a positive OSA screen are at increased risk for comorbidities including diabetes, hypertension, and depression. As result, screening programs for OSA in this population should be considered, to identify earlier, treat, and prevent late complications.

***The Impact of Enteral Feeding on Vasoactive Support in Septic Shock, a Retrospective Observational Study*****Authors:** Ewy M, Aqeel M, Kozeniecki M, Patel K, Banerjee A, Heyland D, Patel J.**Project Mentor:** Jayshil Patel MD

**INTRODUCTION:** Guidelines recommend cautious enteral nutrition (EN) provision during hemodynamic instability because of the splanchnic steal phenomenon, which may worsen shock and increase the vasopressor dose. The aim of this study is to determine the change in vasopressor dose in septic shock patients who received concomitant EN. We hypothesize that EN delivery is not associated with worsening hemodynamic instability.

**METHODS:** A retrospective observational cohort study of adult patients with septic shock admitted to the ICU from January to June 2015 who received EN. We excluded patients with gastrointestinal complications. Vasopressor and EN parameters were collected at 6-hour intervals for the first 24-

hours. An increase in vasopressor dose by  $>50\%$  indicated worsening hemodynamic instability.

We analyzed the change in median NE dose using repeated measures linear regression.

**RESULTS:** Data was available for 28 patients. Mean age was 60 years ( $SD=18$ ) and 54% were females.

SOFA score was 11 ( $SD=3$ ), APACHE II 27 (IQR 22-32) and mNUTRIC was  $>5$  in 79%.

Norepinephrine (NE) was used in 100%. Additional Vasopressin was used in 14% of the cohort. EN and vasopressor overlap totaled 36-hours (IQR 27-69). Median NE dose when starting EN was 5.9mcg/min (IQR 3.8-8) and the maximum dose was 6.8mcg/min (IQR 5.2-10.7) at six-hours. Median change in dose from 0-6 hours was 0.85mcg/min (95%CI 0.68-1.06  $p=0.136$ ). Diarrhea was the most common reported complication in 11% of the cohort. No serious complications such as mesenteric ischemia or bowel necrosis occurred.

**CONCLUSION:** The average vasopressor dose did not increase by  $>50\%$  during the first 24-hours of EN. This suggests early EN delivered during septic shock is not associated with worsening hemodynamic instability and is well tolerated. Limitations include small sample size and residual confounding. Prospective data are needed to confirm our findings.

***HAPI: A community-engaged partnership providing advocacy and education to homeless pregnant women*****Authors:** Diehr S, Ake T, Farias E, Fitzgerald A, Howard L, Kostelyna S, Stagg M.**Project Mentor:** Sabina Diehr, MD**Community Partner:** Milwaukee Women's Center

Women who experience homelessness during pregnancy have poorer birth outcomes than the general population. The result of a previous needs assessment informed the design of the Health Advocacy in Pregnancy and Infancy (HAPI) program, a patient-centered service-learning program for medical students and homeless pregnant women.

**Objective:** To improve perinatal health of homeless mothers and their babies by implementing a service-learning program consisting of educational modules on perinatal health and a student partnership program.

**Methods:** Short educational modules on nutrition, mental health, infant care, breastfeeding, and contraception were taught at a Milwaukee homeless shelter. Debriefing forms were completed following each session evaluating participant satisfaction and suggestions for improvements. Mothers were also invited to participate in a 1:1 student partnership program during pregnancy and through age one of their infant(s). The partnership program was evaluated by participant retention and satisfaction, through self-reporting of maternal health and infants' birth weights, gestational age, immunization status, and attendance at well-child checks.

**Results:** Following the 26 sessions presented, 74 unique analyzable comments were provided. Of those comments, 70.3% were positive and 21.6% included requests for additional information or educational materials with several themes identified. Six women joined the student partnership program and two women remain currently engaged, have completed appropriate health questionnaires, and have delivered three healthy infants.

**Conclusion:** The HAPI program has provided well-received education on perinatal health with actionable areas for improvement in the future. The student partnership welcomed three healthy infants, however, retention in the student partnership program continues to be a challenge with unreliable communication as a significant barrier.

***HAPI: A community-engaged partnership providing advocacy and education to homeless pregnant women*****Authors:** Fitzgerald A, Farias E, Ake T, Stagg M, Kostelyna S, Howard L, Diehr S**Project Mentor:** Sabina Diehr, MD**Community Partner:** Milwaukee Women's Center

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***Mediators of cerebral blood flow in mice using a middle cerebral artery occlusion (MCAO) model.*****Authors:** Free B, Pritchard K, Jones D, Martin D.**Project Mentor:** Kirkwood Pritchard, PhD

Introduction: Upon reperfusion following an ischemic stroke, there is a rapid increase in myeloperoxidase (MPO) function. MPO enzyme is a key secretory product of polymorphonuclear neutrophils (PMN) and generates a variety of oxidants, such as hypochlorous acid (HOCl). During an ischemia/reperfusion injury, HOCl has been shown to inflict a significant amount of damage.

Hypothesis: N-Acetyl lysyltyrosylcysteine (KYC), a proprietary peptide developed by the Zhang-Pritchard Laboratories, has previously been shown to be an effective inhibitor of MPO when administered to mice 1 hour after stroke. We hypothesize that even though KYC can decrease MPO activity, administration of KYC immediately following middle cerebral artery occlusion (MCAO) in mice may not reduce infarct size relative to phosphate-buffered saline (PBS) because the injection was given before the peak of neutrophil recruitment and MPO release.

Methods: Using double-blind protocols, MCAO surgery was performed on 16 mice (n=16) by inserting a monofilament into the left external carotid artery (LECA) and advancing it distally into the Circle of Willis until it occluded the middle cerebral artery. Following a 20-minute occlusion, mice were injected subcutaneously with KYC or PBS. 24 hours later, the brain was isolated and coronal brain sections were cut and stained with 1% 2,3,4-triphenyltetrazolium chloride (TTC). Images were analyzed for infarct size using ImageJ software from the NIH.

Results and Conclusion: Although our analysis of the TTC images were not statistically significant, they suggest that KYC has a tendency to reduce infarct size. This finding is consistent with our hypothesis, along with the fact that KYC is most effective when administered at the peak of neutrophil recruitment and MPO release, which occurs at 60-90 minutes post-reperfusion. This study completes the first step of a three-step program to develop a novel combination therapy aimed at targeting mechanisms of cell death beyond MPO.

***Increasing NAD levels in an iPSC model of Parkinson's disease*****Authors:** Fulleylove-Krause B, Sison S, Ebert A.**Project Mentor:** Allison Ebert, PhD

Parkinson's Disease (PD) is a neurodegenerative disease characterized by death of dopaminergic neurons (DNs) in the Substantia Nigra. Although the exact cause of this neuronal death is unknown, alterations in mitochondrial function have been associated with PD. While PD is primarily a sporadic condition, the G2019S mutation in the LRRK2 gene is the most common hereditary cause of PD. Our lab has previously shown that NAD levels are decreased in DNs with the LRRK2 mutation. Furthermore, sirtuins, a class of NAD dependent protein deacetylases important for metabolic regulation, have decreased activity in LRRK2 DNs. We hypothesized that reductions in NAD levels in LRRK2 DNs causes decreased sirtuin activity, resulting in altered mitochondrial function, and that treatment with NAD precursors may reverse this effect. To test this, induced pluripotent stem cells (iPSCs) from healthy patients (H) and LRRK2 PD patients were differentiated into midbrain DNs. Cells were then fed normal media, or media supplemented with the NAD precursor nicotinamide mononucleotide (NMN). 48 hours after treatment, immunocytochemistry, protein analysis, and a colorimetric NAD/NADH assay were performed to determine differentiation efficiency, sirtuin levels and activity, and NAD levels. Immunocytochemistry indicated expression of enzymes specific to DNs. The NAD/NADH assay showed LRRK2 PD neurons had significantly less NAD than H neurons and that NMN treatment increased NAD/NADH ratios in both groups. In contrast, western blot indicated NMN treatment did not significantly alter sirtuin concentration or activity. These results indicate that treatment with NMN increases NAD levels, but may not be sufficient to restore sirtuin function. NAD precursors remain a valuable approach to the study and treatment of PD, although, more research is needed.



***Contributions of Self-efficacy to Physical Activity in Breast Cancer Survivors*****Authors:** Gabriel S, Beyer KM.**Project Mentor:** Kirsten Beyer, PhD, MPH, MS

**Purpose:** Assess how self-efficacy contributes to physical activity (PA) in breast cancer survivors (BCS).

**Methods:** A systematic review through a search of major bibliographic databases was conducted based on the following study inclusion criteria: social cognitive theory construct “self-efficacy,” breast cancer survivors, quantitative research, published in English, focused on populations residing in the United States, publication dates between 2004 to 2019 (prior 15 years). Additional topical studies were included from study references.

**Results:** Assessing self-efficacy among the different studies was limited by study design, self-efficacy measurements, and physical activity measures which lead to varied results. The studies reviewed contained conflicting results regarding how self-efficacy contributes to PA. However, the majority of the studies described self-efficacy’s contribution to PA either through adherence to PA, preference for type of PA, and the propensity of self-efficacy or PA impacting each other positively.

**Discussion:** Self-efficacy was shown to both contribute and not contribute to BCS PA in different studies via a multitude of factors. Additional research, standardization, and optimization among research studies would be required to further elucidate the true relationship between self-efficacy and BCS PA.

***Norwood Procedure -- Difficulty in Weaning from Cardiopulmonary Bypass and Implications for Outcomes*****Authors:** Gellings JA, Johnson WK, Ghanayem NS, Mitchell M, Tweddell J, Hoffman G, Hraska N, Kuhn EM, Woods RK.**Project Mentor:** Ronald Woods, MD, PhD

**Background:** Difficulty weaning from cardiopulmonary bypass (CPB) or the need to return to CPB (collectively D-CPB) may occur after the Norwood procedure. We sought to evaluate the relationship between D-CBP and survival.

**Methods:** This was a retrospective chart review of all patients undergoing a Norwood procedure at our institution during the interval 2005-2017. Primary outcome was survival for the Norwood procedure. Secondary outcomes included various measures of morbidity. Successful wean from CPB (S-CPB) was defined as no need to return to full flow CPB during the initial definitive wean or after separation from CPB; otherwise the classification was difficulty with wean (D-CPB). Successful rescue in the D-CPB group was defined as not requiring extracorporeal life support (ECLS) either in the operating room or within the first three postoperative days.

**Results:** Of the 196 patients in the cohort, 49 were D-CPB. Survival for S-CPB was 92.5% (136/147) vs 71.4% (35/49) for D-CPB ( $p = 0.001$ ). Major morbidity occurred in 29.9% (44/147) in S-CPB vs 69.4 % (34/49) in D-CPB ( $p < 0.001$ ). With multivariable analysis, D-CPB was significantly associated with mortality (OR=8.09; CI 2.72 -- 24.05;  $p < 0.001$ ). Successful rescue occurred in 30 of 49 patients in the D-CPB group and demonstrated survival similar to the S-CPB group.

**Conclusion:** In the Norwood patient, D-CPB is an important intraoperative event and prognostic factor for mortality and morbidity. Successful rescue appears to ameliorate the impact of D-CPB on survival.

***Delirium Education: Online Modules for PICU Staff*****Authors:** Alvarez R, Simpson P, Zhang L, Redfern W, Gharai S, Olson K, Marcdante K.**Project Mentor:** Rita Alvarez, MD

Background: Delirium is acute cerebral dysfunction with fluctuating disturbances in consciousness and cognition. The incidence is 17-38% in the general PICU and up to 66% in the postoperative PICU. It is associated with increased length of mechanical ventilation, length of stay, costs, and mortality. However, delirium education is not common in pediatric training and delirium screening is not part of standard PICU practice.

Objectives: To determine whether our education modules are useful pediatric delirium learning tools. We aim to create an effective delirium education curriculum for PICU staff.

Methods: Single-center, prospective, randomized controlled pretest-posttest crossover study. 437 PICU nurses, nurse practitioners, physicians, pharmacists and respiratory therapists were entered in the study. Two separate modules were tested: 1) delirium background 2) sedation and delirium screening tools. All tests in each arm contain the same questions in randomized order. The experimental groups completed pretest, module and posttest A. The control groups completed pretest and posttest A. All PICU staff were required to complete the education modules, therefore, the control groups crossed-over and completed the module and posttest B. All participants were assigned a six-month posttest.

Results: There was no significant difference in pretest scores between groups. Controls' posttest A scores were not different from pretest scores. All groups improved test scores after education module ( $P < 0.0001$ ). Experimental groups' posttest A scores were greater than control groups' posttest A scores ( $P < 0.0001$ ). There was no significant difference between pretest and 6-month scores in all groups except the experimental group for arm 2 ( $P = 0.014$ ).

Conclusions: Educational modules increased short term knowledge of delirium as well as sedation and screening tools. Modifications of this curriculum are needed to promote long term knowledge retention for use in clinical practice.

***Measuring Froedtert Hospital's Adult Sickle Cell Clinic Compliance with NHLBI Management Guidelines*****Authors:** Field J, Gillingham B.**Project Mentor:** Joshua Field, MD, MS

Sickle cell disease (SCD) has a substantial detrimental impact on patients, healthcare providers and the broader community, often as a result of a lack of continuity of care or clear clinical guidance. Despite well-known guidelines published in the Evidence-Based Management of Sickle Cell Disease by the National Heart, Lung and Blood Institute (NHLBI), adherence by both patients and providers to treatment protocols is often less than ideal. Chart review of the Froedtert Hospital Adult Sickle Cell Clinic, Wisconsin's only adult sickle cell clinic, provided a baseline dataset of this population's compliance with hydroxyurea therapy, vaccination schedules and iron chelation therapy. Compliance rates for the three metrics listed above measured the proportion of compliant patients to eligible patients per NHLBI guidelines using a data extraction sheet to log information. Baseline data collected from a random sample of 53 active patients at the Froedtert Adult Sickle Cell Clinic revealed compliance rates as follows: Hydroxyurea therapy, 30%, with results revealing that 57.1% of otherwise compliant patients taking hydroxyurea are missing reticulocyte counts in their regular labs, recommended as part of the NHLBI's hydroxyurea monitoring regimen. Vaccination schedule compliance was 84.9%. Iron chelation compliance was 100%. Moving forward, we will develop an EPIC order set to include reticulocyte counts with other laboratory studies recommended by the NHLBI for regular monitoring as well as provide education for Adult Sickle Cell Clinic staff on a standardized approach for prescribing hydroxyurea, regular monitoring and use of the new EPIC order set. Compliance will then be reassessed six months after staff education and improvements have been implemented to guide further steps.

***Mitochondrial Calcium Efflux via the Putative Calcium-Hydrogen Exchanger: Role in Apoptosis*****Authors:** Glait L, Mishra J, Heisner J, Stowe D, Camara A, Kwok W**Project Mentor:** Wai-Meng Kwok, PhD**Introduction**

Mitochondria are critical for regulating and buffering intracellular  $[Ca^{2+}]$ .  $Ca^{2+}$  transport across the mitochondrial membrane occurs through the mitochondrial  $Ca^{2+}$  uniporter (MCU), ryanodine receptor (mRyR),  $Na^{+}/Ca^{2+}$  exchanger (mNCE), and  $Ca^{2+}/H^{+}$  exchanger (mCHE).  $Ca^{2+}$  dysregulation drives the pathogenesis of many diseases, including ischemia-reperfusion injury. Excess matrix  $Ca^{2+}$  opens the mitochondrial permeability transition pore (mPTP), releasing  $Ca^{2+}$  and triggering apoptosis. The molecular components of mPTP are currently unknown, but cyclosporine A (CsA) and ADP both delay its opening. We aimed to delineate the role of mCHE in modulating cardiac mitochondrial  $Ca^{2+}$  efflux.

**Methods**

We isolated mitochondria from rat hearts, energized them with  $Na^{+}$ -free  $K^{+}$  succinate (removing the contribution of mNCE), and measured matrix  $Ca^{2+}$  uptake with spectrophotometry.

**Results**

By blocking  $Ca^{2+}$  uptake through the MCU with Ru360, we uncovered a persistent, concentration-dependent efflux of  $Ca^{2+}$  from mitochondria at  $[Ca^{2+}]$  lower than those that induced mPTP opening. There was no significant difference in the rate of efflux between Ru360 and ruthenium red, eliminating the role of mRyR. ADP greatly delayed mPTP opening and significantly ( $p=0.016$ ) slowed the rate of efflux while CsA had a more minor effect.

**Discussion**

We demonstrated a novel source of  $Ca^{2+}$  efflux in mitochondria through mCHE by eliminating the contributions of MCU, mRyR, and mNCE. The rate of efflux depends on matrix  $Ca^{2+}$  binding capacity, as it slowed slightly in response to CsA and significantly in response to ADP. Our results suggest that mCHE plays a pivotal role in  $Ca^{2+}$  efflux and regulation. It may facilitate opening or be a component of the mPTP.

***Development and distribution of school-based concussion curriculum for Wisconsin schools*****Authors:** Glowniak G, Thomas D.**Project Mentor:** Danny Thomas, MD, MPH

There has been increased awareness about concussions given the high prevalence and potential for lifelong complications that can significantly impair quality of life. A population of particular concern is students. The traditional treatment has been avoidance of all mental stimulation until symptoms resolve. However, this can cause more harm in the long run. Given these concerns, experts have created the Return to Learn (RTL) guidelines, which provide guidance for students to return to the classroom after a concussion. Our objective for this project was to increase awareness about RTL in Wisconsin schools to ensure the best possible recovery after a child receives a concussion. Four different educational resources about RTL were reviewed before it was ultimately decided to use "Get Schooled On Concussions" (GSOC) as the resource that would be utilized most for this project. Using the information GSOC provided, we developed a RTL curriculum that summarized the important recommendations in a single document that is easily distributable and readable. This curriculum was emailed to 2132 Wisconsin public schools. A total of 67 schools responded, 67 found the information helpful, and 42 stated they planned on implementing changes at his/her school(s) because of the presentation. This suggests that not only is there a need for RTL information in schools, but that providing this information may directly improve patient care. However, this also suggests that emailing schools is not the most effective way to distribute information given the low response rate, so further investigation into the best methods for contacting schools is necessary.

***Validity of Antibody Testing Every Seven Days among Women with Placenta Previa***

**Authors:** Paulson D, Nugent M, Simpson P, Gottschall J, Klatt T.

**Project Mentor:** Timothy Klatt, MD

**Objective:** The aim of this study was to evaluate the safety of extending the validity of antibody screens from three to seven days for pregnant women who may be at higher risk for fetomaternal transfusion and subsequent antibody formation.

**Methods:** We performed a retrospective chart review that included all women, aged 18 years or greater, who delivered at Froedtert Hospital between February 2010 and January 2015, with the diagnosis of placenta previa at time of delivery. We compared the rates of antibody formation between two groups: those who experienced at least one bleeding episode prior to delivery, including those delivered for hemorrhage, and those who experienced no bleeding prior to their scheduled cesarean. The primary outcome was the rate of antibody formation detected between the screen performed immediately before delivery and the penultimate screen. Factors investigated as potentially increasing the risk of antibody formation included number of bleeding episodes, gestational ages and volumes of blood transfusions, postpartum hemorrhages and cases of cesarean hysterectomy. A cost analysis for screening for antibody formation every seven instead of every three days was performed.

**Results:** No subject developed an antibody between the screen immediately preceding delivery and the penultimate screen. Only one patient, delivered via scheduled cesarean, formed a clinically significant antibody during the pregnancy, a rate of 1/58 or 1.7%. No factor, including whether hemorrhage necessitated delivery, was associated with antibody formation. Our seven-day validity algorithm prevented ninety screens, a savings of \$11,250 over five years.

**Conclusion:** Among women delivered with placenta previa, hemorrhage prior to delivery, including that necessitating delivery, was not associated with an increased risk of antibody formation. Increasing the length of validity of antibody screens to seven days among pregnant women appears reasonable.

***Myocardial Extracellular Volume (ECV) After Pediatric Heart Transplantation as a Marker of Rejection.***

**Authors:** Gordon A, Goot B, Punnoose A, Yan K, Cava J, Krolikowski M, Kindel S, Samyn MM.

**Project Mentor:** Margaret M. Samyn MD

**Objective:** Cardiac magnetic resonance imaging (CMR) is a noninvasive assessment of heart disease with limited evaluation in pediatrics. Cardiac allograft rejection results in fibrotic remodeling of the myocardium detectable by elevated CMR extracellular volumes (ECV). Our study characterized a heart transplant population by CMR ECV as a possible biomarker for allograft health.

**Methods:** Forty-three pediatric heart transplant patients underwent CMR scans on a 3 Tesla scanner at Children's Hospital of Wisconsin. Images were captured at 3 myocardial slices including basal (top), mid, and apical (inferior) slices of the left ventricle to calculate ECV. ECV were quantified using Circle CVI 42 Cardiovascular Imaging software. Relationships were sought between ECV and treated rejection episodes, transplant ischemic time, and duration of transplant using Pearson correlation.

**Results:** Fifteen females and twenty-eight males underwent CMR imaging. Median subject age was 12.1 years (range 3.4-22.4) with median of 7.2 years from transplant (range 1.9-17.8). Median ischemic donor time was 228 min and 17/43 patients had treated episodes of rejection (>grade 2R). Median ECV at basal, mid, and apical left ventricular slices were 29, 31, and 33% ( $p < .0001$ ). No significant correlations were observed between ECV and treated rejection episodes, transplant ischemic time, or duration of transplant.

**Conclusion:** ECV in heart transplant patients is elevated compared to age matched controls. Apical ECV is significantly elevated compared to other myocardial segments, suggesting possible predilection for rejection. As the first 3T CMR pediatric heart transplant myocardial characterization study, these data warrant further investigation to understand the utility of CMR ECV as biomarker for transplant rejection.

***The “m” Conformation of ANT Enhances Cyclosporin A Rescue of Mitochondrial Ca<sup>2+</sup> Uptake*****Authors:** Goss M, Heisner J, Mishra J, Camara A, Kwok W, Stowe D.**Project Mentor:** David F. Stowe, MD, PhD

Mitochondria take up large amounts of Ca<sup>2+</sup> during IR injury leading to formation/opening of the mitochondrial permeability transition pore (mPTP). Adenine nucleotide translocase (ANT), while not a mPTP component, may regulate mPTP opening. Our aim was to assess if altering the conformation of ANT alters the ability for CSA, a known inhibitor of mPTP, to regulate mPTP opening in healthy and IR injured mitochondria of isolated guinea pig hearts. Examining if ANT inhibitors carboxyatractyloside (cATR) or bongkrekic acid (BKA) alter CSA-induced delay of mPTP opening by stabilizing ANT in the “c” conformation vs “m” conformation respectively. We measured Ca<sup>2+</sup> retention capacity (CRC), a marker of bioenergetic activity, in mitochondria isolated after no IR (time control, TC) or after IR injury. Finding that CSA-induced delay of mPTP opening (assessed by Ca<sup>2+</sup> release in ng Ca<sup>2+</sup>/mg protein) was greater with the addition of BKA for both TC and IR injured mitochondria. With the TC group, for substrates sodium pyruvate and sodium succinate (NaPyr and NaSucc) we found CSA rescue for TC+BKA (633 ng/mg, 528 ng/mg, respectively) was significantly greater ( $p < .05$ ) than both TC+CSA only (280 ng/mg, 300 ng/mg) and TC+cATR (168 ng/mg, 264 ng/mg). With the IR group, for substrates NaPyr and NaSucc we found CSA rescue for IR+BKA (245 ng/mg, 328 ng/mg, respectively) was significantly greater ( $p < .05$ ) than both IR+CSA only (160 ng/mg, 166 ng/mg) and IR+cATR (150 ng/mg, 190 ng/mg). Indicating enhanced efficiency of CSA to stall mPTP opening based on the contention that BKA promotes ANT to ‘m’ being favorable over the ‘c’ conformation.

***An analysis of differing perspectives whereby medical students tailor resources to advance learning*****Authors:** Graff C, Kaljo K, Treat R, Dielentheis K**Project Mentor:** Kathryn Dielentheis, MD

Medical schools have historically utilized instructor-centered lectures to teach medical students the basic sciences. A variety of electronic-based resources are now available to enhance lecture-based content. The purpose of this study is to analyze perceptions between students and faculty regarding supplemental educational resources and the efficacy of lecture-based teaching. The authors distributed surveys to first-, second- and third-year medical students and to basic science teaching faculty at the Medical College of Wisconsin. Survey items used categorical and 10-point scales (10=high) and open-ended text-response. Mean scores compared with independent t-tests and Cohen’s d effect sizes. Pearson (r) and Spearman rho correlations used for relational analysis. IBM® SPSS® 24.0 used for statistical analysis, NVivo 11 used for qualitative analysis. Study is IRB approved. Students reported utilizing a significantly higher number of supplemental educational resources (mean(sd)=5.9(2.0)) than faculty (4.7(2.1)) perceived (Cohen’s d=0.6/ $p < .001$ ). Faculty’s perception of meeting students’ learning needs was rated significantly higher (7.3(1.3)) than students (5.9(2.0)) (Cohen’s d=1.0/ $p < .001$ ). There was a significant negative correlation between meeting learning needs and time spent outside of lecture seeking supplemental learning resources ( $\rho = -0.4$ / $p < .001$ ). Student and faculty perception’s regarding student learning needs were significantly different. Students often personally finance supplemental resources to advance learning, adding to the financial burden of medical education. This study helps bridge the gap between medical students and faculty regarding what educational tools are best suited to support the increasingly diverse student population.

***Adenosine A2A receptor signaling and the effects of  $\Delta^9$ -tetrahydrocannabinol at the CB1 receptor*****Authors:** Griffin, K.J. and Hillard, C.J.**Project Mentor:** Cecilia Hillard, PhD

**Background:** The pharmacological effects of  $\Delta^9$ -Tetrahydrocannabinol (THC) at the CB1 cannabinoid receptor are modified by the other constituents of cannabis. Activation of co-localized adenosine 2A receptors (A2AR) provides hypersensitivity to CB1R agonists in cultured cells. THC acts as a competitive inhibitor of adenosine uptake at the equilibrative nucleotide transporter 1 (ENT1). Limonene, a monoterpene found in some strains of cannabis, is an adenosine receptor agonist. These findings suggest that some THC actions and synergistic effects of limonene could be mediated by adenosine signaling.

**Methods:** Groups of wildtype and A2AR knockout mice received increasing doses of THC (1, 5, 10, and 100 mg/kg). Control mice received 4 injections of vehicle. In a second experiment, groups of wildtype (n=8) and A2AR<sup>-/-</sup> mice (n=8) received a single dose of THC (30 mg/kg) or vehicle followed immediately by a single dose of limonene (50 mg/kg) or saline.

The effects on analgesia, catalepsy, locomotor activity, and temperature were assessed with the tail flick, ring stand, open field, and rectal body temperature assays, respectively.

**Results:** A2AR<sup>-/-</sup> mice spent fewer seconds resting in the ring stand assay during the first (p=0.004) and second (p=0.09) experiments. Wildtype mice who received THC/limonene had a significantly longer tail flick latency than those who received only THC, while A2AR<sup>-/-</sup> mice who received THC/limonene had a shorter latency than those who received THC alone (p=0.03).

**Conclusions:** Our data indicate a potential role for A2AR in the catalepsy response. Limonene may potentiate the analgesic effects of THC in an A2AR-dependent fashion.

***Assessment of Quality of Life in Pediatric Patients with Pulmonary Hypertension*****Authors:** Handler SS, Hallis BJ, Tillman KA, Krolikowski M, Kuhn EM, Kirkpatrick EC, Brosig CL.**Project Mentor:** Stephanie S. Handler MD

To evaluate quality of life in four domains (physical, emotional, social and school) in pediatric patients with pulmonary hypertension (PH) using a validated survey (PedsQL).

Prospective cohort study of pediatric patients 2-18 years of age with PH. Parents of all children and patients 8-18 years of age with appropriate developmental capacity completed PedsQL survey in clinic. Results were compared with published norms for pediatric patients, those with congenital heart disease (CHD) and cancer.

Thirty-three children were enrolled yielding 32 parent and 18 patient self-reports: 7 patients 2-4 years, 3 5-7 years, 11 8-12 years, and 12 13-18 years of age. Twenty-one patients were classified as WHO Group I PAH, 11 WHO Group III PH due to lung disease and 1 WHO Group V with segmental PH. Thirteen patients were NYHA Class 1 function, 12 Class 2, 8 Class 3, and 0 Class 4.

PH cohort had significantly lower scores than healthy children in all domains on both parent and self-report. PH cohort also had significantly lower scores than patients with CHD (parent report- total, physical, social, school; patient self-report- total, physical, school) and cancer (parent report- school; patient self-report- physical, school). Close to 50% of participants reported at risk scores in each domain.

Quality of life in pediatric PH patients assessed by PedsQL revealed functional impairment in multiple domains.

Administration of the PedsQL during outpatient encounters may provide an easy, reproducible method to assess quality of life and direct referral for interventional services.

***A case of significantly elevated transaminases in acute infectious mononucleosis caused by Epstein-Barr virus in a young adult***

**Authors:** Han H

**Project Mentor:** Julie Kolinski, MD

Transaminitis is commonly found in patients with infectious mononucleosis (IM) caused by Epstein-Barr virus (EBV), but most cases are mild with aspartate transaminase (AST) and alanine transaminase (ALT) typically two or three times the upper limit of normal. An 18-year-old woman was admitted for a five-day history of malaise, poor appetite, right upper abdominal pain, and yellowing of her eyes and skin. Her heterophile antibody was positive, AST 141 (11-33 U/L), and ALT 227 (6-37 U/L). Because her elevated liver enzymes were thought to be out of proportion to viral etiology and she had a strong family history of autoimmune disease, she underwent further work-up for an alternative or additional etiology. Other infectious agents such as cytomegalovirus (CMV) and toxoplasma, and autoimmune etiologies were subsequently ruled out. In addition, she had positive confirmatory testing for EBV with serology and polymerase chain reaction (PCR). She was observed in the hospital, during which her liver enzymes trended down, and discharged on day three. AST was 74 and ALT 144 at discharge. This case provides an account of elevated liver enzymes above what is typically reported in the literature in a young adult with acute EBV, that spontaneously resolved with no sequelae. It suggests that once EBV is confirmed in a such a patient who otherwise clinically fits the picture of EBV IM and whose transaminitis is trending down, further etiology search may not be necessary.

***Utility of Prolonged Monitoring During Initiation of Oral Propranolol for Infantile Hemangioma***

**Authors:** Püttgen KB, Hansen LM, Lauren C, Stefanko N, Mathes E, Olsen GM, Tollefson MM, Adams D, Baselga E, Chamlin S, Corey K, Frascari FF, Frieden IJ, Galligan ER, Gupta D, Haggstrom A, Horii K, Hornik CP, Klajn J, Liberman L, Mancini A, Mannschreck D, McGinness A, Newell B, Nguyen H, Nopper A, Oyesanya T, Reynolds M, Rios M, Siegel DH, Ward K, Garzon MC, Frommelt P, Drolet BA

**Project Mentor:** Beth A. Drolet, MD

**Background**

Guidelines for oral propranolol initiation for infantile hemangioma were published in 2013. These were based on expert opinion and intended to be a provisional set of best practices to be updated as evidence-based data emerged.

**Methods**

A retrospective multi-center study was performed to evaluate the utility of prolonged monitoring after the first dose of oral propranolol and after dose escalation(s). Inclusion criteria included diagnosis of infantile hemangioma requiring propranolol of  $\geq 0.3$  mg/kg/dose, initiation age  $< 2$  years, and heart rate (HR) monitoring for  $\geq 1$  hour. Data collected included subject demographics, dose, vital signs and adverse events.

**Results**

783 subjects met inclusion criteria; median age at propranolol initiation was 112 days. Median initiation dose was 0.47 mg/kg/dose. None of the 1148 episodes of prolonged monitoring warranted immediate intervention or discontinuation of propranolol. No symptomatic episodes of bradycardia or hypotension occurred during monitoring at dose initiation among 748 subjects or at escalation dose visits among 357 subjects. The mean change in HR from baseline to 1 hour was  $-8.19 \pm 15.54$  bpm and from baseline to 2 hours was  $-9.24 \pm 15.84$ . Three preterm subjects had dose adjustments. There was no significant difference in pre-treatment HR or in change in HR between those who later experienced an adverse event during treatment and those who did not.

**Conclusions**

Prolonged monitoring for initiation and escalation of propranolol rarely changed care management and was not related to future adverse event occurrence. Few serious adverse events occurred during the course of therapy and none were cardiovascular.



***CD36 Activation Enhances Hydrogen Peroxide Generation in Human Platelets***

**Authors:** Harberg C, Yang M, Chen W, Frolkis T, Wynia-Smith S, Ferreira R, Zielonka J, Carroll KS, Smith BC, Silverstein RL

**Project Mentor:** Roy L. Silverstein, MD

**Introduction:** Thrombosis following atherosclerotic plaque rupture remains a leading cause of death. Oxidized lipids in LDL (oxLDL) are recognized by platelet scavenger receptor CD36 and promote platelet hyperreactivity and thrombogenesis. OxLDL-CD36-generated reactive oxygen species are known to be important platelet activation regulators, but the downstream signaling is not fully elucidated. Oxidative cysteine modifications, such as sulfenylation, are redox-regulated signaling modifications, and their role in oxLDL-induced platelet activation has yet to be defined.

**Hypothesis:** OxLDL-CD36 stimulation generates peroxide species that modulate platelet signaling pathways in atherogenic conditions.

**Methods:** Platelets were isolated from healthy human donors. HPLC was used to measure intracellular oxidation of coumarin boronic acid to 7-hydroxycoumarin (COH) by peroxides in response to oxLDL and other platelet agonists. OxLDL-induced cysteine sulfenylation was examined using carbon nucleophile probes and “click” chemistry followed by western blot analysis. Functional assays were performed using platelet aggregometry and flow cytometry for Integrin αIIbβ3 activation and granule secretion.

**Results:** Platelets showed dose- and time-dependent COH accumulation after oxLDL stimulation, which was blunted by pre-treatment with either catalase, a hydrogen peroxide detoxifying enzyme, or with CD36 blocking antibody. OxLDL-sensitized platelets showed significantly enhanced COH accumulation with collagen receptor GPVI activation, which was not observed with other activating receptors. OxLDL dose-dependently promoted sulfenylation of the platelet proteome, which had functional consequences for platelet activation, as modified nucleophile probes inhibited platelet aggregation and integrin activation.

**Conclusions:** OxLDL-CD36 activation generates hydrogen peroxide in platelets promoting sulfenylation of protein targets leading to platelet activation and aggregation in atherogenic states.

***Re-examining Choosing Wisely: Adherence to Recommendations in the Maternal-Fetal Medicine Department***

**Authors:** Cruz M, Auld J, Koeller C, Yan K

**Project Mentor:** Meredith Cruz, MD, MPH, MBA

**INTRODUCTION:** The Choosing Wisely™ campaign was initiated in April 2012 in an effort to decrease “low value” care that increases costs but fails to improve health, with the release of three sets of guidelines by ABIM and SMFM in 2013, 2015, and 2019. This study examines adherence by the Maternal Fetal Care Center (MFCC) at Froedtert Hospital to recommendations 6, 7, 9, and 10. **STUDY METHODS:** An i2b2 Cohort Discovery tool query retrospectively identified patients to whom care was delivered by providers at the MFCC and who met study criteria. Specifically, examination of Recommendation 6 (“Don’t perform routine cervical length screening for preterm birth risk assessment in asymptomatic women before 16 weeks of gestation or beyond 24 weeks of gestation”) identified women who had cervical length screening during these time periods. For Recommendation 7, (“Don’t perform antenatal testing on women with the diagnosis of gestational diabetes who are well controlled by diet alone and without other indications for testing”), charts of women who had routine BPPs and NSTs were examined to establish whether these were performed solely due to diet-controlled GDM. For Recommendation 9 (“Don’t order serum aneuploidy screening after cfDNA aneuploidy screening has already been performed”), women who had cfDNA testing completed followed by serum aneuploidy screening were identified. Lastly, Recommendation 10 (“Don’t perform maternal serologic studies for cytomegalovirus and toxoplasma as part of routine prenatal laboratory studies”) was studied by identifying patients who had routine CMV and toxoplasma testing during pregnancy. **RESULTS:** Study data is currently being analyzed to determine final results. Anecdotally however, the MFCC adhered to Choosing Wisely™ recommendations even prior to their publication. This adherence continued 1 year post-publication. **CONCLUSIONS:** In the year after publication, the MFCC continued to provide evidence-based care per Choosing Wisely™ guidelines.

***Parental Perception of Care for Infants with Fever During Hospitalization*****Authors:** Hayes J, Vepraskas S.**Project Mentor:** Sarah Vepraskas, MD

Project REVISE (Reducing Excessive Variability in Infant Sepsis Evaluation) was a national quality improvement collaborative that sought to improve aspects of care around infants with fever, including appropriate work-up and length of stay (LOS). The objective of this study arm was to understand parental perceptions regarding the care of febrile infants.

The study group included parents of infants admitted to one acute care unit of Children's Hospital of Wisconsin who met inclusion criteria for Project REVISE (non-complex, well-appearing infants, ages 7-60 days, evaluated for fever without a source). A 5-question structured interview was given to parents by one study team member over a 6-month period. Question topics included reason for and length of hospitalization, discharge education concerns and time preference, and disruption of hospitalization to daily life.

87% (21/24) of parents correctly identified their infants' reason for hospitalization as fever. 13% correctly provided established diagnoses. 29% (7/24) of parents anticipated a 36-hour LOS, 50% (12/24) a 48-hour LOS, and 21% (5/24) other. 91% (22/24) of parents expected to have enough information at discharge, 4.5% (1/24) were unsure, and 4.5% (1/24) did not expect to have enough information at discharge. 50% (12/24) of parents preferred morning discharge, 42% (10/24) overnight discharge, and 8% (2/24) had no preference. 55% (13/24) of parents found their hospital stay to be disruptive to their daily routine, while 45% (11/24) did not.

The results demonstrate that education from the healthcare team is needed in emphasizing the rationale for fever as the reason for the baby's hospitalization as well as the target goal of a 36-hour LOS if bacterial cultures were negative. Optimized education for all parents of infants awaiting results would then allow them to better predict their LOS and determine if their preferences for overnight or morning discharge could be accommodated within 36 hours.

***Medication Errors in Prehospital Care: A Study of Milwaukee County Experience*****Authors:** Heintz, H, Colella, M.**Project Mentor:** Mario Colella, DO, MPH

**Objective:** According to a study published in the journal *Prehospital Emergency Care*, over 9% of paramedics self-reported a medication error within a single month. Given an annual EMS call volume of nearly 80,000 in Milwaukee County, this suggests that as many as 7,200 errors may have occurred. We are interested in describing the medication errors that are occurring within our system to refine protocols and improve patient outcomes for the citizens of Milwaukee County.

**Methods:** An OEM (Office of Emergency Management) smart phone application was written to gather error data from all Milwaukee County EMS operations from April 2016 to April 2017. The events were compiled into a continuous quality improvement database. We examined only paramedic-level providers and focused only on errors related to medication administration. We used descriptive statistics in the analysis of our data.

**Results:** Within our one-year study period, we identified 14 self-reported medication-related errors, representing 0.0175% of total call volume. The wrong drug was administered on 7 occurrences, accounting for 50% of the errors. The wrong dose was administered on 5 occurrences, accounting for 36% of the total errors. The wrong route was utilized on 2 occurrences, accounting for 14% of the total errors.

**Conclusions:** Paramedics have used the OEM application to self-report medication errors that occur while in the field, which has driven the creation of a continuous quality improvement database. We now have a better understanding of the types of medication errors occurring within our EMS system. This information will help to drive future training, policy, and quality improvement projects.

***HAPI: A community-engaged partnership providing advocacy and education to homeless pregnant women*****Authors:** Howard, L; Stagg, M; Kostelyna, S; Fitzgerald, A; Farias, E; Ake, T; Diehr, S**Project Mentor:** Sabina Diehr MD**Community Partner:** Milwaukee Women's Center

Women who experience homelessness during pregnancy have poorer birth outcomes than the general population. The result of a previous needs assessment informed the design of the Health Advocacy in Pregnancy and Infancy (HAPI) program, a patient-centered service-learning program for medical students and homeless pregnant women.

**Objective:** To improve perinatal health of homeless mothers and their babies by implementing a service-learning program consisting of educational modules on perinatal health and a student partnership program.

**Methods:** Short educational modules on nutrition, mental health, infant care, breastfeeding, and contraception were taught at a Milwaukee homeless shelter. Debriefing forms were completed following each session evaluating participant satisfaction and suggestions for improvements. Mothers were also invited to participate in a 1:1 student partnership program during pregnancy and through age one of their infant(s). The partnership program was evaluated by participant retention and satisfaction, through self-reporting of maternal health and infants' birth weights, gestational age, immunization status, and attendance at well-child checks.

**Results:** Following the 26 sessions presented, 74 unique analyzable comments were provided. Of those comments, 70.3% were positive and 21.6% included requests for additional information or educational materials with several themes identified. Six women joined the student partnership program and two women remain currently engaged, have completed appropriate health questionnaires, and have delivered three healthy infants.

**Conclusion:** The HAPI program has provided well-received education on perinatal health with actionable areas for improvement in the future. The student partnership welcomed three healthy infants, however, retention in the student partnership program continues to be a challenge with unreliable communication as a significant barrier.

***Differentially expressed MicroRNA patterns to investigate the mechanism of progression in FSGS*****Authors:** Huls S, Williams A.M, Baker M.A, Pan X, Wan Y, Iczkowski K, Regner K, Liang M.**Project Mentor:** Mingyu Liang, MB, PhD

**Background:** The incidence of focal segmental glomerulosclerosis (FSGS) has increased and is now one of the leading causes of nephrotic syndrome in adults. Between 40-70% of patients diagnosed with FSGS will progress to end-stage renal disease (ESRD) with many requiring transplantation or dialysis. Primary FSGS is an idiopathic lesion without an established pathological mechanism. Due to this lack of understanding, FSGS presents many difficulties in diagnosis and treatment. This study obtained (near-) genome-wide profiles of microRNA abundance in glomeruli and tubulointerstitial regions in human kidney biopsy specimens obtained from primary FSGS patients. Gaining an understanding of the pathological progression of primary FSGS will allow for more precise treatments to be developed.

**Methods:** Patient data was collected for FSGS and control subjects. FSGS subject biopsy blocks were cut by MCW Histology Core. Three cuts were made, one for Hematoxylin and Eosin (H&E) staining and two for laser capture microscopy. H&E stained Glomeruli were scored based on proportion sclerotic. Laser Capture microscopy was performed, followed by RNA extraction and MiRNA library preparation. An in house statistical analysis was performed to determine differential expression patterns. A literature search was performed on differentially expressed miRNA.

**Results:** Analysis has shown differential MiRNA expression between glomeruli scored with less than 25% sclerosis vs glomeruli with greater than 50% sclerosis.

**Conclusions:** This study shows there does exist differential miRNA expression between sclerotic and non-sclerotic glomeruli. Further work is being done to specifically characterize differentially expressed miRNA profiles and to examine the mechanism of miRNA in FSGS progression.

***HPA Axis Response to Hypoxia: Effect of Androgen Receptor Blockade***

**Authors:** Christine Huynh, Ashley Gehrand, Jonathan Phillips, Minhal Gardezi, Mack Jablonski, Kevin Malott, Hershel Raff

**Project Mentor:** Hershel Raff, PhD

Neonatal stress leads to a long-term change in adult endocrine function that is sexually dimorphic. Neonatal testosterone may program these differences in adult endocrine function. We hypothesize that neonatal androgens alter the neonatal HPA axis response to stress (e.g. hypoxia) which may lead to long-term effects. To test this, we administered flutamide to neonates and evaluated the subsequent response to hypoxia.

We determined the effect of pretreatment of rats (on post-natal days 1-5) with flutamide and measured the neonatal ACTH and corticosterone responses to acute hypoxia on PD 7, 14 and 21.

Flutamide or vehicle was injected subcutaneously to pups daily for 5 days. On PD7, PD14, or PD21, baseline blood samples were obtained by decapitation. Additional pups were exposed to 90 minutes of hypoxia or normoxia and then decapitated. Plasma testosterone was measured by LCMSMS.

The effect of flutamide administration was unexpectedly similar in male and female neonates. Thus, both data were combined. Flutamide pretreatment on PD1-5 did not alter Baseline or Normoxia plasma ACTH concentrations at PD 7, 14, or 21. Hypoxia increased plasma ACTH and corticosterone in the vehicle and flutamide-treated pups at all ages. In PD7 pups only, flutamide pretreatment inhibited the ACTH response to hypoxia but augmented the corticosterone response. In PD14 pups, the ACTH response to hypoxia was still attenuated by flutamide pretreatment, but the corticosterone response was not different from vehicle pretreatment.

Flutamide augments adrenal corticosterone responses to hypoxia in neonatal rats despite having no effect by itself. Our conjecture for the lack of sexual dimorphism in the effects of flutamide despite low testosterone in females is that flutamide may be acting as a selective androgen receptor modulator in the presence of increased steroidogenesis. The augmented corticosterone levels would explain an attenuated ACTH response to hypoxia due to negative feedback.

***Sleep Aid Use and Sleep Problems Among Hematopoietic Stem Cell Transplant Patients***

**Authors:** Ibrahim A, Bronwen S, Cusatis R, Knight J, D'Souza A.

**Project Mentor:** Bronwen Shaw, MD, PhD

Sleep deprivation is associated with impaired cognitive performance potentially due to neurobehavioral functions being lessened. Affected brain regions involve the parietal and frontal cortexes as well as thalamic areas. In hospitalized patients, sleep deprivation is more common whether it is due to the change in environment, the medications given to the patient, or all the tools attached to the patient such as IV lines or cardiac leads. Of note, 75-80% of hospitalized hematopoietic stem cell transplantation (HSCT) patients have reported poor sleep, which could have resulted from the transplant. Most patients who have undergone hematopoietic stem cell transplantation (HSCT) report that one side effect related to the HSCT is insomnia. Multiple studies in the past have attempted to find the etiology of their poor sleep. In this study, the primary focus was on medications that patients either were admitted with, were given during their admission, or given on discharge. Benzodiazepines, benzodiazepine-like medications, and first-generation histamine blockers, specifically, have been widely used by patients suffering from insomnia and other sleep-related disorders to initiate and stay asleep at night. There is evidence proving the efficacy of using such medications to help patients regulate their sleeping habits. The impact and incidence of most sleep medications have not been studied in HSCT patients. Results are still pending regarding a correlation between patients were chronically dealing with sleep related problems and still receiving those medications during their admission and patients who were sleep aid medication naïve and received those drugs.

***Altered Frontal Lobe Network Function in Temporal Lobe Epilepsy Revealed by Graph Theory Analysis***

**Authors:** Iyer S, Mathis J, Ustine C, Nair V, Rozman M, McMillan T, Kraegel P, Almane D, Forseth C, Hwang G, Nencka A, Birn R, Ward D, Prabhakaran V, Maganti R, Conant L, Hermann B, Humphries C, DeYoe E, Raghavan M, Meyerand E, Binder J.

**Project Mentor:** Jeffrey R. Binder, MD

**Background:** There are 2.5 million people with epilepsy in the United States. A large portion of these patients have temporal lobe epilepsy (TLE) which can't be managed using anticonvulsant medication or surgery. Originally thought of as a focal process, TLE is increasingly viewed as a process that involves large-scale networks of the brain, and thus can't be solved by removing a singular lesion.

**Objective:** To identify aberrant brain network function in patients with TLE using graph theory analysis.

**Methods:** Resting-state fMRI data was collected for 50 TLE patients and 40 healthy controls. Connectivity matrices of z-score activity correlation values between 379 cortical nodes, defined by the Glasser parcellation, were made for each participant. Matrices were thresholded to retain the largest 6% z-score values, on top of each matrix' minimum spanning tree (the minimal connections of a network). Graph theory measures assessing network integration (pagerank) and network segregation (modularity) were compared between groups using t-tests, with Bonferroni correction for multiple comparisons ( $p < 0.00013$ ).

**Results:** TLE patient group had significantly lower pagerank in several frontal opercular nodes (right FOP1, right FOP4, left FOP1, right MI) ( $p < 0.00013$ ), and lower modularity in several prefrontal nodes (left a9-46v, right 11l, right d32, right 46) ( $p < 0.00013$ ).

**Conclusions:** The lower pageranks and modularity in the TLE frontal and prefrontal regions indicate a reduced influence of these nodes on overall brain network function, and also a reduced nodal organization in these sub-networks. These alterations could underlie the reported executive and working memory deficits observed in some people with TLE.

***Management of Acute Cholecystitis During Neoadjuvant Therapy in Patients with Pancreatic Adenocarcinoma***

**Authors:** Jariwalla N, Aburajab M, Khan A, Dua K, Christians K, Aldakkak M, George B, Ritch P, Erickson B, Hall W, Evans D, Tsai S.

**Project Mentor:** Susan Tsai, MD, MHS

**Introduction:** Patients with localized pancreatic cancer (PC) often have a biliary stent placed to relieve obstructive jaundice. During neoadjuvant therapy, they are at risk of developing acute cholecystitis. The potential for treatment of cholecystitis to cause a delay in pancreatic cancer therapy is not well understood.

**Methods:** Treatment details were abstracted on consecutive patients with localized PC who had a biliary stent placed at the time of diagnosis. Stent-related complications were noted and the time from stent placement to the development of a stent-related complication during the neoadjuvant treatment period was calculated. Patients were categorized as having surgical versus non-surgical management of the cholecystitis. Time to surgery was defined as the time from the start of treatment to surgery.

**Results:** Data was available for 283 patients, 121 (43%) with resectable and 162 (57%) with borderline resectable PC. Of the 283 patients, acute cholecystitis occurred in 17 (6%) patients. Acute cholecystitis was managed with cholecystostomy tube placement in 15 (88%) patients and cholecystectomy in 2 (12%). Of the 189 patients who completed all neoadjuvant therapy and surgery, the median time to surgery was 3.2 months for the 179 patients without cholecystitis and 3.6 months for the 10 patients with cholecystitis ( $p = 1.00$ ).

**Conclusion:** The development of acute cholecystitis during neoadjuvant therapy occurred in 6% of patients who had an endobiliary stent. The placement of a cholecystostomy tube for the management of acute cholecystitis does not significantly delay the completion of neoadjuvant therapy and surgery and should be considered the optimal management of this complication.

***Use of Naloxone Administration to Identify Opioid Overdose-Related Out-of-Hospital Cardiac Arrest*****Authors:** Jasti J, Kennedy K, Colella MR, Aufderheide TP**Project Mentor:** Tom P. Aufderheide, MD, MS

Background: Naloxone administration is not recommended by resuscitation guidelines for treatment of suspected opioid overdose-related out-of-hospital cardiac arrests (OHCA). The frequent use of naloxone by Emergency Medical Services (EMS) providers has allowed prehospital researchers to use it as a proxy for identifying these patients. However, the accuracy of this classification method has not been evaluated.

Methods: We conducted a retrospective cohort study of all adult, non-traumatic OHCA patients treated by Milwaukee County EMS from 2015-2016. Receipt of naloxone was used to categorize OHCA patients into two groups: Received > 1 Naloxone and No Naloxone. Opioid toxicology data from the Milwaukee County Medical Examiner was matched to OHCA patients that expired and the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of using naloxone to identify opioid overdose-related OHCA was calculated. Demographics and outcomes were compared between groups using Mann-Whitney U and Chi-square tests as appropriate.

Results: 1,850 OHCA cases were included of which 137 (7.4%) were >1 Naloxone and 1713 (92.6%) were No Naloxone. Compared to No Naloxone, >1 Naloxone were younger (36[28.5-49.5] vs. 63[53-74],  $p < 0.001$ ) but not different in sex or race/ethnicity. >1 Naloxone was associated with higher rates of return of spontaneous circulation (50.4% vs. 39.4%,  $p < 0.012$ ), and survival to hospital discharge (18.2% vs. 10.0%,  $p < 0.010$ ). The sensitivity, specificity, PPV, and NPV of using naloxone was 39%, 97%, 56%, and 94% respectively.

Conclusion: Naloxone administration by EMS providers has limited sensitivity (39%) for identifying opioid overdose-related OHCA. Prehospital researchers should use alternative methods to accurately classify this important population

***Case study: assessment of a FQHC's adherence to breastfeeding best practices among african american women*****Authors:** Johnson K, Willis E.**Project Mentor:** Earnestine Willis, MD, MPH**Community Partner:** Martin Luther King Heritage Health Center

The purpose of this case study was to learn about the breastfeeding promotion policies and practices of a Milwaukee Federally Qualified Health Center (FQHC) that primarily services African American women, and to evaluate the extent to which the FQHC has integrated what's been identified in the literature as best practice in promoting breastfeeding amongst African American Women into their own breastfeeding promotion efforts. Formal structured interviews with 3 different key informants: Women, Infants, and Children (WIC) office director; prenatal primary care provider (midwife); prenatal care nurse; were conducted and one of the WIC site's peer breastfeeding classes was observed. A breastfeeding scorecard—an 18-item survey derived from literature-identified best practices for breastfeeding promotion in African American women—was completed by the key informants and the investigator. Results revealed that, despite not having a written policy on breastfeeding promotion, promotion is incorporated into the health center's culture and breastfeeding practices are discussed with all prenatal patients in various ways and at multiple levels of care. Promotion efforts were minimized in patients who showed disinterest in breastfeeding. WIC had more multidimensional breastfeeding promotional efforts than the FQHC. Observed inhibiting factors to breastfeeding and limits to breastfeeding promotion in this study are explicated using existing literature, social cognitive theory, and the influences of social determinants on health. A potential intervention modification for the FQHC includes training community health center and WIC staff on motivational interviewing techniques to address breastfeeding with patients who are not amenable to breastfeeding.

***Investigating the Impact of HCAHPS Survey Results on 30-Day Readmission Rate and Length of Stay Index*****Authors:** Josephson M, Helm M, Gould JC**Project Mentor:** Jon C. Gould, MD

Background: The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) was developed as a standardized measure to survey patient satisfaction. Survey results are publicly available and have the potential to influence patients' decisions on where they seek care. Thus, it is important to understand whether HCAHPS surveys are an accurate measure of care and services provided to patients. Methods: Top box response rates from four HCAHPS survey questions, two related to discharge process and two related to pain control, were obtained for a contiguous year July 2016 – June 2017. % top box response rates were used as a continuous predictor in units of 10% and a regression coefficient calculated for correlation to 30-day readmission rate and length of stay (LOS) index. Results: The association between HCAHPS % top box and 30-day readmission rate for the question 'information provided about symptoms' was significant with a regression coefficient of -0.78 ( $p = 0.04$ ). For the question 'staff asked about home help', this relationship was not statistically significant (regression coefficient of -0.63,  $p = 0.161$ ). The association between HCAHPS % top box and LOS index for the question 'how often was pain well-controlled' was not significant (regression coefficient = -0.03,  $p = 0.139$ ), nor was it significant for the question 'staff did everything they could to control pain' (regression coefficient = -0.01,  $p = 0.501$ ). Conclusion: Receiving information about symptoms to look out for after leaving the hospital correlated with a lower 30-day readmission rate. This demonstrates the importance of the discharge process in reducing 30-day readmission rate. If further studies show correlation between HCAHPS survey results and specific quality measures, this would emphasize the importance of patient satisfaction in monitoring quality improvement

***Implementing Virtual Reality in Medical Education and Training*****Authors:** Joshi D, Botts M, Ramamurthi A, Alivo B, Joyce D**Project Mentor:** David L. Joyce, MD

Our project aims to create immersive virtual reality modules to help healthcare professionals provide better care for our communities. By allowing medical professionals to practice in a 3D environment, medical professionals will be better equipped to provide care to patients without putting them at risk. This will also reduce the amount of medical error costs experienced in the industry today.

Studies show that 25% of surgeons who graduate from residency are not confident in performing surgeries on their own. Complication rates increase by 300% when attempting procedures for the first time. Virtual reality can pose a solution to this dilemma by providing medical professionals an environment to practice procedures on their own time - thereby increasing confidence and competence.

Additionally, many incoming medical students enter medical school unsure of the field of medicine they want to pursue. The first decision they have to make is whether they want to pursue the clinical side or the surgical side of medicine. However, the first two years of medical school are spent learning the basic sciences in the classroom, with sparse clinical exposure. Clinical rotations begin in their third year, but a decision for their career has to be made within 9 months of the rotations starting. We hope to make an impact here through the use of virtual reality (VR) by exposing students to different medical fields through a variety of VR modules.

The overall goal is to determine if exposing medical students to VR clinical and surgical modules can assist in their career decision making. Additionally, we will compare surgical performance between medical professionals who learned procedures via lecture vs virtual reality based teaching methods.



***The Effects of the Maternal Diet on Ischemic Reperfusion Injured Adult Dahl Salt-Sensitive Rats*****Authors:** Kadden D, Key K, Lund H, Mattson D**Project Mentor:** David Mattson, PhD

**Background:** Acute kidney injury (AKI) is the largest cause of mortality in critical care settings. Previous studies demonstrated that the protein composition fed to the parents of Dahl Salt-Sensitive (DSS) rats leads to differences in development chronic kidney disease in the offspring despite identical diets. The present experiment examined differences in the response to AKI between rats with parents fed different proteins.

**Methods:** Fifty DSS rats were maintained on identical diets from weaning throughout the experiment. The parents were fed identical diets containing either casein (SS rats) or wheat gluten (SSWG rats) as the protein source. The study examined the response to AKI (induced by 30-minute bilateral occlusion of the renal pedicle) in male and female SS and SSWG rats. Subsets of rats from each group underwent a sham surgery as a control group.

**Results:** For sham rats, serum creatinine concentration remained constant throughout the protocol. Male IR rats had a significantly greater rise in creatinine concentration than females on day 1 post-surgery (1.57 and 0.73 respectively,  $p < 0.001$ ). Male SS rats also showed a statistically higher creatinine on day 1 than male SSWG rats (1.79 and 1.37 respectively,  $p < 0.001$ ). All creatinine values trended toward baseline by day 3 post-surgery.

**Conclusions:** Adult offspring of parents fed diets containing wheat gluten showed more favorable outcomes in response to AKI than offspring of rats fed casein-based diet. Females also showed a blunted response to AKI compared to males. Further investigation is necessary to determine how the diet contributes to AKI propensity.

***The Role of PGC-1 $\alpha$  During Endothelium-Dependent Dilation in Human Arterioles*****Authors:** Kadlec A, Chabowski DS, Ait-Aissa K, Hockenberry JC, Otterson MF, Durand MJ, Freed JK, Beyer AM, and Gutterman DD**Project Mentor:** David Gutterman, MD

Blood flow through healthy human vessels releases NO to produce vasodilation, whereas in patients with coronary artery disease (CAD), the mediator of dilation transitions to mitochondria-derived hydrogen peroxide (mtH<sub>2</sub>O<sub>2</sub>). Excessive mtH<sub>2</sub>O<sub>2</sub> production contributes to a proatherosclerotic vascular milieu. Loss of PGC-1 $\alpha$  (peroxisome proliferator-activated receptor  $\gamma$  coactivator 1 $\alpha$ ) is implicated in the pathogenesis of CAD. We hypothesized that PGC-1 $\alpha$  suppresses mtH<sub>2</sub>O<sub>2</sub> production to reestablish NO-mediated dilation in isolated vessels from patients with CAD. Isolated human adipose arterioles were cannulated, and changes in lumen diameter in response to graded increases in flow were recorded in the presence of PEG (polyethylene glycol)-catalase (H<sub>2</sub>O<sub>2</sub> scavenger) or L-NAME (NG-nitro-L-arginine methyl ester; NOS inhibitor). In contrast to the exclusively NO- or H<sub>2</sub>O<sub>2</sub>-mediated dilation seen in either non-CAD or CAD conditions, respectively, flow-mediated dilation in CAD vessels was sensitive to both L-NAME and PEG-catalase after PGC-1 $\alpha$  upregulation using ZLN005 and  $\alpha$ -lipoic acid. PGC-1 $\alpha$  overexpression in CAD vessels protected against the vascular dysfunction induced by an acute increase in intraluminal pressure. In contrast, downregulation of PGC-1 $\alpha$  in non-CAD vessels produces a CAD-like phenotype characterized by mtH<sub>2</sub>O<sub>2</sub>-mediated dilation (no contribution of NO). Loss of PGC-1 $\alpha$  may contribute to the shift toward the mtH<sub>2</sub>O<sub>2</sub>-mediated dilation observed in vessels from subjects with CAD. Strategies to boost PGC-1 $\alpha$  levels may provide a therapeutic option in patients with CAD by shifting away from mtH<sub>2</sub>O<sub>2</sub>-mediated dilation, increasing NO bioavailability, and reducing levels of mtH<sub>2</sub>O<sub>2</sub>. Furthermore, increased expression of PGC-1 $\alpha$  allows for simultaneous contributions of both NO and H<sub>2</sub>O<sub>2</sub> to flow-mediated dilation.

***Improving return to learn communication with schools*****Authors:** Kamer ML, Thomas DG**Project Mentor:** Danny Thomas, MD, MPH

**BACKGROUND:** Return to Learn information given to patients diagnosed with concussion in the Children's Hospital of Wisconsin (CHW) Emergency Department (ED) was being under-utilized by the target audience: the patient's school. The aim of this study was to improve the effectiveness of care of patients in the CHW ED with concussion, by increasing utilization of Return to Learn information provided upon discharge by faxing this information directly to the patient's school.

**METHODS:** Baseline assessment included review of patient medical records and telephone surveys to determine the proportion of patients that shared Return to Learn information with their school out of total number of patients aged 5-17 that were diagnosed with concussion in the CHW ED. Assessment of school preference in receiving information and effectiveness and accuracy of fax numbers was conducted. A database of Wisconsin school fax numbers and a Return to Learn document were created for this project.

**INTERVENTION:** A protocol to fax a Return to Learn document directly to patients' schools was created and carried out by callback nurses in the CHW ED.

**RESULTS:** Following implementation of the faxing protocol, the average percentage of patients with concussion whose school received Return to Learn information increased from 35.7% to 60.5% over 7 months.

**CONCLUSIONS:** Implementation of a faxing protocol to send Return to Learn information directly to patients' schools following diagnosis of concussion improved utilization of Return to Learn information. Additional work is needed to increase both the number of parents who are contacted in order to obtain consent and school information as well as provider utilization of our Return to Learn document.

***Laparoscopic Fundoplication for Refractory GERD: A Procedure Worth Repeating When Necessary*****Authors:** Kanani Z, Helm M, Gould J.**Project Mentor:** Jon C Gould, MD

**Background:** Laparoscopic fundoplication is the current gold standard surgical intervention for medically refractory gastroesophageal reflux disease (GERD). In the long-term, 5-10% of laparoscopic fundoplication patients require reoperative surgery. Our objective was to compare the symptomatic outcomes of primary and reoperative fundoplications.

**Methods:** This was a retrospective review of patients who underwent laparoscopic primary or reoperative fundoplication by a single surgeon between 2011 and 2017. Patients were asked to complete the validated GERD-Health Related Quality of Life (GERD-HRQL) survey prior to surgery and postoperatively at standard intervals to assess long-term symptomatic outcomes and quality of life. GERD-HRQL composite scores range from 0 (highest disease-related quality of life) to 50 (lowest disease-related quality of life, most severe symptoms).

**Results:** There were 136 (62.4%) primary and 82 (37.6%) reoperative fundoplications that met inclusion criteria. Of the reoperative patients in this series, 67 (81.7%) were undergoing their first reoperative fundoplication and 15 (18.3%) their second reoperative fundoplication. Prior to surgery, GERD-HRQL scores were similar for primary and reoperative patients (primary  $27.2 \pm 11.4$  vs. reoperative  $23.5 \pm 12.9$ ;  $p=0.10$ ). Both groups experienced significant improvement in GERD-related quality of life at 2 years following surgery, although this improvement was greater in primary patients (primary  $8.70 \pm 7.77$  vs. reoperative  $14.33 \pm 13.54$ ;  $p=0.02$ ). 30-day complications  $\geq$  Grade III, according to the Clavien-Dindo Classification of Surgical Complications, were similar (2.2% primary vs. 1.2% reoperative;  $p=0.6$ ).

**Conclusions:** Patients who undergo reoperative fundoplication have more severe long-term GERD-related symptoms. However, both reoperative and primary fundoplication patients can experience significant long-term symptomatic improvement without major perioperative morbidity.

***Frailty Markers as Predictors of Outcomes in Geriatric Trauma Patients*****Authors:** Karandikar A, Yu S, Webb T, Cerniglia R, Codner P**Project Mentor:** Travis Webb, MD, MHPE**Objective:**

To evaluate the predictive capability of frailty markers -- including the modified Edmonton Frail Scale (EFS), grip strength, and psoas muscle density (PMD) -- on outcomes in geriatric trauma patients 65 years or older at Froedtert Hospital (FH).

**Methods:**

Patients aged 65 years or older who were admitted to FH's Trauma Surgery Service were assessed for markers of frailty as part of standard of care. CT scans, which were available for a subset of these patients, were used to measure PMD in Hounsfield Units. The relationship of the previously stated frailty markers with patient outcomes including the number of complications, discharge disposition, and death were investigated. Data analysis was conducted with the use of SPSS.

**Results:**

180 patients were included in this study, with a mean age of 77 years. Of 180 patients, 78 had CT scans analyzed for PMD. Upon discharge, 93 patients were deemed to have favorable discharge dispositions, meaning they returned to their original living facility. Unfavorable discharge disposition occurred in 87 patients (i.e. discharged to a facility with higher acuity of care). After analysis with an independent sample t-test, patients with favorable discharge dispositions, on average, were found to have lower EFS scores (3.92 vs. 4.32,  $p=0.327$ ), increased grip strength (49.91lbs vs. 39.94lbs,  $p=0.007$ ), and larger PMD (47.53HU vs. 42.97HU,  $p=.040$ ). No statistical significance was found between the number of complications and EFS ( $r=0.083$ ,  $p=0.269$ ), grip strength ( $r=-0.062$ ,  $p=0.405$ ) or PMD ( $r=-0.81$ ,  $p=0.479$ ). Mortality was not analyzed as only 5 deaths occurred within 30 days of discharge in this study.

***Admission Computed Tomography as a Prognostic Indicator for Surgery in the Setting of Ulcerative Colitis*****Authors:** Katbamna B, Blank J, Hu K, Peterson C, Ludwig K, Ridolfi T.**Project Mentor:** Timothy J. Ridolfi, MD

**Introduction:** Ulcerative colitis (UC) is a chronic inflammatory bowel disease which affects the mucosal lining of the colon. CT scans may demonstrate the severity of mucosal inflammation of UC; however, the predictive value of a CT scan in determining the need total abdominal colectomy (TAC), has not yet been studied.

**Study Aims:** Determine the prevalence of patients admitted with UC and undergoing CT scan within Froedtert Hospital and determine need for further surgical intervention.

**Hypothesis:** CT scan findings such as thickened mucosa, colonic dilation, and whole colon involvement at the time of admission will be predictive for colectomy.

**Methods:** A retrospective chart review was performed at a single institution from January 2008-May 2017. Patients with diagnosed of UC who underwent CT scan during inpatient admission were included. Univariate and multivariate analysis was performed at 30, 90, 180, and 1 year using the Cox proportional-hazards regression model.

**Results:** Among patients having colectomy in 30 days, hazard ratio for hemoglobin on admission was 0.7 (95% confidence interval, 0.5, 0.9). Ascending Colon (AC) wall thickness had a hazard ratio of 2.4 (95% confidence interval, 1.2, 5.1). At 90 days, hazard ratio for undergoing colectomy in patients with rectal bleeding compared to those who did not was 9.8 (95% confidence interval, 1.2, 78.3). Specifically related to the CT scan findings, Descending Colon (DC) and AC wall thickness had hazard ratios of 2.6 (95% confidence interval, 1.017, 6.485) and 2.3 (95% confidence interval, 1.2, 4.6) respectively. When looking at AC wall thickness, the adjusted hazard ratio was 3.3 (95% confidence interval, 1.06, 10.4) for requiring a colectomy within 90 days.

**Conclusion:** CT scan may be helpful in predicting colectomy up to 90 days. Rectal bleeding at 90 days, AC wall thickness at 30 and 90, and with DC wall thickness at 90 days may be useful in predicting the need for colectomy in patients with Ulcerative Colitis.

***Bone Marrow vs Peripheral Blood from Unrelated Donors for Children and Adolescents with Acute Leukemia*****Authors:** Keesler D, St Martin A, Bonfim C, Seber A, Zhang MJ, Eapen M**Project Mentor:** Mary Eapen, MD, MS

Graft-versus-host disease (GVHD) rates are higher after unrelated donor transplantation; thus, we examined whether there would be differences in transplant outcomes by graft type in children and adolescents with acute leukemia. The primary endpoint was overall survival. We studied 872 patients <18 years old who were transplanted with bone marrow (n = 650) or peripheral blood (n = 222) from unrelated donors. The characteristics of the 2 groups were comparable, except recipients of bone marrow were younger than recipients of peripheral blood (median age, 10 versus 12 years). Grades 2 to 4 (hazard ratio [HR], 1.48; P < .001) and grades 3 and 4 acute (HR, 1.69; P < .001) and chronic GVHD (HR, 1.92; P < .001) were higher with transplantation of peripheral blood than with bone marrow. Although relapse risks were lower after peripheral blood transplants (HR, 0.76; P = .05), transplant-related mortality (HR, 1.91; P = .003) and overall mortality (HR, 1.34; P = .032) were higher than with bone marrow transplants. The 8-year probability of overall survival after transplantation of bone marrow was 47% compared with 42% after peripheral blood. The 8-year probability of leukemia-free survival was 40% after transplantation of bone marrow and peripheral blood. Lower relapse after transplantation of peripheral blood negated the survival advantage after transplantation of bone marrow. The observed higher acute and chronic GVHD seen with peripheral blood suggest cautious use of this graft in children and adolescents with acute leukemia.

***Characterization of scavenger receptor expression and function in human adipose tissue depots.*****Authors:** Kenealy B, Reneau J, Nicholson K, Kidambi S, Sahoo D.**Project Mentor:** Daisy Sahoo, PhD

Adipose tissue (AT) serves as an important cholesterol storage site, but the biochemical processes regulating cholesterol homeostasis in different AT depots are poorly understood. Regulation of cholesterol in the body is mediated in part by scavenger receptors, including scavenger receptor class BI (SR-BI) and CD36, and members of the ATP-binding cassette family, including ABCA1 and ABCG1. We hypothesize that differences in cholesterol homeostasis between AT depots are due to differences in receptor expression and/or function. The expression of SR-BI, CD36 and ABCA1 mRNA, as well as the cholesterol efflux capacity of adipocytes within different AT depots (subcutaneous, SAT and visceral, VAT) was investigated. Subjects (n = 25; 64% female) were stratified based on presence or absence of metabolic syndrome (MS, n=18). To assess function, differentiated mature adipocytes were cultured from SAT and VAT (n=2) and cholesterol efflux assays were performed. Our data indicated that SR-BI and CD36 expression, but not ABCA1 expression, were significantly higher in SAT compared to VAT. Additionally, in those without MS, SR-BI and CD36 expression continued to be higher in SAT compared to VAT, but this difference was absent in those with MS. We also showed that VAT-derived adipocytes exhibited an increased ability to efflux cholesterol to both HDL and apoA-I acceptors compared to SAT-derived adipocytes, with HDL serving as a more efficient cholesterol acceptor than apoA-I. Collectively, the data suggest that AT depots differ in their capacity to regulate cholesterol homeostasis, perhaps due to differential expression of SR-BI and CD36.

***A longitudinal study of burnout and resilience among first year medical students at MCW*****Authors:** Khan S, Ferguson C.**Project Mentor:** Catherine Ferguson, MD**Objective and Background:**

Our objectives were: 1) to understand how the levels of burnout, depression, stress, anxiety, maladaptive perfectionism, and self-compassion reported by medical students changed over an academic year; and, 2) to determine the effects of a pilot well-being curriculum on these measures over an academic year.

**Methods/Approach:**

138 medical students from all four classes enrolled at MCW completed surveys that combined four validated inventories to assess various measures of well-being, including burnout, depression, anxiety, and stress, maladaptive perfectionism, and self-compassion at the beginning of the 2017-2018 academic year and again at the end.

**Results:**

All respondents were moderately to extremely severely depressed, stressed and anxious. Both depression and stress scores significantly worsened over the year. Depersonalization scores increased significantly over the year, with males having significantly higher scores than their female counterparts. Students had moderate levels of self-compassion and these levels did not change over the year or between classes. The overall scores for maladaptive perfectionism were not increased from undergraduate peers. While the pilot well-being curriculum was very well-received by the students and 90% of respondents felt that all medical students should receive it, those students participating in the well-being curriculum did not have significantly different scores than their peers.

**Conclusion:**

We found that the medical students in our study have extremely high levels of depression, anxiety and stress. A brief pilot curriculum focused on well-being was very well-received by students who felt that it should be a part of the general curriculum, but exposure to this curriculum did not significantly impact these measures. The findings from this research project should be evidence that medical students face extreme stressors throughout medical school and a substantial intervention is warranted.

***Frequency of Fertility Preservation Discussion In Cancer Patients Varies Based On Age*****Authors:** Dietrich P, Machen G. L., Kiani K, Sandlow J.**Project Mentor:** Jay Sandlow, M.D.

The American Society of Clinical Oncology (ASCO) recommends that all patients with a cancer diagnosis be counseled on the impact of their disease and treatment on fertility. Despite this, oncofertility is often omitted in pretreatment discussion and planning. The reason for lack of adequate counseling and referrals for fertility preservation is unclear. This study seeks to evaluate the prevalence of cryopreservation discussions. In this analysis, chemotherapy or radiation therapy as primary treatment were significantly associated with cryopreservation counseling. Patients aged 30-39, 40-49, and 50-60 were significantly less likely to receive counseling when compared to patients aged 18-29 while controlling for other variables. Reproductive side effects are not as openly discussed as other systemic side effects when a patient receives a cancer diagnosis or when they start treatment. Our study indicates that cryopreservation is vastly under discussed. Younger patients and those undergoing chemotherapy or radiotherapy alone as primary treatment were more likely to receive cryopreservation counseling. As assisted reproductive techniques have become more successful and readily available, it is important to include options and counseling for all patients

***Stereotactic body radiation therapy for palliation of bone metastases: practice patterns and outcomes.*****Authors:** Kinchen C, Taylor T, Robbins J, Johnstone C.**Project Mentor:** Candice A. Johnstone, MD, MPH

Stereotactic body radiation therapy (SBRT) is an emerging modality of treatment designed to deliver high radiation doses in few fractions. We examine practice trends in the use of SBRT for managing bone metastases in patients with breast, kidney, non-small-cell lung, melanoma, or prostate cancer.

**Methods:** We selected patients from the National Cancer Database (2004-2013) diagnosed with bone metastases from breast, kidney, non-small-cell lung, melanoma, or prostate cancer. SBRT fractionation regimens were defined as 12-45 Gy in 1 fraction, 14-50 Gy in 2 fractions, 21-50 Gy in 3 fractions, 28-50 Gy in 4 fractions, and 30-60 Gy in 5 fractions.

Standard palliative radiation fractionation regimens were defined as all other cases with 2-40 Gy in 20 fractions or fewer.

**Results:** Patients receiving SBRT regimens made up 1454 of 57,556 total palliative cases. Bone metastases treated with SBRT primarily at the spine (65.5%), hip/pelvis (12.3%), and shoulder/extremity (11.4%). SBRT palliation regimens were used for only 2.5% of patients. Though standard palliative radiation fractionation regimens comprised the majority of treatments (97.5%), SBRT utilization is increasing, with a majority (68.4%) of SBRT cases occurring from 2009-2013.

Treatment at an academic center and lack of comorbidities were positively associated with receiving SBRT regimens.

Mean survival outcomes were higher for patients receiving SBRT (24.3 months) than patients receiving standard regimens (16.9 months).

**Conclusions:** Though the vast majority of bone metastases were treated with standard palliative radiation fractionation, SBRT utilization increased from 2004-2013, with the greatest portion of SBRT cases occurring at academic institutions. Patients receiving SBRT exhibit better survival outcomes, likely as a result of patient selection practices.

***Natural Interfaces for the Evaluation and Management of Shoulder Dysfunction*****Authors:** Korducki J, Burns E, Grindel S, Tarima S, Urbain J, Mischkl D.**Project Mentor:** Edith Burns, MD

Shoulder dysfunction affects >50% of individuals 60 years or older. Physical therapy (PT) is an effective and standard treatment component, yet adherence is low and knowledge on home exercise adherence is sparse. We developed an exploratory study to determine whether supplementing PT with objective visual feedback increases adherence to PT and home exercise (HE). Novel software was developed for a motion-sensing Kinect camera, translating video images of patients performing standard range of motion (ROM) maneuvers into skeletal avatars. Images were recorded, stored, and played back, providing objective visual documentation of progress. Participants were randomized to the intervention group (IG, viewed current and previous images at each of 4 study visits) or control group (CG, imaged but did not view clips). All participants completed questionnaires regarding daily function, perceived improvement, PT effectiveness, and time spent on HE. 21 patients mean age 66.8+/- 6.5 years attending physical therapy for first-time management of shoulder impairment were consented and enrolled. IG and CG were similar in age, demographics, and dysfunction due to shoulder impairment. IG spent more time performing HE, 42.1 +/- 29.8 min/day vs. 19.1 +/- 8.2 min/day ( $p = 0.04$ , 2-sample  $t$  test). IG experienced 0% study dropout rate vs. 40% for CG (Fisher exact test;  $p=0.04$ ). Adjusting for baseline ROM, IG demonstrated a trend towards greater gain in forward elevation ROM from visit to visit, compared to CG (9.25 deg ROM/visit vs 0.49 deg ROM/visit respectively;  $p=0.17$ ). Providing objective visual feedback on progress was associated with greater adherence to HE, lower attrition rates from PT, and possibly greater increases in ROM recovery. The results provide encouragement that objective and visual feedback on progress spurs motivation to adhere to PT treatment plans and should be further explored in clinical settings.

***HAPI: A community-engaged partnership providing advocacy and education to homeless pregnant women*****Authors:** Kostelyna S, Howard L, Fitzgerald A, Farias E, Ake T, Stagg M, Diehr S.**Project Mentor:** Sabina Diehr, MD**Community Partner:** Milwaukee Women's Center

Women who experience homelessness during pregnancy have poorer birth outcomes than the general population. The result of a previous needs assessment informed the design of the Health Advocacy in Pregnancy and Infancy (HAPI) program, a patient-centered service-learning program for medical students and homeless pregnant women.

**Objective:** To improve perinatal health of homeless mothers and their babies by implementing a service-learning program consisting of educational modules on perinatal health and a student partnership program.

**Methods:** Short educational modules on nutrition, mental health, infant care, breastfeeding, and contraception were taught at a Milwaukee homeless shelter. Debriefing forms were completed following each session evaluating participant satisfaction and suggestions for improvements. Mothers were also invited to participate in a 1:1 student partnership program during pregnancy and through age one of their infant(s). The partnership program was evaluated by participant retention and satisfaction, through self-reporting of maternal health and infants' birth weights, gestational age, immunization status, and attendance at well-child checks.

**Results:** Following the 26 sessions presented, 74 unique analyzable comments were provided. Of those comments, 70.3% were positive and 21.6% included requests for additional information or educational materials with several themes identified. Six women joined the student partnership program and two women remain currently engaged, have completed appropriate health questionnaires, and have delivered three healthy infants.

**Conclusion:** The HAPI program has provided well-received education on perinatal health with actionable areas for improvement in the future. The student partnership welcomed three healthy infants, however, retention in the student partnership program continues to be a challenge with unreliable communication as a significant barrier.

***The Hidden Hand: Hand-Assisted Laparoscopic Sigmoid Colectomy is Underrepresented in Coding Data*****Authors:** Kurtz B, Blank J, Peterson C, Ridolfi T, Ludwig K.**Project Mentor:** Kirk A. Ludwig, MD

**Introduction:** Laparoscopic sigmoid colectomy (LSC) has been associated with improved patient outcomes. However, a purely LSC is a technically challenging procedure with a significant conversion rate to open surgery in difficult cases. Hand-assisted laparoscopic surgery (HALS) is an alternative to both laparoscopic and open procedures with similar outcomes benefits to those of laparoscopy. The utilization of HALS compared to LSC is unknown as billing codes classify HALS the same as LSC. We hypothesize HALS sigmoid colectomies are performed at a higher rate in our institution than standard laparoscopy.

**Study Methods:** A retrospective chart review was performed on adult patients who underwent LSC between 2008 and 2017. We queried our institution's EMR using the CPT code for laparoscopic sigmoid resection. Specifically, the operative report was queried for documentation of the insertion of a hand within the abdominal cavity. This defined a HALS operation. Descriptive statistical analysis was then performed on data.

**Results:** This query retrieved 528 patients using the CPT for LSC. Of these, 275 patients truly underwent LSC (52.1%). Ten (3.6%) procedures began laparoscopically and 265 (96.4%) procedures began with HALS. Of the ten cases begun laparoscopically, one converted to HALS and one to open, for an overall conversion rate of 20% (2/10). In comparison, four HALS cases were converted to open sigmoid colectomy for a conversion rate of 1.5% (4/265). Average age, BMI and hospital stay were similar between LSC and HALS.

**Conclusions:** HALS sigmoid colectomy was frequently used by nearly all providers in our institution despite procedure names and codes that do not clearly identify this technique. HALS may be a more common technique than previously understood, due to inconsistencies in coding different types of minimally invasive surgery. Coding practices could be changed to identify these patients who may represent more difficult or challenging cases for the surgeon



***Rehabilitation of Victims from the 2015 Nepal Earthquake*****Authors:** Kayastha G MD, MPH, Mackinney T, MD, MPH1**Project Mentor:** Theodore MacKinney, MD, MPH1**Community Partner:** Patan Academy of Health Sciences

Background: In April 2015 an earthquake struck Nepal causing nearly 9,000 fatalities and 23,000 injuries. Objectives: To summarize the extent of rehabilitation services offered in Nepal following the earthquake, and to qualitatively describe the care of earthquake victims. Methods: healthcare professionals were interviewed from 06/20015-07/2015. Results: 10 interviews were conducted with physicians, surgeons, therapists, and administrators from five hospitals near Kathmandu. Except one hospital, all facilities had only basic physical therapy equipment. As described in other earthquakes, common patient injuries included open tibia or fibula fractures. The impact on providers was consistent; all physical therapists interviewed reported working with dramatically increased patient loads that they struggled to manage. A significant barrier to continued care was transportation cost and misconceptions regarding therapy. Family support was vital to recovery. Compared to international standard earthquake rehabilitation practices, most facilities surveyed were found inadequate. Conclusions: without resources, most Nepali facilities provide minimal levels of physical therapy.

***Effectiveness of Bariatric Surgery Prior to Total Joint Arthroplasty -- A Systematic Review*****Authors:** LaPrade M, Schwab J, Kidambi S.**Project Mentor:** Srividya Kidambi, MD

Background: Morbidly obese adults (BMI above 40 kg/m<sup>2</sup>) have higher rates of osteoarthritis and more post-operative complications following total joint arthroplasty (TJA) compared to patients with normal BMIs. Bariatric surgery (BS) is occasionally offered to morbidly obese patients by surgeons in hopes of reducing complication rates. It is unknown if BS before TJA lessens postoperative complications in this population.

Hypothesis: We hypothesized that BS prior to TJA in morbidly obese patients would decrease complication rates compared to morbidly obese patients who did not undergo BS before TJA.

Specific Aims: Our objective was to perform a systematic review to determine whether BS prior to TJA reduced post-operative complications in the morbidly obese population.

Methods: A systematic literature search was conducted on PubMed and included morbidly obese patients who underwent BS prior to TJA. Over 100 papers were initially analyzed, and 13 studies were chosen for analysis.

Results: There were conflicting results among the 13 studies analyzed, which included 12,759 patients who underwent BS prior to TJA. Nearly half of the studies demonstrated decreased complication or revision rates in patients who underwent BS prior to TJA. In comparison, one study demonstrated a potentially greater risk of complications in patients who underwent BS prior to TJA. The rest of the studies showed no significant change in complications in patients who underwent BS prior to TJA.

Conclusions: A systematic review of the literature suggests that BS prior to TJA does not significantly affect complication rates in morbidly obese patients. However, BS prior to TJA may reduce costs, co-morbidity burden, and length of stay in morbidly obese patients.

Future Directions:

The data on this matter was often overlapping or underpowered, limiting our ability to draw definitive conclusions.

Future prospective studies are highly recommended.

***Parent Preferences Regarding Home Oxygen Use for Infants with Bronchopulmonary Dysplasia*****Authors:** Lau R, Crump RT, Brousseau D, Panepinto J, Nicholson M, Engel J, Lagatta J**Project Mentor:** Joanne Lagatta, MD, MS

**Objective:** To determine parent preferences for discharge with home oxygen in infants with bronchopulmonary dysplasia (BPD).

**Study design:** Prospective study of parents of infants <32 weeks with BPD approaching NICU discharge. Parents were presented a hypothetical scenario of an infant who failed weaning to room air, and two options: discharge with home oxygen, or try longer to wean oxygen. LOS and readmission outcomes were increased or decreased until the parent switched preference. Three months post-discharge, parents were asked to reconsider their preference. Differences were analyzed by chi-squared or Kruskal-Wallis tests.

**Results:** Of 125 parents, 50% preferred home oxygen. For parents preferring home oxygen, the most important reason was comfort at home (79%). 40% switched preference when the LOS difference decreased by 1 week; 35% switched when readmission increased by 5%. For parents preferring to stay in NICU, the most important reason was fear (73%). 32% switched preference when the LOS difference increased by 1 week; 31% switched when readmission decreased by 5%.

110 parents completed 3-month follow-up; 80 were discharged with home oxygen. 78% would prefer home oxygen (97% who initially preferred home oxygen, 60% who initially preferred to stay in the NICU).

**Conclusions:** Parents weigh differences in NICU LOS and readmission risk similarly. After discharge, most prefer earlier discharge with home oxygen. Earlier education to increase comfort with home technology may facilitate NICU discharge planning.

***Systematic Literature Review of Trauma-Informed Care Curricula for Primary Care Providers*****Authors:** Laurent E, Gundacker C, Barry C **Project Mentor:** Courtney Barry, PsyD, MS; Constance Gundacker, MD, MPH

**Purpose:** The purpose of this literature review is to determine the current approaches to trauma-informed care training for primary care providers.

**Methods:** The authors performed an extensive literature search using terms related to “trauma-informed care”, “primary care”, and “training” in multiple online databases including OVID Medline, PsycINFO, Academic Search Premier, and MedEd Portal. Inclusion criteria included trauma-informed care training programs for primary care providers, trauma as defined by SAMHSA, evaluations of the trainings, English language, and settings within the US. Exclusion criteria included discussing organizational implementation of trauma-informed programs without describing provider training, definitions of trauma not described by SAMHSA, non-primary care providers/settings, no evaluation of training, non-English language, and non-US settings. Each author individually reviewed abstracts before determining as a group which would be included in the full-text analysis. Included article analysis involved identifying unique curricula and evaluating them based on target population, educational method, topics covered, evaluation methods, and results.

**Results:** Of the 3843 resultant articles, 40 full-text articles were reviewed with 6 being included in the final literature review. The 6 articles exhibit 5 distinct curricula.

**Conclusion:** There is a paucity of literature on trauma-informed care training curricula for primary care providers. Multiple articles reported an increase in provider confidence providing trauma-informed care, improved knowledge about trauma and health impacts, improved attitudes toward patients with trauma, and changes in provider behavior after the trainings. Future research directions include determining the impact of trainings on quality of care, patient health outcomes, and patient behaviors and determining the need for trauma-informed training at our institution.

***Identifying Parameters for Defining Tracheostomy Fitness in the Critically Ill.*****Authors:** William S Leber, Jonathan Bock, MD**Project Mentor:** Jonathan Bock, MD**Abstract:**

Tracheostomies are life-saving procedures performed by surgeons or physicians at the bedside to improve ventilation in the setting of respiratory failure. However, for critically ill patients suffering from respiratory distress, otolaryngologists are routinely consulted to assess the airway and perform these procedures. Currently, there is no specific risk stratifying criteria to assess the fitness of the patients for the placement of a tracheostomy. The goal of our study is to explore and identify patient parameters to establish a protocol for performing a tracheostomy in critically ill patients. A multi-institutional retrospective chart review was completed on all adult patients in the ICU who underwent elective tracheostomies for respiratory failure. Patient hospital admission and operative data were abstracted from the electronic medical record to analyze parameters that may play into the prognostication of perioperative morbidity and mortality. The data was then analyzed for statistical significance using the Chi-Square, Fisher, and Student t-test calculations. Due to the multi-institutional nature of the project and large sample size, we will develop criteria that provide specific indications for otolaryngologists performing tracheostomies in critically ill patients with respiratory failure. This study aims to provide medical professionals a simplified method of making complex medical decisions for critically ill patients in need of a tracheostomy.

***Clinical Outcomes of Drug Coated Balloon Therapy in Patients with Critical Limb Ischemia*****Authors:** Lee S, Stiff A, Wohlaue M, Hieb R, Patel P, White S, Seabrook G, Rossi P, Lee CJ.**Project Mentor:** Cheong Jun Lee, MD

**Objective:** Drug Coated Balloon (DCB) treatment is widely employed in the treatment of peripheral arterial disease (PAD). Treatment outcomes of DCB in patients with critical limb ischemia (CLI) is still lacking. Objective of this study is to compare and assess clinical outcomes of DCB treatment versus standard angioplasty and stenting (SAS) in patients with CLI.

**Methods:** Patients with CLI who have undergone endovascular interventions for femoro-popliteal artery occlusive disease between 2013 to 2017 were identified retrospectively from an institutional database. Relevant patient data and clinical outcomes were collected and compared between DCB and SAS. Primary outcomes assessed and compared included target limb salvage rates, patency and frequency of secondary interventions (SI). Univariate and multivariate analysis were used to determine predictors of major amputations and SI.

**Results:** During the study period, 122 patients with CLI were identified who underwent endovascular treatment of primary femoro-popliteal disease (DCB = 58, SAS = 64). Mean lesion length treated was 14.7 cm (SD 8.9) in the SAS group versus 13.7 cm (SD 7.8) in the DCB group ( $p = 0.317$ ). Overall 12-month target limb salvage rate was not statistically different between DCB (87%) and SAS (83%) ( $p = 0.168$ ). 6 month and 12 month freedom from SI was 84% and 75% respectively with DCB versus 85% and 70% respectively for SAS ( $p = 0.651$ ). Female gender (HR 2.1,  $p = 0.02$ ) and higher TASC classifications (HR 1.8,  $p = 0.035$ ) were significant risk factors for reintervention. One-year mortality in the cohort was 48%.

**Conclusions:** DCB treatment demonstrates non-inferiority compared to SAS in CLI patients but definitive efficacy cannot be supported by this data. Female gender and higher TASC classification in lesions were associated with higher risk of reinterventions following DCB or SAS.

***Review of Religious/Spiritual Coping and Psychological/Physical Well-Being in Medical Students*****Authors:** Lin BN, Jotterand F.**Project Mentor:** Fabrice Jotterand, PhD, MA

**INTRODUCTION:** Studies have shown that US medical students have higher levels of burnout relative to their peers. Burnout has been associated with personal and professional adverse events such as substance abuse/dependence, depression, suicidal ideation, increased medical errors, decreased empathy for patients, and decreased patient satisfaction. Numerous studies have attempted to investigate what factors may prevent or mitigate burnout, but not many have studied the role of religion and spirituality as a coping mechanism in medical students.

**OBJECTIVE:** The purpose of this project is to review the current literature and investigate if and how religious/spiritual coping in medical students may function in relation to their psychological and physical well-being.

**METHODS:** A PubMed literature search of papers published between 1967 and 12/31/2018 was performed using the following keywords: religion; medical students. This search was limited to studies that included a measure of religion/spirituality in relation to psychological or physical well-being outcomes (ex. depression, anxiety, burnout, suicide/suicidal ideation, high-risk behaviors such as smoking/alcohol/illicit drug use) in medical students. The following were excluded: non-English papers and case studies. After these exclusions, 20 articles were included in this review.

**RESULTS/CONCLUSIONS:** The evidence pertaining to whether religion and spirituality functions as an effective means of coping for medical students is inconclusive due to conflicting results. There is also a lack of standardization in the instruments being used to assess well-being outcomes such as quality of life, depression, anxiety, and stress. Further research is warranted to validate the instruments being used in individual religious/spiritual populations and to adjust for differences in cultural backgrounds and medical training/programs.

***Parental understanding of fetal interventions in complicated twin pregnancies: a qualitative study.*****Authors:** Lindekugel S, Olson K, Leuthner S, Peterson E.**Project Mentor:** Steve Leuthner, MD, MA

Parents presenting with a complicated twin pregnancy (Twin-twin transfusion syndrome [TTTS], fetal abnormality, or selective IUGR), are often offered fetal interventions. Little is known about the parental understanding of and participation in the decision-making process. Our objective was to describe the reasons why patients accept or decline fetal intervention in cases of complicated twin pregnancy using qualitative methods. Medical records from patients presenting to a fetal treatment center were reviewed to identify families who were offered a fetal intervention. We used intentional recruitment to enroll 17 parents. Parents completed semi-structured interviews with the study team generating audio data. Multi-investigator transcript coding and data collection continued until thematic saturation resulted in an experiential frame for analysis. Three themes emerged. (1) The magic of twin pregnancy and its singular identity: parents viewed twin pregnancy more positively and as a single identity rather than differentiating fetuses. (2) Priming and intervention as curative: prognostication by the referring obstetrician created enduring expectations around the purpose and outcomes of fetal intervention. (3) Critical time frame influences parental information saturation, attention, and impression of agency: the short time period during which diagnosis, decision, and intervention occurred limited parental understanding and reduced perception of agency. Conclusion: The data suggests parental understanding could be enhanced: (1) through targeted education of referring obstetricians regarding the goals and outcomes of fetal surgery, (2) by addressing gaps in patient counseling to provide experiential information, and (3) to enhance resources to address ambiguous fetal loss.

***Cost-Utility of Smartphone Camera vs. Tabletop Digital Fundoscopy for Diabetic Retinopathy Screening*****Authors:** William J, Hueston, MD**Project Mentor:** William Hueston, MD

Background: Diabetic retinopathy (DR) is the leading cause of adult blindness in the United States. Diabetics should be screened regularly, but economic barriers to healthcare access mean that compliance can be as low as 18% in some rural and inner-city communities. Stereoscopic dilated eye exam is the gold standard for evaluating retinas but is very expensive and time consuming, requiring an on-site eye specialist. Technological advances in the last decade have led to more efficient and cost-conscious methods of screening. Increasingly powerful tabletop digital cameras (TDCs) allow high quality retinal images to be obtained by on-site technicians, which can be evaluated remotely by a physician at a later time. Nonetheless, the cameras that exist now are very expensive and bulky, which preclude their use in economically disadvantaged communities that would benefit the most from their use.

Methods: We explore smartphone fundoscopy (SF) as a low cost screening alternative. Cost-benefit analysis was performed using a decision tree model. Empiric data for disease prevalence, screening device sensitivity, specificity, as well as Medicare payment rates, were used and results plotted against each other graphically.

Results: Baseline DR prevalence of 28% was used. For TDCs, data for test validity was obtained from the non-weighted mean of 22 studies and found to be 82.9% for sensitivity and 92.2% for specificity which resulted in a cost of \$576.12 spent for each case of DR diagnosed. For smartphone fundoscopy, 2 studies were used returning a sensitivity of 72% and specificity of 75%, resulting in \$506.85 per case diagnosed.

Conclusion: Based off of Medicare payment rates, current smartphone camera technology is capable of providing cost-effective screening compared to existing tabletop digital cameras, despite falling short of the minimum 80% sensitivity recommended by the British Diabetic Association.

**Thomas, PhD, Monica*****Understanding Chemokine Promiscuity at G Protein Coupled Receptors*****Authors:** Thomas M, Volkman B.**Project Mentor:** Vrian Volkman, PhD

Chemokines are small, secreted proteins that share a common tertiary fold and function to induce cellular chemotaxis by interacting with cell surface G protein-coupled receptors (GPCRs). With ~50 known chemokine ligands and only ~20 known chemokine receptors, there exists a high degree of promiscuity in the chemokine system. One chemokine ligand can interact with one or multiple chemokine receptors, and one chemokine receptor can interact with one or multiple chemokine ligands. Interestingly, specificity is maintained in this promiscuous system, and every chemokine ligand does not interact with every chemokine receptor. If the molecular determinants of chemokine-GPCR selectivity, specificity, and promiscuity can be elucidated, we will be better positioned to design specific inhibitors of pathologic chemokine-GPCR interactions. To this end, we have begun to investigate the structural basis for chemokine-GPCR promiscuity utilizing the chemokine ligand CCL28 and its two cognate GPCRs CCR10 and CCR3. We first used comparative modeling to create homology models of human CCR10 and CCR3 and then validated the resulting models using all-atom molecular dynamics simulations. Subsequently, computational docking of the flexible N-terminal peptide of CCL28 was performed. Finally, a mutagenic functional analysis of the N-terminus of CCL28 was performed, and CCR10- and CCR3-specific interaction sites were identified. Using this approach in a broader context, we can begin to understand molecular features that mediate the delicate balance between specificity and promiscuity for chemokine-GPCR interactions.

***Clinical Decision-Making Tools Embedded in the Electronic Health Record Reduce Patient-Provider Mismatch*****Authors:** Livingston AJ, Wainaina JN**Project Mentor:** J. Njeri Wainaina, MD

**Background:** Preoperative consultation before surgery aims to minimize complications and optimize patient outcomes. To aid referring surgical departments in matching their patients to the most suitable clinician at the Froedtert Hospital multidisciplinary preoperative clinic, a referral order that incorporated clinical decision-making support was developed within the electronic health record (EHR) to replace the previous paper decision tool.

**Methods:** We performed a retrospective review of patients who underwent preoperative evaluation at the Froedtert Hospital preoperative clinic prior to neurosurgical procedures between March 1, 2017 and May 31, 2017 while the paper decision guide was in use (pre-intervention period) and between March 1, 2018 and May 31, 2018 after the referral order became available in the EHR (intervention period). We assessed each appointment to determine if the patient was scheduled with the appropriate provider.

**Results:** 191 patients were scheduled in the preoperative clinic prior to neurosurgical procedures during the pre-intervention period in 2017 and 209 patients were scheduled during the post-intervention period in 2018. During the pre-intervention period, 121 (63.35%) patients were scheduled with the appropriate preoperative clinic provider and 70 (36.65%) were scheduled with the incorrect provider. During the intervention period in 2018, 181 (86.60%) patients saw the appropriate clinician and 28 (13.40%) did not. This difference was statistically significant ( $p < 0.00001$ ).

**Conclusion:** A patient referral order in the EHR that incorporates clinical decision support is an effective means to improve the accuracy of the preoperative scheduling process.

***Novel mechanisms of immune evasion by human filarial and schistosomal parasites*****Authors:** Love N, Kron M**Project Mentor:** Michael Kron, MD

A hallmark of chronic infection by many different species of human parasitic helminths is the development of a relative degree of immunosuppression in the human host. This phenomenon is believed to represent an evolutionary adaptation of the parasite to promote its survival in the host. Cytokine orthologues have been implicated in this phenomena however until recently, there were no examples of a parasite-derived chemotactic factor that had structural similarity to human chemokines. Herein we report our research on the first reported example of a parasite “physiocrine” — the *Brugia malayi* asparaginyl-tRNA synthetase (BmAsnRS) — that has one function intracellularly (aminoacylation of tRNA) and a second novel role in signal transduction when it is transported extracellularly via interaction with interleukin-8 receptors. Comparative structural studies of the filarial BmAsnRS and the asparaginyl-tRNA synthetase from the parasite *Shistosoma japonicum* with the known physiocrine human tRNA synthetase splice variants that bind to CCR5, CCR3 or IL-8 chemokine receptors suggest conservation of three-dimensional features with select differences that may account for the differing chemokine specificities of these proteins.

### ***Pulmonary Atresia with Intact Ventricular Septum (PAIVS): A Comprehensive Review of Management Practices***

**Authors:** Luck KM, Punnoose A, Johnson WK, Sachdeva S, Gudauskys T, Woods RK.

**Project Mentor:** Ronald Woods, MD, PhD

**Background:** The current management of Pulmonary Atresia with an Intact Ventricular Septum (PAIVS) is based on the degree of right ventricle and tricuspid annulus hypoplasia, as well as presence of right-ventricular-dependent-coronary-circulation (RVDCC).

**Methods:** Retrospective evaluation of patients with PAIVS admitted to our institution between 2000 and 2016.

**Descriptive analysis of patient characteristics, treatment sequences, outcomes, early (discharge) and late (last-follow-up) survival.**

**Results:** The cohort included 64 cases with a median follow-up of 5-years. Discharge survival for the newborn admission was 97% (62/64); and late survival was 88% (56/64). Median age of death was 103 days (IQR 56.5 days to 3.85 years). Treatment approaches included biventricular-repair in 21 (33%); single-ventricle-palliation in 31 (48%), cardiac-transplantation in 9 (14%) and 1.5-ventricular-palliation in 3 (5%). RVDCC was documented in 19 patients--all 9 transplants had RVDCC. There was no mortality in the biventricular and 1.5-ventricular repair groups. There was 6 (81% survival) deaths in the single-ventricle-palliation group and 2 (78% survival) deaths after transplantation. Survival was 74% (14/19) with RVDCC versus 93% (42/45) without RVDCC. For the 14 RVDCC patients with early listing for transplant, 3 died before transplant, and 2 were de-activated (doing well after the Glenn procedure). In the overall cohort, 5 of the 8 deaths occurred in the first 4.5 months of life.

**Conclusion:** Anatomy that led to a systemic to pulmonary artery shunt was associated with worse outcomes. While transplantation appears to be a reasonable strategy for patients with RVDCC, typical wait list times may exceed the period of highest vulnerability in the first few weeks to months of life. Refinement of methods to provide a stable source of pulmonary blood flow may warrant further consideration.

### ***Pre-Operative Regional Anesthesia Blocks Reduce Post-Operative Narcotics After Roux-en-Y Gastric Bypass***

**Authors:** Mais B, Helm M, Higgins R, Gould J, Kindel T.

**Project Mentor:** Tammy Kindel, MD, PhD

**Background:** Bariatric surgery patients are at an increased risk of morbidity and mortality if they are immobile post-operatively due to pain or insufficient pulmonary hygiene. Regional anesthesia is an attractive, non-narcotic method to treat post-operative pain after surgery. The primary goal of this study is to compare postoperative narcotic usage between laparoscopic Roux-en-Y gastric bypass (LRYGB) patients who did and did not receive regional anesthetic blocks. **Methods:** A retrospective review of primary LRYGB surgeries from 2016-2017 was performed. Based on surgeon preference, some patients received a pre-operative transversus abdominal plane (TAP) combined rectus sheath (RS) block. Univariate analyses were performed between groups to assess 24-hour narcotic usage, pain scores, nausea, and length of stay.

**Results:** There was no difference in sex, age, body mass index, obesity-related comorbidities, or pre-operative opioid use between groups. A regional block did not significantly affect overall length of hospital stay. Patients who received a TAP-RS block (n=87) used significantly less morphine equivalents in the 16-24 hour interval after surgery compared to no block (n=42, p=0.02) without a change in the reported pain score (p=0.09). TAP-RS block patients had significantly fewer instances of nausea (p=0.02) with significantly lower usage of metoclopramide (p=0.04).

**Conclusions:** In patients undergoing primary LRYGB, pre-operative regional anesthesia blocks significantly reduced the need for post-operative opioids and anti-emetics in the first 24-hours after surgery. Future studies should study the impact of regional blocks beyond 24 hours on opioid and nausea-related morbidity.

***Improving Immunization and Health Literacy Through a Community-Based Approach*****Authors:** Willis E, Gundacker C, Harris M, Mameledzija M.**Project Mentor:** Earnestine Willis, MD, MPH

**Background:** Immunization coverage rates in Milwaukee have been documented to be as low as 45% for the age-appropriate series, significantly below the Healthy People 2020 target of 80%. CHIMC (Community Health Improvement in Milwaukee's Children) Project was established in 2005, guided by CBPR principles, to address immunization disparities in Milwaukee, while following a Knowledge-To-Action Framework.

**Methods:** CBPR approach guided the development of health literacy materials in the Project, and Wisconsin Immunization Registry was used to track immunization status. Community residents were involved in all aspects of the research design and intervention. Modalities used to enhance immunization health literacy: 1) CHIMC-TCI! Toolkit; 2) social marketing campaign; and 3) intervention using the theory of planned behavior.

**Results:** 1,651 parents/caregivers were enrolled in dissemination phases (n=1,335 Black cohort, n=316 Hispanic cohort). A statistically significant increase in WIR-verified UTD immunization rates was seen from baseline to project completion for children in the Black cohort (Ages 19-35 mos. Pre: 63%; Post: 70%;  $p<0.001$ , and 36-59 mos. Pre: 62%; Post: 86%;  $p<0.001$ ). The Hispanic cohort experienced an increase in UTD immunization status from baseline rates (Ages 19-35 mos. Pre: 63-70%; Post: 75-77%). Data in the Hispanic cohort was not statistically significant, likely due to limited size of population enrolled and shorter time period of study. Both cohorts demonstrated statistically significant increases in health literacy, immunization knowledge, and positive relationship with healthcare providers.

**Conclusions:** A culturally-tailored CBPR approach, using a multilayered intervention, was effective at decreasing immunization disparities and increasing health literacy in Black and Hispanic populations.

***Increasing Low-SES Consumer Access and Use of Milwaukee Farmers Markets to Improve Produce Intake*****Authors:** A. McCurdy, L. Ruffalo, R. Bernstein, J. Casey, M. Kilkenny, M. DeNomie, Z. Carlson, C. Stoming**Project Mentor:** Leslie Ruffalo, PhD**Community Partner:** Fondy Food Center, Ascension Community Fund, Healthier WI Partnership Program

**Background:** Fruit and Vegetable Prescription (FnVRx) programs provide financial incentive for purchasing produce supported by recommendations of healthcare professionals.

**Methods:** This study compared redemption rates of two educational approaches - "brief" and "comprehensive" interventions - used in an FnVRx program. All patients visiting Columbia St. Mary's Family Health Center were eligible, and any clinic team member could refer patients and sign prescriptions. All participants received two-\$20 vouchers to Fondy Farmer's Markets and an education packet. The interventions were assigned by clinic room location, with half the clinic performing one intervention type for the first half of the FnVRx's, and then switching for the second half. For the comprehensive intervention, patient education was provided by a medical student; for the brief intervention, education was the responsibility of the referring clinic team member.

**Results:** 125 prescriptions were provided: 61% brief, 39% comprehensive. Redemption rates for the first \$20 voucher was 52% (52% comprehensive, 51% brief). Medical Assistants (55%) provided the most referrals, followed by physicians (40%). Obesity (41%) and poor nutrition (50%) constituted the main reasons for referral. No statistically significant difference was found between redemption rates (of first or second voucher) with regard to intervention type or provider type. Physicians were more likely to refer patients who were Food Insecure ( $p=0.002$ ) or Obese (0.001).

**Conclusions:** FVRx programs hold promise for connecting patients (particularly with obesity, poor nutrition, and food insecurity) to affordable produce. Results demonstrate that less structured education was no less effective than more structured education at encouraging prescription redemption.



**HEART score analysis: inter-provider reliability of suspicion for acute coronary syndrome by history****Authors:** McDonald WR, Pappademos D, Brooks J, Hoogstra R, Lerner EB**Project Mentor:** Robert Hoogstra, MD

The HEART score is an accelerated diagnostic pathway used to quickly risk-stratify patients presenting to the emergency department with concerns for acute coronary syndrome (ACS). The overall score is computed using five elements: history, EKG findings, age, ACS risk factors, and serum troponin level. Of those five variables, history is the only subjective element of the score. This allows for potential discrepancies in scoring. To our knowledge, no study has quantified the inter-observer reliability among physicians evaluating the same patient for ACS, specifically focusing on this history element. A cross-sectional observational study was performed in real time in the emergency department. EM resident physicians evaluating a patient with a chief complaint of chest pain, chest pressure, or shortness of breath were asked to provide their assessment of the patient's history prior to presenting the patient's case to the attending physician. A weighted kappa ( $\kappa$ ) coefficient was used to determine the inter-observer reliability of the score assessment between EM residents of all levels of training and attending physicians. From intern level to PGY-3, the weighted  $\kappa$  coefficients comparing residents with attending physicians were 0.261, 0.457, and 0.52, respectively. This showed an increased level of agreement as training progressed. However, the maximum value reached was only designated as a moderate level of agreement. Additionally, correlation analysis showed that other elements had a significant effect on history score, even though all variables in the HEART score are meant to be independent. Many healthcare professionals use the HEART score and it is important to mitigate discrepancies in scoring. The moderate level of agreement and variable correlations we found show that more work needs to be done in establishing clear guidelines for history rating when utilizing the HEART score.

**Identifying Diffusion Tensor Imaging Biomarkers for Cervical Spondylotic Myelopathy****Authors:** Mendoza M, Budde M, Kurpad S, Wang M**Project Mentor:** Shekar Kurpad, MD, PhD

Identifying Diffusion Tensor Imaging Biomarkers for Cervical Spondylotic Myelopathy

Purpose/Background:

Cervical Spondylotic Myelopathy (CSM) is the most common reason for patients over the age of 60 to seek spinal surgery, however there are no useful biomarkers for predicting the efficacy of surgery as measured by the Japanese Orthopaedic Association (JOA) score, which is a self-reported score for CSM severity. DTI, an MRI modality that measures water diffusion in biological structures, has been identified as a potential source of useful imaging biomarkers. The goal of this study was to assess different Diffusion Tensor Imaging (DTI) biomarkers to determine potential predictors of positive functional outcomes in patients who had surgery for CSM.

Methods:

72 patients with CSM, as identified by the surgeon, had functional outcomes measured using the JOA at pre-op, 3, 6, 12, and 24 months post-operation prior to surgery. The measured biomarkers were fractional anisotropy (FA), mean diffusivity (MD), and transverse (tADC) and longitudinal apparent diffusion coefficient (lADC). Each was measured at the level of maximum compression, determined using Osirix, and analyzed using the STATA statistical package. Based on JOA score, we identified 2 sub-populations: those who had significant improvements (responders) and those who didn't (non-responders).

Results:

On average, JOA score improved after 3 months post-op, but then plateaued. Additionally, initial JOA was found to be negatively correlated with change in JOA score at each time point. lADC ( $p = 0.017$ ) and MD ( $p = 0.039$ ) was significantly different between responders and non-responders. Other biomarkers were not significantly different.

***Use of Multimodals vs. Interscalene Nerve Blocks for Short Term Outcomes in Total Shoulder Arthroplasty***

**Authors:** Middleton AH, Haidet K, Ziegler DW, Papandrea RF, Mickschl D, Grindel SI

**Project Mentor:** Steven Grindel, MD

**Community Partner:** Orthopaedic Hospital of Wisconsin, Orthopaedic Associates of Wisconsin

**Background:** Total shoulder arthroplasty is an increasingly common procedure associated with noteworthy postoperative pain. This study compares the efficacy of 3 post-operative pain management strategies after total shoulder arthroplasty: multimodals alone, single shot interscalene block, and continuous interscalene nerve block.

**Methods:** Retrospective analysis was performed on patients undergoing primary or reverse total shoulder arthroplasty. Highest pain in the hospital (0-10), opioid use until 3 months postoperatively (morphine equivalents), length of hospital stay (days), and complications were recorded. Patients were asked to recall their worst pain and satisfaction with their pain management. Statistical analysis included ANOVA, t-Test, Chi-Square, and Kruskal-Wallis.

**Results:** A total of 99 consecutive patients, 33 from each group, were reviewed. The average patient receiving multimodals alone reported a highest pain of  $5.7 \pm 2.2$ , whereas patients receiving single shot or continuous interscalene blocks reported  $6.5 \pm 2.0$  and  $7.3 \pm 2.1$ , respectively; the only significant difference was between the continuous block group and multimodals alone. Single shot block was a predictor of decreased opioids during the hospital stay compared to the other two groups ( $p < 0.001T$ ). Length of stay was significantly different between each group ( $p < 0.001A$ ):  $1 \pm 0.0$  for multimodals,  $1.7 \pm 0.7$  for single shot, and  $2.4 \pm 0.7$  for continuous blocks. No difference was noted in recall of highest pain or satisfaction with pain management.

**Conclusions:** Our results suggest that each strategy has benefits and drawbacks related to short term outcomes, and further investigation is needed to determine when or for whom each strategy may provide the most value.

***Caregiver perceptions, observations, and documentation of pediatric hospital discharge education***

**Authors:** Baker A, Millen H, Player B, Gage S, Porada K

**Project Mentor:** Brittany Player DO, MS

Discharge education (DE) is a key component of safe transition from inpatient to outpatient care in the pediatric population. Project IMPACT (Improving Pediatric Patient-Centered Care Transitions) is a multi-site quality improvement project developed to improve care transitions for pediatric patients using a transition bundle. One bundle element focuses on thorough DE and the use of teach back (TB) to confirm caregiver understanding of discharge instructions. The objectives of this study were: (1.) To determine and compare the accuracy of TB documentation and caregiver perception of occurrence with observed performance and (2.) To assess caregiver attitudes about the use of TB for DE and to compare other components of nursing communication during the session along with caregiver perceptions. Observation of DE occurred on the pediatric hospital medicine service at Children's Hospital of Wisconsin using a hospital-approved observation tool to assess use of TB and communication components. Caregivers completed a survey to ascertain perceptions of the DE received. Retrospective chart reviews were done to determine if TB use was documented by the discharging nurse.

Of 70 discharges observed, TB occurred 61% of the time. The use of TB was associated with increased perception of effective DE by caregivers and caregiver perception of TB was a more reliable predictor of occurrence than nursing documentation. Caregivers that perceived that TB had been done found it helpful. Further work is needed to identify barriers to nursing staff performing TB during DE as well as accurate documentation.

***Analysis of optineurin and dynein mutations in the formation of the neuromuscular junction in zebrafish*****Authors:** Eric Clark; Brian Link, PhD**Project Mentor:** Eric Clark; Brian Link, PhD

Age-related neurodegenerative disease have complex etiology and affects millions of people world-wide. Several publications have identified a link between mutations in genes related to mitochondrial homeostasis such as optineurin (optn), and neurodegenerative diseases such as ALS (Wong and Holzbaur, 2014). Our aim in this study was to elucidate how (A) Optineurin functions in relationship to Dynein (dyn), an organelle-trafficking protein implicated in mitochondrial homeostasis, and (B) contributes to motor neuron dysfunction that is commonly seen in age-related neurodegenerative disorders. We propose that mutations in optineurin will hinder motor neuron health formation, and that this will be exacerbated by mutations in dynein.

***Septic Arthritis and Acute Hematogenous Osteomyelitis: Antibigram and Implications for Treatment*****Authors:** Nisreen Mobayed BS; Kevin Schlidt BS; Daniel Roadman BS; Danita Hahn MD; Anna R. Huppler**Project Mentor:** Danita Hahn, MD; Anna R. Huppler, MD

The aim of this study is to compare the epidemiology of osteoarticular infections (OAI) to antibiotic regimens and local antibiograms.

A retrospective study was performed on patients aged 6 months to 18 years with a diagnosis of septic arthritis or acute hematogenous osteomyelitis in a large, free-standing children's hospital between 7/2012 and 7/2017. Exclusion criteria were chronic osteomyelitis, prior trauma or surgery at the site, noninfectious arthritis, and Lyme arthritis. Data collected from the electronic medical record included demographics, initial and discharge antibiotic therapy, and microbiologic results. Data were compared to the local antibiogram during the same time period.

A total of 207 patients were included: 66 patients <4 years (<4Y) and 141 patients ≥4 years (≥4Y). Causative pathogens were identified in 70% of patients. Staphylococcus aureus comprised 55% of positive results in children <4Y and 73% in children ≥4Y. Among S. aureus cultures, 70-76% were methicillin sensitive (MSSA). Overall clindamycin susceptibility was 97%, with all resistant strains detected in children ≥4Y with MSSA. This is strikingly different than the institutional antibiogram showing 79% overall clindamycin sensitivity in S. aureus [82% in MSSA, 72% in methicillin resistant (MRSA)]. Kingella kingae was exclusively identified in children <4Y (21% of positives), which was also the group with the highest rate of culture negative infection (42%). Intravenous clindamycin alone was the most frequent initial antibiotic regimen, prescribed for 41% of all patients. Initial antibiotic regimens matched organism susceptibilities in 95% of MRSA and 85% of MSSA infections.

Our study revealed high rates of clindamycin-susceptible S. aureus in older children and K. kingae and culture-negative infection in children <4 years with OAI. Antibiotic susceptibilities differing from our institutional antibiogram suggest that disease-specific antibiograms will aid with treatment decisions.

***Early Evaluation of Preoperative Diabetes Optimization Program*****Authors:** William Montagne, Carlos E Mendez, Rebekah Walker, Austin Livingston, Leonard Egede**Project Mentor:** Carlos Mendez, MD

It is well established that peri-operative hyperglycemia predicts poor clinical outcomes and increased post-operative complications. A program aimed to improve glycemic control in patients with poorly controlled diabetes (HbA1c greater than or equal to 8%) scheduled for elective surgery was designed and implemented at our institution. Within the preoperative clinic, short notice consult appointments can be scheduled with a physician diabetologist to optimize the patient's diabetes regimen prior to surgery. Fructosamine levels are obtained 2 or 3 weeks after initial intervention to assess short term changes in glycemic control. Records of 37 surgical patients identified as participants were reviewed within the study period and compared with 46 patients who proceeded to surgery without the intervention. Both groups required patients with HbA1c values greater than or equal to 8%. Information was gathered on variables of interest for the intervention and comparison groups. Our results showed a positive impact from the intervention. For the intervention group, the mean pre-visit A1c reflected poor glycemic control (HbA1c of 9.88%). However, mean Fructosamine levels obtained after the intervention showed significant improvement of glycemic control equivalent to an A1c of 6.60%. Mean day of surgery fasting glucose of the intervention group was significantly lower than the comparison group (138.03 mg/dL vs. 175.87 mg/dL). There were six postoperative complications in the comparison group compared to one in the intervention group. In conclusion, the early evaluation of this innovative initiative resulted in significantly improved preoperative glycemic control and showed lower rates of complications.

***Translating Ribosome Affinity Purification (TRAP) for RNA Isolation from Endothelial Cells In vivo*****Authors:** Moran, P, Silverstein, R, Yichen, G, Yuan, R, Barnekow, N, Palmer, J, Beck, A, Ren, B**Project Mentor:** Roy Silverstein, MD

Many studies have been limited to using in vitro cellular assays and whole tissues or isolating of specific cell types from animals for in vitro analysis of transcriptome and gene expression by qPCR and RNA sequencing. Comprehensive transcriptome and gene expression analysis of specific cell types in complex tissues and organs will be critical to understand cellular and molecular mechanisms by which genes are regulated and their association with tissue homeostasis and organ functions. In this article, we demonstrate the methodology for isolation of ribosome-bound RNA directly in vivo in the vascular endothelia of animal lungs as an example. The specific materials and procedures for tissue processing and RNA purification will be described, including the assessment of RNA quality and yield as well as real time qPCR for arteriogenic gene assays. This approach, known as translating ribosome affinity purification (TRAP) technique, can be utilized for characterization of gene expression and transcriptome analysis of certain cell types directly in vivo in any specific type in complex tissues.

***RAS mutation confers prognostic significance in patients undergoing CRS-HIPEC for colorectal cancer*****Authors:** Morgan Z, Krepline A, Hembrook M, Tsai S, Christians KK, Mogal H, Gamblin TC, Clarke CN**Project Mentor:** Callisia N. Clarke, MD

**Introduction:** Approximately 5% of patients with colorectal cancer (CRC) will present with peritoneal carcinomatosis (PC) with a mean overall survival (OS) of 6 months if left untreated. CRS-HIPEC is an aggressive surgical approach to treat PC, and better prognostic factors are needed to facilitate better risk stratification for prospective CRS-HIPEC patients. We performed a single institution study of CRC patients undergoing CRS-HIPEC with curative intent to identify prognostic factors associated with recurrence or overall survival.

**Hypothesis:** We hypothesize that KRAS and BRAF mutations are known poor prognostic factors in metastatic CRC that will risk stratify patients at risk for early recurrence after CRS-HIPEC.

**Methods:** Patients with CRC evaluated for CRS-HIPEC at the Regional Therapies Program at the Medical College of Wisconsin from 2010-2017 were identified. Clinicopathologic data including age, sex, PCI score, completeness of cytoreduction, lymphovascular invasion, neutrophil-lymphocyte ratio, histology, microsatellite stability, BRAF and RAS mutation status were collected and analyzed.

**Results:** 47 patients underwent CRS- HIPEC with curative intent. 22 (47%) were RAS mutant, 4 (9%) BRAF mutant. At median follow-up of 2 years, 23 (48%) died of disease with a median OS of 19 months [IQR: 10-27], 36 (77%) patients developed recurrence with a median disease free survival (DFS) of 7 months [IQR: 5-12]. RAS mutation status and LVI were the only significant predictors of decreased DFS ( $p=0.02$  and  $0.03$  respectively) on univariate analysis. On multivariate analysis neither remained significant.

**Conclusion:** RAS mutation status is an independent marker of poor prognosis after CRS-HIPEC and may provide enhanced prognostic information in these high risk patients. Larger cohort studies are needed to validate these findings. Efforts are ongoing to validate findings in multi-institutional collaborative databases.

***Evaluation of sigmoid colon toxicity and its correlation to dose-volume parameters*****Authors:** Ghulam Mujtaba, Irina Sparks, Beth Erickson**Project Mentor:** Beth Erickson, MD

**Introduction:** The dose-volume constraints related to sigmoid toxicity are not well established for the treatment of cervical cancer with external beam irradiation (EBRT) and image-guided brachytherapy (IGBT). **Purpose:** The goal of our study was to systematically evaluate the rectal and sigmoid contours and dose-volume parameters in patients with sigmoid toxicities following definitive EBRT and IGBT for cervical cancer to gain a better understanding of the potential contributing factors. **Methods:** From January 2008 through March 2017, we retrospectively reviewed the 61 patients treated at the MCW for cervical cancer (stage IB-IV) with intracavitary brachytherapy utilizing 3-T MRI-guided HDR planning. Charts were reviewed for documented sigmoid toxicities, and patients with significant symptoms and colonoscopy/biopsy-proven radiation induced changes in the sigmoid were selected. **Results:** Among 61 cases reviewed, 4 patients were identified, 2 with grade 2 and 2 with grade 3 (CTCAEv4.03) toxicities localized to the sigmoid or rectosigmoid on colonoscopy/surgery. The overall rate of grade  $\geq 2$  sigmoid toxicities was 6.5%. The initial EBRT plus HDR EQD2 D2cc parameters for rectum were  $< 65$  Gy in all patients except 1, whose D2cc was 69 Gy. Sigmoid D2cc was  $< 61$  Gy in 2 patients, and 73.5 and 71 Gy in 2 patients. After creating and analyzing the new rectosigmoid contour, significantly higher D2cc doses were noted, 69.3 Gy, 70 Gy, 76.6, and 82 Gy. **Conclusions:** The identification and analysis of a new rectosigmoid dose-volume parameter in addition to the standard rectal and sigmoid dose volume parameters may help expose non-apparent high D2cc doses at the rectosigmoid junction and be key in identifying exposed portions of the rectum and sigmoid and preventing complications.

***Evaluating the Long-Term Impact of a Health Care Pipeline Program at James Madison Academic Campus*****Authors:** Munshi N, Letellier S, Kendrick R, Meurer L**Project Mentor:** Linda Meurer, MD, MPH**Community Partner:** Milwaukee Area Health Education Center, James Madison Academic Campus

**Problem:** The demographics of healthcare professionals do not reflect those of the general population. Certain ethnic and racial groups are considered underrepresented in medicine (URM). Cultural barriers between provider and patient can lead to care disparities and poorer outcomes for patients.

**Methods:** The Youth Health Service Corps (YHSC) program at James Madison Academic Campus (JMAC) is a community partnership between the Medical College of Wisconsin (MCW), JMAC and the Milwaukee Area Health Education Center (AHEC) that aims to foster interest in healthcare careers in URM high school students. Each year, MCW medical students design and deliver monthly sessions related to health careers. Since 2010, this partnership has involved over 50 JMAC students and 13 medical student leaders. A survey was designed and sent to 55 past participants to determine how involvement in YHSC affected these students' career paths. Information was also gathered from publicly available social media websites.

**Results:** Data was collected from 18 participants (33%). Of those 18, 83% went to college and 50% pursued healthcare careers. 83% of completed surveys reported that involvement in YHSC strengthened or solidified their plans of going into healthcare and 83% agree or strongly agree that YHSC involvement had a positive impact on their lives.

**Conclusions:** Though limited, the available data point to YHSC making a potential impact on students' lives and career paths. To achieve the goal of increasing healthcare interest in underrepresented minorities, the YHSC program will continue with JMAC and MCW student involvement and yearly re-evaluation to improve the program.

***The impact of opioid focused CME and a PDMP mandate on referrals to behavioral health services*****Authors:** Muradian M, Hernandez-Meier J, Zosel A**Project Mentor:** Amy Zosel, MD, MSCS

The increase in opioid prescriptions over the past few decades has been associated with a rise prescription drug abuse with drug overdoses becoming the second leading cause of injury death. To address the growing opioid epidemic many new initiatives have been implemented such as opioid focused continuing medical education programs (CME) and prescription drug monitoring programs (PDMP). Some states, including Wisconsin in 2017, have made usage of the PDMP mandatory when prescribing scheduled drugs. This aim of this study was to assess whether CME and the implementation of a PDMP mandate can be effective at increasing referrals to behavioral health and substance abuse treatment programs in a community health system. The number of referrals was obtained from the electronic health record and providers were also surveyed regarding their opinions and usage of the PDMP. A baseline referral rate was established and compared to the rates after implantation of two CME trainings and the PDMP mandate. The results suggest that while individually the PDMP mandate and CME were not associated with increases in referrals there may be cumulative effects from these interventions as there was an overall upward trend in the referral rate. This was somewhat consistent with the survey findings as providers reported high levels of confidence in finding substance abuse treatment resources and that the PDMP was not primarily used to assess for substance with most relying on their gestalt. These findings suggests that multiple system changes may be required to address the opioid epidemic and while a PDMP mandate and CME may have roles in addressing this, additional research characterizing how the PDMP is used may be beneficial.

***Multimorbidity and Functional Status in Geriatric Veterans*****Authors:** Murray K, Ndukwe K, Burns E**Project Mentor:** Edith Burns, MD

**Introduction:** Chronic medical conditions are the major cause of disability among older adults and tend to limit activities of daily living. Though patterns of multiple chronic co-morbid conditions may contribute to declines in functional status, these patterns have not been well-described. Robust characterization of these patterns may influence a paradigm shift in the care of older adults, focusing less on individual diseases and more on the complex interplay of multiple chronic conditions and how patterns affect functional status, patient perceptions, and healthcare utilization.

**Specific Aims:** 1. Describe patterns of multimorbidity and functional status among geriatric veterans attending appointments at a VA outpatient primary care clinic.

**Study Methods:** The investigation team conducted cross-sectional patient interviews of a convenience sample of patients (> 65 years old) attending outpatient appointments at the primary care Red Clinic at Zablocki VAMC, consisting of standard measures such as Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL), Short Physical Performance Battery (SPPB), and a semi-structured interview concerning patient perceptions.

**Results:** To date, 81 subjects (mean age  $77.7 \pm 8.9$  years; range 65-93) have been interviewed. The mean number of conditions is 16.4. Subject self-reported function yielded a mean ADL of 5.7 (range 0-6) and a mean IADL of 6.5 (range 0-8). Objective functional assessment yielded a mean SPPB of 7.3 (range 0-12). Subjects tend to perceive their chronic conditions as being individual and separate, with little to no interrelatedness.

**Conclusions:** The studied population shares a disease burden of multiple chronic conditions, the accumulation of which tends to be associated with a decline in functional status. While subjects tend to rate their functioning highly (ADL and IADL), SPPB appears to be a better reflection of overall function.

***PatientWisdom Promoting Patient-Centered Care*****Authors:** Cusatis R, Holt J, Asan O, Williams J, Nukuna S, Flynn K, Crotty B**Project Mentor:** Bradley Crotty, MPH, MD

Patient-centered care is a primary goal for healthcare systems. Quality disparities exist in healthcare despite interventions. Minority patients do not connect with their physicians, which alters the quality of care they receive. PatientWisdom allows patients to establish personal preferences prior to appointments, allowing physicians to customize the appointment around the goals and interests of their patients. Patient usage is tracked through Epic as data can be gathered regarding the users and the frequency at which they use PatientWisdom. Effectiveness is monitored using formal summative questionnaires, interviews and focus groups among patients and providers. Qualitative methods were used to analyze the data, identifying common themes among responses. Among five area clinics, 3050 secure messages were initially sent for account creation. Messages were opened by 42% of patients and 30% of the patients that opened the messages then created an account. Patients and providers were interviewed within focus groups or individually which resulted in four main themes including patient voice, space for sensitive topics, rapport building, and agenda building. The implementation of PatientWisdom encourages patients to take a more active role in their healthcare, allowing them to connect with their provider and receive more customized quality care. The shift in patient and physician interactions can help close the quality gap and allow an enhancement of patient-centered care. There are still challenges with this model in regards to patient buy-in, signing up and interacting with the program.

***The Current State of Pediatric Procedural Sedation in Africa*****Authors:** Schultz M, Niescierenko M, Evans F, Gray R.**Project Mentor:** Megan Schultz, MD

During pediatric surgical procedures or other painful procedures, pain management through analgesia and sedation is paramount to prevent certain post procedure complications and morbidities (Schwartz et. Al, 2016). Unfortunately, due to poor infrastructure, lack of monitoring equipment, available drug supplies, training, and skilled personnel, pediatric anesthesia in low and middle-income countries is under-resourced (Anderson et. Al, 2018). Additionally, whereas developed countries have national guidelines for administration of pediatric anesthesia, low resource countries do not; thus, limiting the safety of procedural anesthesia. The aim of the study is to evaluate the current practice of pediatric procedural sedation in Africa. Data will be collected in 3 phases. Phase 1 will entail interviews of Africa medical providers key informants to gather information regarding their use of pediatric sedation. This will be done over the course of three months through phone or online communication methods. Phase II, also conducted in the span of 3 months, will entail sending online surveys to about 1000 African medical providers about the state of pediatric sedation in their countries. Finally, phase III will involve sending online surveys to African members of medical professional society regarding available formal education or training they provide on pediatric procedural sedation. Results obtained will be used as a guide to develop formal guidelines and training for pediatric procedural anesthesia in low resource settings.

***Study of the Role of BATF in T Cells*****Authors:** Nguyen B, Schauder D, Cui W.**Project Mentor:** Weiguo Cui, MD, PhD

CD8+ T cells are significant mediators of type 1 diabetes mellitus. CD4+ T cells are also known to help stimulate CD8+ T cells' autoimmune activity, and studies have shown that IL-21 deficient CD4+ T cells and IL-21 receptor deficient CD8+ T cells prevent the development of type 1 diabetes mellitus in NOD mice. IL-21 from CD4+ T cells has been shown to induce BATF expression in CD8+ T cells, allowing cell survival and activity. BATF is theorized to mediate those functions by regulating gene expression with IRF4 cooperativity. This project aims to understand the function of BATF in CD8+ T cells and the importance of the BATF-IRF4 interaction in CD8+ T cell activity. CD8+ T cells were isolated from P14+ C57BL/6 mice spleens, activated with IL-2, transduced with the retroviral vector MSCV-IRES-Thy1.1 overexpressing BATF or BATF mutants H55Q or E77K, and recultured in IL-2. Cytokine stimulations, annexin V/7-aminoactinomycin D assays, transcription factor assays, and effector molecule assays were performed to assess the effect of BATF or BATF mutant overexpression in CD8+ T cells. BATF overexpression was successful ( $p = 0.0489$ ), but increases or decreases in IRF4, T-bet, granzyme B, tumor necrosis factor  $\alpha$ , and interferon  $\gamma$  expression were not statistically significant. Although not significant, BATF and BATF E77K mutant overexpression trended towards an increase in cell survival in CD8+ T cells. These results demonstrated that BATF likely helps with T cell survival and not all residues in BATF's basic leucine zipper domain contributes to BATF's function and the BATF-IRF4 interaction.



***Stigma, isolation and depression among older adults living with HIV in rural areas*****Authors:** Katherine G. Quinn, Molly K. Murphy, Zack Nigogosyan and Andrew E. Petroll**Project Mentor:** Andrew Petroll, MS, MD

There is a growing population of ageing individuals living with the human immunodeficiency virus (HIV). Older adults living with HIV often contend with intersecting stigmas including HIV stigma, ageism and, for some, homonegativity and/or racism. Although the HIV stigma literature is quite robust, research on the relationship between HIV stigma, social support and mental wellbeing among older adults living with HIV is limited. This study begins to address this gap by examining how intersectional stigma affects social support and mental wellbeing among rural-dwelling older adults living with HIV. Qualitative interviews were conducted by phone with 29 older adults living with HIV, over the age of 50, living in rural areas of the United States of America. Interviews were transcribed verbatim and analysed using thematic content analysis in MAXQDA qualitative analysis software. Analysis revealed three primary themes. The first had to do with gossip and non-disclosure of HIV status, which intersected with ageism and homonegativity to exacerbate experiences that fell within the remaining themes of experiences of physical and psychological isolation and loneliness, and shame and silence surrounding depression. The prevalence of social isolation and the effects of limited social support among older adults living with HIV are prominent and indicate a need for tailored interventions within the HIV care continuum for older adults living with HIV.

***Adolescents' Attitudes of Expedited Partner Therapy Provided in the Emergency Department*****Authors:** Norman B, Pickett M, Hoehn E, Vistocky A, Ciener D, Drendel A**Project Mentor:** Michelle Pickett, MD, MS

Background: Expedited partner therapy (EPT) allows providers to treat patients' partner(s) for certain sexually transmitted infections (STIs) without having to be evaluated, but is underutilized. This study was to understand adolescents' knowledge of EPT, and likelihood of giving EPT received in the ED to their partner.

Methods: The internet-based multicenter cross-sectional survey included English speaking adolescents aged 14-22 presenting to the ED. The 23 questions ranged from demographics and sexual history, to knowledge of EPT, self-efficacy (score 3-12, higher score demonstrates greater self-efficacy), likelihood of delivering EPT to partner (Likert scale, dichotomized as likely vs not likely) and barriers/facilitators via hypothetical scenarios. Data was analyzed using chi-square analysis and t-test.

Results: 393 surveys analyzed: 249 (65%) female, 216 (55%) black, 153 (39%) white. Mean age was 16.8 (SD + 2.0). 147 (37%) considered high sexual risk. 86 (22%) have had a STI. 348 (89%) had no knowledge of EPT. 316 (80%) likely to give EPT to partner(s). No differences in likelihood based on: sexual risk ( $p=0.96$ ), gender ( $p=0.53$ ), history of STIs ( $p=0.78$ ), age ( $p=0.46$ ) or self-efficacy ( $p=0.87$ ). Greatest perceived barrier and facilitator to using EPT were no contact with last partner, and being in a current relationship, respectively.

Conclusion: Overall, knowledge of EPT among adolescents in the ED was low, but likelihood of giving EPT to their partner was high. There was no difference in likelihood among subgroups. Adolescents are likely to use EPT from the ED, therefore it is imperative to increase its use to help prevent reinfections.

***International study on medical students sleep habits*****Authors:** Bellony Nzemenoh, B Tucker Woodson, Zoran Dogas, Zeljko Bosnjak**Project Mentor:** Zeljko Bosnjak, PhD

Inadequate sleep plays a role in the functioning, alertness and attention, interfering with brain's cognitive processes. The prefrontal cortex makes up >10% of the brain and is therefore linked to a multitude of functions. The most notable, being the executive center that controls intelligence, decision making, problem solving, self-control and other higher cognitive behaviors. This study sought to identify factors impacting the sleep hygiene and subsequent day-to-day lives of medical students and compare the sleep habits between The Medical College of Wisconsin (MCW) and international medical students.

An anonymous 55 question survey was administered to MCW, University of Split School of Medicine, and the Josip Juraj Strossmayer University of Osijek School of Medicine medical students. MCW (N=92) and Croatia (N=157) students surveys were collected. Analysis was done using SAS Version 9.4, t-test and chi-squares.

We found that 63.3% MCW students woke up feeling refreshed vs. 78.9% Croatian students feeling refreshed on days without class. 26.4% MCW students report napping during the day vs. 62.2% Croatian medical students. Overall, more Croatian students (65.4%) were satisfied with the amount of sleep they got per night than MCW students (32.2%); though only 41.3% of Croatian medical students' vs 58.4% of MCW students report chronic fatigue. This observational study found that Croatian medical students take less stimulants, less depressants, spend less time on their computers, consume less coffee and alcohol and exercise less frequently than their MCW counterparts.

***The Role of Pigmentation Genes in Foveal Development in Individuals with Normal Vision*****Authors:** Bisola Omoba, Rachel Linderman, Erica N. Woertz, Jenna Cava, Melissa Wilk, Joseph Carroll**Project Mentor:** Joseph Carroll, PhD

**Introduction:** Understanding normal foveal development can clarify the pathophysiology of conditions that disrupt foveal structure and function. In albinism, for example, decreased retinal pigment due to tyrosinase (TYR) gene mutations leads to abnormal foveal anatomy, but many retinal measurements overlap with those of clinically normal patients. The purpose of this study is to examine the retinal anatomy in individuals with clinically normal vision and hypomorphic alleles of known albinism genes such as TYR, and OCA2.

**Methods:** We examined retinal anatomy in 130 individuals with clinically normal vision and no known ocular disease. All subjects had hypomorphic alleles of known albinism genes, as determined by Next Gen sequencing using blood or saliva samples. Foveal pit depth, area, depth and diameter were measured using optical coherence tomography (OCT), and foveal avascular zone (FAZ) area was measured using OCT-angiography. ANOVA with multiple comparisons was used to examine relationships between the number of hypomorphic alleles within each individual and their foveal specializations measurements.

**Results:** Of the 2 genes tested. There was a statistically difference between the number of hypomorphic mutations subjects had and pit volume ( $p = 0.047$ ), pit area ( $p = 0.031$ ), pit depth ( $p = 0.030$ ), pit diameter ( $p = .021$ ) and FAZ area ( $p = .023$ ).

**Conclusions and Next steps:** Hypomorphic alleles of genes involved in melanin biosynthesis alter the pigment profile of the retinas; this in turn affects foveal development. More work needs to be done to expand the number of subjects and to examine other aspects of foveal anatomy, such as cone photoreceptor density.

***Food Doctors: Measuring One-year Retention of Nutrition Education*****Authors:** Bobel E, Otto PE, Brichta C, Quinn C, Tuomela K, Nelson D.**Project Mentor:** David Nelson, PhD**ABSTRACT**

Food Doctors is a nutrition education program that provides lessons to third grade students. The program focuses on a student population that is majority African-American and majority living below the federal poverty line. This study focused on assessing knowledge retention one year removed from the intervention. The study also includes a survey that was used to assess the students' opinions of the intervention. Literature has shown that lectures that included hands on activities had better knowledge retention and an improved attitude towards the subject matter. This was an intervention based study at Milwaukee Academy of Science and St. Marcus Lutheran School in Milwaukee, WI. N =210. Three lessons integrate healthy recipes and approach students through cultural references and the creation of a healthy snack. Past data has shown that the lessons successfully educate third graders in the short-term. In this new study, a cross-sectional one year-post assessment will be administered to the students who participated in the intervention. The assessment is the same pre and post-test administered during their third-grade year. Class performance was assessed using t-test statistical analysis. Students showed an increase in knowledge a year removed from the intervention, especially on questions that directly related to the snacks made in class. Students also claimed to enjoy past lessons and a desire for more education in their curriculum. Hands on nutrition education interventions may result in long-term knowledge gains and attitude shift. This study proves that the Food Doctors program is an example of successful education intervention and can be used to create future interventions.

***A comparison of mental health disorders among sex trafficked children and 3 groups at risk of trafficking*****Authors:** Palines P, Pan A, Nugent M, Ehrman W, Rabbitt, A.**Project Mentor:** Angela Rabbitt, DO**Community Partner:** Rethink Resources, Wraparound Milwaukee

Background: Despite increased research on child sex trafficking, we have poor understanding of mental illness in child victims. Individuals at high-risk for trafficking are often subject to complex trauma that only intensifies during the trafficking experience. This greatly increases their risk of mental illness, although the actual prevalence of mental health disorders in children remains unclear. Objective: To examine the prevalence of mental health diagnoses among a sample of youth identified as being sex trafficked, and to compare these rates to samples of high-risk groups reported in the literature. Participants and Setting: 143 female and male child trafficking victims in Wisconsin. Methods: We retrospectively reviewed individual medical records, identifying mental health diagnoses and behaviors. A literature review was conducted for studies on runaway children, juvenile offenders, and foster children to serve as comparison. Results: We observed significantly higher rates of ADHD (52.4%,  $p < 0.05$ ) and bipolar disorder (26.6%,  $p < 0.05$ ) in our sample of trafficked youth compared to all high-risk groups, as well as for depression (45.5%), anxiety (19.6%), PTSD (19.6%), conduct disorder (19.6%), ODD (25.9%), and psychosis (14.0%) relative to many groups individually. Conclusions: The complex trauma suffered by child survivors of sex trafficking imparts numerous effects with overlapping symptomatology of many mental health disorders. Survivors' adaptive responses to complex trauma may lead to improper diagnosis and treatment of mental health disorders at the expense of prompt access to trauma-focused therapies. Alternative diagnoses and treatment that characterize the complex dysfunction resulting from sex trafficking are discussed.

***HEART score analysis: inter-provider reliability of suspicion for acute coronary syndrome by history*****Authors:** Pappademos DC, McDonald WR, Brooks JM, Lerner EB, Hoogstra R.**Project Mentor:** Robert Hoogstra, MD

The HEART score is a diagnostic tool used to risk-stratify patients presenting to the emergency department with concerns for acute coronary syndrome (ACS). The history component is the only subjective element of the score, allowing for potential discrepancies. To our knowledge, no study has quantified the inter-observer reliability among physicians evaluating the same patient for ACS. We hypothesize that upper level Emergency Medicine (EM) residents have higher rates of inter-observer agreement with attending physicians when evaluating for ACS in the same patient. A cross-sectional observational study was performed in real time in the emergency department. EM residents evaluating a patient with a chief complaint of chest pain, chest pressure, or shortness of breath provided their assessment of the patient's history prior to presenting the patient's case to the attending physician. Their ACS suspicion was graded following the HEART score design. A weighted kappa coefficient was used to determine the inter-observer reliability of the score assessment, which showed a moderate level of agreement between residents and attendings at 0.452. From intern level to third-year residents, the weighted coefficients were 0.261, 0.457, and 0.52, respectively. This showed an increased level of agreement as training progressed with the maximum value only reaching a moderate level of agreement. Additionally, correlation analysis showed that other elements had a significant effect on the history score. Most significantly, ACS risk factors showed a statistically significant small-to-medium effect on resident and attending history scores (Pearson R .239, .222 respectively,  $p < .01$ ). Many healthcare professionals use the HEART score and it is important to mitigate discrepancies in scoring. The moderate level of agreement and variable correlations we found show that more work needs to be done in establishing clearer guidelines for history rating when utilizing the HEART score.

***Improving Sexual Abuse/Assault Evaluations in the Emergency Department*****Authors:** Parthum K, Petska H, Rabbitt A, Bretl D, & Cox J**Project Mentor:** Hillary Petska, MD, MPH

**Background:** Evaluation for sexual abuse/assault (SA) in children can be challenging due to the complex medical, legal, and psychosocial needs of victims. An optimal response is multifaceted, and particularly challenging in the Emergency Department (ED) due to high volume and acuity of care. Requests for evaluation guidance by ED staff, and new state legislation (Wisconsin Act 351) has changed the best practice response to victims seen at CHW.

**Study Aims:** Improve the recognition, medical evaluation, and provision of resources to children who present for a SA evaluation at the CHW ED.

**Methods:** A retrospective quality improvement project of the evaluation, documentation, and management of children less than 18 years of age, who were evaluated for SA in the CHW ED was performed. Cases were selected from the Child Advocacy and Protection Services (CAPS) database, from four, two-month periods, from January 2017 through February 2019. Evaluation was based on documentation of specific criteria, including: patient demographics, details of assault, medical testing and medications given, if an advocate was offered and/or utilized, reporting to outside agencies, and follow-up recommendations. Two interventions occurred, with successive chart review to assess for the effectiveness of each intervention and to guide next steps. First was an ED SmartText; second was a social work template.

**Results:** Ninety-eight charts were reviewed, with ED SmartText used seven times, and social work template used once. Improvement between time periods could not be determined due to infrequency of use. As a result, adherence to the recommended documentation, evaluation, and management were compared between cases within the same time period. Overall improvement was seen when the SmartText was used.

**Conclusion:** While template use exhibits improved documentation, evaluation, and management in cases of SA, under-utilization clearly demonstrates the need for auto-population or BPA alert of templates.

***Patient safety superheroes: Using a comic book to train residents on patient safety*****Authors:** Patel R, Maatman T, Fletcher K.**Project Mentor:** Theresa Maatman, MD

The ACGME Clinical Learning Environment Review (CLER) process required patient safety training for all residency programs. The challenge is developing formal programming that is both engaging and high yield for the learners. Some institutions are using simulation for patient safety teaching. Unfortunately, the MCW residency programs do not have funding to use simulation for this type education.

We used a comic book based learning tool to highlight patient safety issues. The comic consisted of 5 graphics with 24 specific safety concerns spread across them. The comics together took the reader admission for an elderly patient through sign out and decompensation of the patient. Questions were included with each graphic to prompt the reader to look for safety concerns. This comic book was implemented during the internal medicine intern core skills week. Residents had 15-20 minutes to individually identify all the safety concerns in the comic, followed by an open dialogue where the residents identified the safety hazards as a group. The curriculum was implemented three times to in groups of 16-18 participants.

After doing the curriculum 51% of participants were found to have increased their confidence level of identifying patient safety concerns. 65.3% had an increase in their confidence of speaking up about patient safety concerns. Though this was conducted at a single institution the resident population have been trained at multiple medical schools and therefore would be representative of a broader range of safety education. This curriculum helped to demonstrate some of the area of training that starting interns are very familiar with as well as some areas that they are unfamiliar with. Residents seemed to have high awareness of delirium prevention, Fall prevention and polypharmacy. However, there was low awareness about use of name alerts, keeping a bedrail down, proper placement of oxygen tubing on the face and how to tie restraints.

***Perioperative antibiotics and the resolution of hypertension in gastric bypass and sleeve gastrectomy*****Authors:** Patz JJ, Helm MC, Higgins RM, Goldblatt MI, Gould JC, Kindel TL**Project Mentor:** Tammy L. Kindel, MD, PhD

Background: Recent studies have suggested that potential aberrant alterations in the gastrointestinal microbiome contribute to the development of cardiovascular disease, specifically hypertension. We hypothesized that the type of prophylactic antibiotic given for bariatric surgery could impact the resolution rate of hypertension by altering the post-operative gastrointestinal microflora. Methods: A retrospective analysis of adult bariatric patients who underwent Roux-en-Y gastric bypass (RYGB) or sleeve gastrectomy (SG) between 2012 and 2016 was conducted. The standard antibiotic prophylaxis was cefazolin, or clindamycin in patients with a penicillin allergy. Univariate analyses were performed comparing the differing perioperative antibiotic treatments with resolution of hypertension at 2-week ( $\pm 1$  week), 6-week ( $\pm 2$  weeks), 3-month ( $\pm 2$  weeks), 6-month ( $\pm 6$  weeks), and 1-year ( $\pm 2$  months) follow-up appointments. The criterion for resolution of hypertension was no longer requiring medication at time of follow-up. Results: In total, 123 RYGB and 88 SG were included in our analysis. No significant differences were found between cefazolin and clindamycin regarding hypertension resolution rates after SG. There was a significant difference in the resolution of hypertension after RYGB with the use of prophylactic clindamycin versus cefazolin. Patients who underwent RYGB and received clindamycin had a significantly higher rate of hypertension resolution compared to cefazolin. This effect started at 2 weeks post-operatively (52.4% vs 23.5% respectively,  $p=0.008$ ) and persisted up to the 1-year (57.9% vs 44.0% respectively,  $p=0.05$ ). Conclusion: Regarding RYGB, prophylactic peri-operative clindamycin was associated with significantly increased resolution of hypertension compared to cefazolin. This finding was not observed in SG patients. Future studies are needed to confirm the mechanism of action for this novel finding.

***The Impact of Mental Health Disclosure in Applying for Residency*****Authors:** Pheister, M, Wrzosek, M, and Peters, R**Project Mentor:** Mara Pheister, MD**Abstract**

**Purpose:** Medical students have higher rates of depression than age-matched peers. Given the societal stigma against mental illness, students who struggle with depression often seek guidance on disclosing this in residency applications. This study aims to answer whether disclosing a mental illness during the residency application process affects an applicant's success in the National Resident Matching Program (the Match). The authors hypothesized that candidates disclosing mental illness would receive fewer interviews and would be ranked lower than those disclosing physical illness. **Methods:** The authors randomized program directors from all residencies accredited by the Accreditation Council for Graduate Medical Education (ACGME) to receive one of two surveys. Both surveys included similar demographic information and three applicant vignettes, varying only in the presence and type of illness disclosed (Major Depression or Diabetes Mellitus). The authors analyzed data using the Generalized Estimating Equation (GEE) method for ordinal logistic regression. **Results:** Out of 3838 ACGME residency programs, 596 responded. 380 programs (survey 1, n=204; survey 2, n=176) completed the survey. Applicants who disclosed a history of depression had a higher odds of being in a lower category of receiving an invitation or a lower category of ranking compared to the resident who disclosed a history of diabetes. However, strong applicants who disclosed depression still fared better in the application process than an average applicant without disclosed illness. **Conclusion:** Disclosing depression during the residency application process puts an applicant at a notable, though not insurmountable, disadvantage compared to applicants who do not disclose mental illness.

***Electronic Emergency Information Form for Special Needs Children: Emergency Medical Service Focus Groups*****Authors:** Piibe Q, Kane E, Melzer-Lange M, Beckmann K.**Project Mentor:** Kathleen Beckmann, DO**Community Partner:** Children's Health Alliance of WI; Emergency Medical Services for Children WI

**Introduction:** Patient at Risk (PAR) is an online database using an emergency information form (EIF) that parents of children with special health care needs (CSHCN) complete to store their child's medical information. Emergency medical service (EMS) providers can then access these EIFs during an emergency or for emergency planning. PAR has been active for 10 years but use by patients and providers has been limited. **Methods:** Focus groups were held at 32 fire/ambulance houses in Wisconsin. A moderator transcribed answers to the following questions: 1) Have you heard of PAR? Have you used PAR? Why/Why not? 2) What barriers do you see to using PAR? 3) What changes would make you more likely to use PAR? 4) What changes to the EIF would better suit EMS? 5) How would you use PAR for patient care? 6) Do you think PAR is important? Why/why not? 7) Would PAR help you feel more comfortable treating CSHCN? The moderator then reviewed the transcriptions for themes. **Results:** 146 EMS providers participated. 11% of EMS providers were aware of PAR. Many did not use PAR because of a lack of follow up, limited internet access, inconvenience, attending to more urgent responsibilities during calls, and not knowing when to use PAR. Solutions included developing or purchasing new technology, involving dispatch in PAR, and returning to a paper-based EIF. The EIF received positive reviews with few changes suggested. Providers stated they would use PAR to pre-plan or search for patient information while driving to or at the scene of a call. Most providers felt PAR was important because it would help them provide better care and feel more comfortable treating CSHCN. **Conclusion:** EMS providers want to access the information provided by EIFs in PAR and believe this information will help them improve patient care for CSHCN. There are still technological and logistical barriers to overcome, but providers feel that using online EIF databases are important to providing more informed care for CSHCN.

***Expectations of Critical Radiology Result Communication*****Authors:** Qazi Z, Treat R, O'Connor S**Project Mentor:** Stacy O'Connor, MD, MPH, MMS

Intro Timely communication of critical results is a nationally patient safety concern and the division of these results into 3 levels of urgency is accepted. However, little data exists comparing radiologist and referring provider expectations regarding which imaging findings fall into which category of critical results and how these results should be communicated. Methods An anonymous survey asked radiologists and referring providers if ten findings were critical results and, if so, what level. Preferred method of communication for each level, appropriateness of the number of critical results called by radiologists, and level of difficulty in reaching someone were also assessed.  $\chi^2$  test compared the distribution of level category assignment for the findings as well as communication preferences. A word cloud tool was used to analyze free text comments for recurrent themes. Results 19% (124/658) of providers responded. The distribution of level of urgency differed between radiologists and referring providers for intrabdominal abscess ( $p = .019$ ), pulmonary nodule ( $p = .02$ ) and solid renal mass ( $p = .002$ ). Although distribution for DVT was similar for the 2 groups, overall 65/123 (52%) chose Level 2 and 53/123 (43%) chose Level 1. Pager was the preferred method of communication for level 1 53/123 (43%) and level 2 64/119 (54%) critical results. Radiologists were the only specialists that reported many/too many critical results are called 5/32 (16%) and that reaching someone in regard to a critical result is very difficult 2/18 (11%). Conclusion Differences between and among radiologists and referring providers were found in categorization of findings as critical results. Referring providers, especially emergency medicine, are more likely to choose higher levels of urgency. Radiologists and referring providers have differing expectations for critical results communication, creating opportunities for interdisciplinary consensus building and education.

***Exam room prevention of crashes and injury on the road: assessment of geriatric patients' driving ability*****Authors:** Quaglieri C, Kuester J.**Project Mentor:** Jessica Kuester, MD

The second leading cause of injury-related deaths in 65-84 year olds are motor vehicle crashes (CDC, 2015). While the American Medical Association, Department of Transportation, and American Geriatrics Society all offer driving assessment recommendations and resources, there is no standardized assessment tool used by health care providers when assessing the driving ability of elderly patients. This study sought to explore the practices and opinions of health care providers who conduct these assessments. A population of primary care providers at the Clement J Zablocki VA Medical Center in Milwaukee, Wisconsin, was included in this qualitative, ethnographic study which employed anonymous, voluntary interviews and value-ranking surveys. Nineteen of the thirty-nine surveys (48.7%) were returned and most notably displayed a higher value attributed to the importance of the provider assessing the safety of elderly patients than the value attributed to the self-perceived confidence in provider ability to assess the safety of these patients. Six of the thirty-nine participants (15.4%) were interviewed and a wide variety of opinions were expressed on: driving assessment methods in the exam room, the self-perceived role of providers in assessing patients and reporting to the Department of Motor Vehicles, and the concept of standardized screening for driving safety. No participants admitted referencing any materials produced by a healthcare organization to aid in their driving assessment. From these results, it appears that health care providers share a common unawareness or underutilization of assessment resources. Additionally, there is discord in providers' self-perceived role, responsibility, and confidence level in assessing the driving impairment of elderly patients. Future studies should explore the use of standardized screening prompts during the patient encounter and how to best make health care providers aware of current assessment resources.

***Ventricular Assist Device For Bridge-to-Recovery Following High Risk Coronary Revascularization***

**Authors:** Smith N, Ramamurthi A, Cole A, Joyce D, Kamalia M, Joyce L

**Project Mentor:** David Joyce, MD

**Study:** Severe ventricular dysfunction in patients with ischemic cardiomyopathy remains a negative risk factor for morbidity and mortality. Sustained ventricular unloading with a left ventricular assist device (LVAD) may improve outcomes as a bridge-to-recovery (BTR) strategy following coronary artery bypass grafting (CABG).

**Methods:** From 2017 to 2019, seven patients with coronary artery disease and severe ventricular dysfunction (ejective fraction  $\leq 30\%$ ) presented in varying stages of ischemic heart failure requiring revascularization: three in cardiogenic shock (ACC/AHA class D, INTERMACS 1-2) and four electively (Class C-D, INTERMACS 3-5). Given the degree of cardiomyopathy, it was decided to support each patient with an LVAD implanted pre- or intraoperatively.

**Results:** All patients underwent successful CABG with support of either an implantable or microaxial LVAD device. Two patients with microaxial LVADs required reoperation for bleeding and one patient with an implantable LVAD required driveline revision. Patients remained inpatient 9-40 days postoperatively. In-hospital complications included two episode of GI bleeding requiring transfusion, one instance of vocal cord paralysis, complete heart block requiring a pacemaker, and one death due to aspiration. All patients with microaxial devices were successfully weaned to device removal. Implantable LVADs at the time of discharge provided 3.4-5.2 L/min. One patient was able to undergo successful LVAD explantation 305 days after index implant with a recovered ejection fraction of 50%. The remaining implantable LVAD patients continued to requiring support at most recent follow up. Here we describe a novel approach to coronary revascularization in patients with ischemic cardiomyopathy and severe ventricular dysfunction utilizing concomitant LVAD implantation at index CABG as a BTR strategy. This has the potential to offer safe, supported recovery in a high risk surgical population.

***Contribution of placental mitochondrial damage to preeclampsia and associated vascular defects***

**Authors:** Rappelt M, Beyer A, Gutterman D, Toro R, Norwood Toro L, Derayunan A, McIntosh J.

**Project Mentor:** Jennifer McIntosh, DO, MS

**Introduction:** Preeclampsia (PreE), a hypertensive disorder of pregnancy, is the leading cause of maternal and perinatal mortality worldwide. The etiology of PreE is poorly understood. It is believed that the underlying mechanism is related to placentally derived oxidative stress. Recent cardiovascular studies have implicated mitochondrial dysfunction and resulting reactive oxygen species (ROS) as key players in the pathogenesis of hypertension and cardiac disease. A similar mechanism may underlie PreE.

**Hypothesis:** Pregnancies complicated by PreE have decreased mitochondrial integrity as manifested by increased mitochondrial DNA (mtDNA) damage, increased fission which eventually results in decreased ATP production, and elevated levels of ROS.

**Methods:** Fetal and maternal placental tissues from singleton pregnancies were separated into preeclamptic and healthy control groups.

Quantitative PCR assessed the integrity of the mitochondrial genome. Traditional gel-based and gel-free immune assays and were conducted to detect relative expression of mitofusin (MFN) and dynamin related protein 1 (DRP), indicators of mitochondrial fusion and fission respectively.

**Results:** PCR based analysis found an average of 0.032 lesions/10Kb out of 3 placenta samples in the control group. By contrast, mtDNA damage in the 3 PE samples averaged 0.236 lesions/10Kb (~7-fold increase,  $p=0.011$ ). Expression of active DRP-1 (promotes fission) in preeclamptic samples was greater than healthy controls ( $p=0.053$ ). MFN1 (promotes fusion) expression in preeclamptic samples was decreased compared to healthy controls ( $p=0.078$ ).

**Conclusions:** Data from preeclamptic placentas indicates a trend towards greater levels of mitochondrial DNA damage and increased rates of baseline mitochondrial fission, an indicator of mitochondrial stress and dysfunction.



***Influence of preoperative opioid use on postoperative outcomes and opioid use after arthroscopic rotator cuff repair*****Authors:** Williams BT, Redlich NJ, Mickashl DJ, Grindel SI.**Project Mentor:** Steven Grindel, MD

**BACKGROUND:** Recent orthopedic research has questioned the effect of opioid use on surgical outcomes. This study investigated this in the context of arthroscopic rotator cuff repair. We hypothesized that preoperative opioid use would be associated with inferior outcomes and greater postoperative opioid requirements.

**METHODS:** A database query identified adult patients with full-thickness or partial-thickness supraspinatus tears surgically treated between 2011 and 2015. Preoperative and postoperative outcomes scores (active range of motion [AROM], American Shoulder and Elbow Surgeons [ASES], Constant scores, Simple Shoulder Test [SST], and visual analog scale [VAS] for pain) and postoperative opioid use were retrospectively recorded. Patients with less than 2 years of follow-up data at the time of the retrospective review were contacted for prospective ASES, SST, and VAS data collection.

**RESULTS:** A total of 200 patients, 44 of whom received opioids preoperatively, were identified for inclusion. Patients prescribed preoperative opioids had consistently inferior preoperative and postoperative outcomes scores; however, the magnitudes of improvement were not significantly different between groups. Postoperatively, patients in the preoperative opioid group received 1.91 (95% confidence interval, 1.31-2.78) times more opioids over a postoperative course of treatment that was 2.73 (95% confidence interval, 1.62-4.59) times longer. In addition to having a greater proportion of women, this group also had significantly higher rates of certain comorbidities, including back pain, depression, degenerative joint disease, and chronic pain conditions.

**CONCLUSIONS:** All patients demonstrated significant improvements in outcomes scores after surgical repair that were not significantly different between groups. However, patients taking opioids preoperatively did not ultimately reach the same level of functionality and had substantially greater opioid requirements postoperatively.

***Postoperative urinary retention after bariatric surgery: an institutional analysis*****Authors:** Roadman D, Helm M, Goldblatt M, Kindel T, Gould J, Higgins R.**Project Mentor:** Rana Higgins, MD

**Background:** Postoperative urinary retention (POUR) can impact quality outcomes, leading to urinary tract infections, longer lengths of stay, and increased healthcare costs. The incidence of POUR in bariatric patients is unknown. Our primary objective was to determine the incidence and risk factors contributing to POUR in primary bariatric surgery.

**Methods:** A retrospective review was conducted on patients who underwent a laparoscopic sleeve gastrectomy (LSG) or laparoscopic Roux-en-Y gastric bypass (LRYGB) from 2013 to 2017. POUR was defined as the inability to urinate postoperatively requiring urinary catheterization. Univariate and multivariate analyses were performed on perioperative variables and their correlation with POUR.

**Results:** During the study period, 603 patients underwent surgery: 317 (52.6%) LSG and 286 (47.4%) LRYGB. Overall, 49 (8.1%) patients developed POUR. There were no significant differences in preoperative demographics between patients with and without POUR. Patients who underwent an LSG had an increased incidence of POUR compared to LRYGB ( $p=0.002$ ). In both procedures, POUR was associated with decreased neostigmine, isolated non-depolarizing muscle relaxant, and reduced intraoperative fluid (Table 1). LSG and congestive heart failure as well as LSG and body weight were independently associated with POUR (Table 6). Female patients who experienced POUR had significantly increased length of stay.

**Conclusions:** Risk factors associated with POUR after primary bariatric surgery include LSG, less intraoperative neostigmine and intravenous fluids, and isolated non-depolarizing muscle relaxants. These risk factors can help educate patients and providers, as well as identify quality initiatives that focus on perioperative and anesthetic management to reduce POUR and length of hospital stay.

***Rat fMRI Brain Responses to Noxious Stimulation During Spinal Cord Stimulation*****Authors:** Robinson M, Kent A, Saber M, Schwabe D, Khan Z, Hogan Q, Pawela C**Project Mentor:** Quinn Hogan, MD

Introduction: Spinal cord stimulation (SCS) is used to treat various chronic pain conditions. Different stimulation patterns have been proposed to optimize efficacy. Here, we compare three clinically-relevant temporal stimulation patterns in a preclinical neuropathic pain model and evaluate efficacy by mapping the integrated response of pain-activated brain centers to these SCS treatments using functional magnetic resonance imaging (fMRI). Methods: Both naïve and 2-week post tibial nerve injury (TNI) adult male rats had an SCS electrode inserted at the T13 level. During dexmedetomidine anesthesia, 9.4T imaging was performed during noxious electrical toe stimulation ("Nox"). Imaging acquisitions included Nox alone, then Nox during SCS with Tonic, BurstDR, or BurstDR microdosing stimulation patterns. Image acquisitions were averaged across animals and used to create activation maps of the brain regions of interest. Results: In naïve animals, Nox produced dominant signal changes in three regions. Primary somatosensory cortex (S1HL, sensory/discriminative) showed modest reduction of activation by Tonic, but greater effects of BurstDR and mBurstDR. For caudate putamen (emotional/motivational) and anterior cingulate (Cg, cognitive/affective), BurstDR and mBurstDR nearly eliminated Nox-induced changes, whereas Tonic had a moderate effect. Nox-induced thalamus activation was unaffected by SCS. Comparable findings were observed in TNI animals, with most marked effects by BurstDR and mBurstDR in S1HL and Cg. Conclusion: These findings show that all three temporal patterns of SCS suppress pain induced brain activation in control and neuropathic pain animals. Considering what is known about homologous brain centers in humans, these observed changes represent analgesia in the behaving rat.

***Association of CHEK2 Variants with Increased Pancreatic Cancer Incidence*****Authors:** Roki A, Geurts J, Visotcky A, Sparapani R**Project Mentor:** Jennifer Geurts, MS, CGC

Individuals with genetic predisposition to pancreatic cancer (PC) may benefit from early diagnostic screening. Studies have shown that well-known PC-associated genes do not completely account for PC risk, encouraging the research to expand to less studied ones such as CHEK2. However, existing studies have been too small to detect the effects of CHEK2 on PC risk. This study uses meta-analysis to evaluate the association of three more commonly studied variants (1100delC, IVS2+1G>A and I157T) with PC risk.

Systematic PubMed database search was conducted using the following key words: Familial Pancreatic Cancer, PDAC, CHEK2 and PDAC, 1100delC, del5395, I157T, IVS2+1G>A. Literature review identified PC patients positive for CHEK2 variants of interest and public Genome Aggregation Database (GnomAD) search identified reference controls. A normal approximation to the Poisson was used to determine if there was a significant difference in the reviewed studies versus in the general population.

Comparing 52 unique patients with pancreatic cancer identified in the literature review to 6984 reference controls showed significant associations between pancreatic cancer and all three CHEK2 variants. The I157T (observed frequency 6.17% vs population frequency 0.51%,  $p < 0.001$ ) and c.1100delC (observed frequency 0.79% vs population frequency 0.24%,  $p < 0.001$ ) variants were associated with increased PC incidence. On the other hand, the IVS2+1G>A variant was associated with decreased PC incidence (observed frequency 0.49% vs population frequency 20.2%,  $p < 0.001$ ). This meta-analysis demonstrates the association of the I157T and c.1100delC CHEK2 variants with increased PC incidence, and the association of the IVS2+1G>A CHEK2 variant with decreased PC incidence. Follow-up studies could further investigate the association of I157T and c.1100delC variants with PC by including these variants in future PC gene panels. Investigations need to explore possible protective effect of IVS2+1G>A in PC.

***Neuropathic pain and health-related quality of life in adolescents with sickle cell disease*****Authors:** Roman M, Highland J, Retherford D, Pan A, Panepinto J, Brandow A**Project Mentor:** Amanda Brandow, DO, MS

**Background:** Acute and chronic pain is the hallmark of sickle cell disease (SCD) and impairs patients' health-related quality of life (HRQL). Data reveal almost 40% of SCD patients report neuropathic pain. Neuropathic pain is associated with poor HRQL in non-SCD pain conditions, but this relationship in SCD is unknown. We sought to determine associations between neuropathic pain and HRQL in adolescents with SCD. We hypothesized neuropathic pain is associated with poor HRQL in adolescents with SCD.

**Methods:** We conducted a cross-sectional study with patients ages 13-18 in their baseline state of health. Primary outcome was HRQL, assessed by the PedsQL SCD Module (child self-report, parent-proxy). Neuropathic pain was assessed using the painDETECT questionnaire. PedsQL is scored from 0-100; higher scores indicate better HRQL. PainDETECT is scored from 0-38; higher scores indicate neuropathic pain. Descriptive statistics were performed. Associations between painDETECT and PedsQL Total Score, Pain and Hurt, Pain Impact, and Pain Management and Control scores were determined via Pearson correlation. Significance was  $p < 0.05$ .

**Results:** Twelve patients, [median (IQR) age: 15 (14-16.5) years] 75% female and 83.3% on hydroxyurea, completed both PedsQL SCD Module and painDETECT. Higher painDETECT scores were significantly associated with lower parent-proxy Total Scores ( $r = -0.64$ ,  $p = 0.03$ ) and Pain and Hurt scores ( $r = -0.67$ ,  $p = 0.02$ ). Higher painDETECT scores were also significantly associated with lower child self-report Pain and Hurt scores ( $r = -0.68$ ,  $p = 0.01$ ). There were no significant associations between painDETECT and Pain Impact or Pain Management and Control scores.

**Conclusions:** Patients with SCD and neuropathic pain have poor HRQL even in their baseline state of health.

***Connecting Food Security to a Patient Centered Medical Home and Back Again*****Authors:** Runkle N, Nelson D**Project Mentor:** David Nelson, PhD**Community Partner:** Friedens Community Ministries; Columbia St. Mary's - Family Health Center

**Background:** Food insecurity is a growing issue in the United States, and it is well established that food insecurity is linked to health and chronic illnesses. Food security is often thought to be handled by community-based organizations (CBOs), whereas chronic illnesses are traditionally addressed in primary health care settings. Studies have shown the impact of CBOs on food access to clients and food security screenings performed in primary care offices, but the relationship between CBOs and primary care medical homes has not been thoroughly investigated. Each setting holds their unique relationship with users and can benefit from partnerships with each other to strengthen their role in improving health in their community. The goal of this project is to describe the phenomenon of food security and primary care, illustrate how CBOs and primary care can be connected, and develop initial policy recommendations moving forward. **Methods:** Focus groups were held with staff and community members of Despensa, a local food pantry, and with primary care physicians at Columbia St. Mary's and Children's Hospital Wisconsin. Questions were asked on 1. How food insecurity and health fit in CBO and primary care spaces, 2. How can they be connected, and 3. How can they be talked about. Focus groups were recorded, transcribed, and analyzed for theme emergence. **Result and Implications:** Our initial results suggest 1. Variations exist on how food insecurity and health currently fit into these spaces, 2. Limited and only unidirectional connections exist between primary care and food pantries and 3. Integrated approach with multiple actors is needed for effective solutions. Our theme emergence expresses the phenomenon of food insecurity and health in the CBO and primary care settings and provides insight to collaborative solutions to this growing community health issue.

***A Retrospective Study on Post-Cardiac Surgery Delirium Rates at the Milwaukee VA*****Authors:** Carolyn Pinkerton, MD, Thomas Ebert, MD, PhD, Katherine Sherman, MS**Project Mentor:** Carolyn Pinkerton, MD

Delirium after cardiac surgery is an unfortunately common yet serious complication. Patients who suffer from delirium have been found to have longer ICU stays and increased rates of long-term morbidity and mortality. We conducted a retrospective chart review on 250 post cardiac surgery patients who underwent surgery over a 20-month period. The purpose of this study was (1) to investigate the delirium rates of patients who underwent cardiac surgery at the Clement J. Zablocki VA Medical Center in Milwaukee, WI and (2) determine risk factors associated with increased rates of delirium. In addition to determining a delirium diagnosis, we also collected a total of 59 variables that were grouped as being demographic, pre-operative, intra-operative, or post-operative. Stepwise logistic regression analysis of the data was performed using SAS 9.4, and main-effects models were formed for each group of variables. Each time-subsequent model included all statistically significant variables from previous models. The frequency of delirium from our chart review was 14.63%, within the 3% to 31% found by other delirium studies. From the analysis of the 59 variables, we discovered that patients more likely to become delirious were older, non-white, had histories of drug abuse or psychiatric problems or high creatinine, a vasopressor or a post-operative antibiotic, or were in the ICU longer.

***Risk factors for medical device-related pressure injuries with EEG lead use in pediatric ICU patients*****Authors:** Aaron Sandock, MS3, Rebekah Barrette, MS, RN, PCNS-BC, WCC, Christine Schindler, PhD,**CPNP Project Mentor:** Christine Schindler, PhD, CPNP

**Introduction:** Pressure injuries have typically been considered a phenomenon of the adult population, but recent literature suggests that the problem has been under recognized in children, disproportionately so in critically ill children. The incidence of pressure injury development in the pediatric critical care population has been reported to be as high as 10.2-27%. EEG leads accounted for 26% of the total device related injuries. Adverse health outcomes and associated financial costs have led the Institute for Healthcare Improvement to identify pressure injury prevention as a priority area for patient safety.

**Hypothesis:** There are common risk factors that can lead to actionable strategies to reduce MDRPI related to EEG leads in the pediatric critical care population.

**Methods:** This project is a retrospective study. Data was collected between January 1, 2014 through December 31, 2018. Data collection includes demographic data, patient characteristics, clinical characteristics, and whether or not the child developed a MDRPI related to EEG leads. Analysis focuses on comparing the groups for specific patient or clinical characteristics that were associated with MDRPI development.

**Results:** Mortality during encounters in which a PI was noted was much higher (21%) than for the other encounters (4%). Age at admission was lower (median 0.9 years vs. 5.2 years), and the length of stay was longer (median 84.5 days vs 3 days) for encounters in which a PI was noted compared to the other encounters. The median number of days after admission until the first pressure injury was noted was 13.

**Conclusion:** Criteria yielded a patient population of 3136. Twenty-four unique patients with history of EEG lead use developed thirty-four total pressure injuries. Incidence of pressure injury within PICU patients with EEG lead use was associated with increased mortality and length of hospital stay. No differences were found among varying patient races or genders.

***Parent focus group for the positive parenting program.*****Authors:** Sanghavi J, Meurer J, Harris K, Beyer M, Harrell A.**Project Mentor:** John Meurer, MD, MBA**Community Partner:** Children's Hosp of WI Community Services; COA Youth & Family Centers - Goldin Center

Background: Child development is influenced by a myriad of interconnected determinants. Negative parenting is one of the determinants that has been identified as adversely impacting a child's development, health outcomes, and productivity in society. To address this problem, Children's Hospital of Wisconsin (CHW) offers an evidence-based parenting intervention to parents of the community. While CHW offers programming to the community at no cost, it has been challenging to implement within inner-city Milwaukee. Purpose & Aims: The purpose of the focus group was to explore the parent experience in inner-city Milwaukee. Specifically, the aims were to understand perceptions of parenting programs and identify barriers to participation in these programs. Methods: An academic-community partnership was established with COA Goldin Center in Milwaukee. 12 parents who are clientele of Goldin Center were recruited to participate in the focus group. Academic/community partners facilitated the focus group and transcribed the dialogue into a summary report. Results: The focus group revealed that participating parents agree upon positive, negative, and neutral aspects of their caregiver experience. While content and effectiveness of parenting program influence interest, the background of the facilitator, environment of programming, and reputation are key factors that influence parents' motivation to participate. Barriers to attendance include psychosocial perceptions of parenting programs and inconvenience. Conclusion: The focus group study is of direct relevance to CHW. CHW can use the results to reassess current implementation strategies, such that a program that meets the cultural and logistical needs of inner-city parents can be designed.

***The Rothman Index Implementation*****Authors:** Scarpinato M, Stadler M, Resnick A.**Project Mentor:** Andrew Resnick, MD MBA

At Froedtert and the Medical College of Wisconsin, our quality metrics have been consistently at the top of our peers. There was a gap in observed mortality. Froedtert and the Medical College of Wisconsin was average compared to our peer Academic Medical Centers. With many possible explanations for this gap, our leadership identified two possible causes of our average mortality including lack of communication between providers and nurses and a lack of an early warning detection system. Our leadership underwent an interrogative vendor search to see if any tools could help improve both communication between physicians and nurses and warn our clinicians before clinical decline was visible. The Rothman Index was identified as a crucial tool to improve the overall care our patients received, and in 2018, Froedtert and the Medical College of Wisconsin implemented the Rothman Index with the first ever 24/7 remote monitoring of the Rothman Index. This innovative implementation strategy allowed ICU trained nurses to monitor patients at all Froedtert's campuses remotely. While this strategy was novel, it caused multiple challenges on the implementation front, because it was the first of its kind. The implementation team utilized multiple iterations of implementation starting from a top-down implementation and finally settling on a bottom up, inclusive implantation on the Rothman Index. The implementation was successful with an on-time launch and slightly over budget. The initial results demonstrated the Rothman Index changed the way Froedtert and the Medical College of Wisconsin take care of our patients.

***Septic Arthritis and Acute Hematogenous Osteomyelitis: Disease-Specific Antibigram and Implications*****Authors:** Nisreen Mobayed, Kevin Schliddt, Daniel Roadman, Danita Hahn, Anna R. Huppler**Project Mentor:** Anna Huppler, MD

**Introduction:** Osteomyelitis and septic arthritis are common pediatric musculoskeletal infections with potential to cause significant morbidity and mortality. The aim of this study is to compare the epidemiology of osteoarticular infections (OAI) to antibiotic regimens and local antibiograms.

**Methods:** A retrospective study was performed on patients aged 6 months to 18 years with a diagnosis of septic arthritis or acute hematogenous osteomyelitis in a children's hospital between 7/2012 and 7/2017. Data collected from the electronic medical record included demographics, initial and discharge antibiotic therapy, and microbiologic results.

**Results:** A total of 207 patients were included: 66 patients <4 years (<4Y) and 141 patients ≥4 years (≥4Y). Causative pathogens were identified in 70% of patients. *Staphylococcus aureus* comprised 55% of positive results in children <4Y and 73% in children ≥4Y. Among *S. aureus* cultures, 70-76% were methicillin sensitive (MSSA). Overall clindamycin susceptibility was 97%, with all resistant strains detected in children ≥4Y with MSSA. This is strikingly different than the institutional antibiogram showing 79% overall clindamycin sensitivity in *S. aureus* [82% in MSSA, 72% in methicillin resistant (MRSA)]. *Kingella kingae* was exclusively identified in children <4Y (21% of positives), which was also the group with the highest rate of culture negative infection (42%). Intravenous clindamycin alone was the most frequent initial antibiotic regimen, prescribed for 41% of all patients. Initial antibiotic regimens matched organism susceptibilities in 95% of MRSA and 85% of MSSA infections.

**Conclusion:** Our study revealed high rates of clindamycin-susceptible *S. aureus* in older children and *K. kingae* and culture-negative infection in children <4 years with OAI. Antibiotic susceptibilities differing from our institutional antibiogram suggest that disease-specific antibiograms will aid with empiric treatment decisions.

***Longitudinal Assessment of Acute Concussion Outcomes Through SMS Text (ConText Study)*****Authors:** Schoenfeld R, Drendel A, Ahamed S, Thomas D**Project Mentor:** Danny Thomas, MD, MPH

**Objective:** Mild Traumatic Brain Injury (mTBI), also known as concussion, is a common health problem that has seen a 60% increase in US adolescents between 2007-2014. This study uses SMS text messaging (a mobile health, or mHealth, tool) to report patient symptoms. We hypothesize that this mHealth tool will have high retention/completion rates and correlate with a conventional means of assessing symptoms, the Post-Concussion Symptom Inventory (PCSI).

Additionally, we hypothesize that patients with risk factors will have a prolonged recovery (>10 days).

**Methods:** 31 pediatric patients with acute mTBI were recruited and completed a modified PCSI that accommodates the mHealth format. Patients completed the mHealth tool once every 3 days for the first 21 days, then once a week for 6 weeks. Patients additionally rated the usability of the tool.

**Results:** There was a strong, and positive correlation between the PCSI and the mHealth tool ( $r_s = 0.875$ ,  $P < .000$ ,  $N = 22$ ). Those with a prolonged recovery had higher initial PCSI scores ( $66.25 \pm 29.65$ ) than those without a prolonged recovery ( $17.0 \pm 20.28$ ),  $t(17) = 4.329$ ,  $P < 0.001$ . Average surveys completed was  $8.19 \pm 5.0$  out of 15.

**Conclusion:** Our results demonstrate that this tool is a valid and well-liked method of reporting pediatric mTBI symptoms -- it replicates and identifies novel findings in mTBI recovery. Retention/completion rates were lower than predicted, indicating that text messaging may not be the ideal format in this population. Text messaging may still have other applications for short term communication/symptom measurement.

***A Mobile Health Care Van for Milwaukee: A Study on Feasibility and Value of a New Delivery Model*****Authors:** Schwartz V, Young S**Project Mentor:** Staci Young, PhD

Milwaukee County is the most populated county in Wisconsin and an estimated 74,000 (7.8%) residents live without health insurance. Lack of health insurance has been associated with increased emergency room visits, higher morbidity and mortality from chronic diseases such as asthma, diabetes, and hypertension, and poorer health overall. Having uninsured and underinsured individuals is a costly burden to hospital systems and the state, adding to the millions of dollars in expenditures, as patients often utilize emergency departments for primary care or exacerbated, preventable illnesses. Through philanthropy, grants, and volunteer man-power, free and low-cost clinics as well as other safety net resources have emerged to alleviate this burden by providing the underserved with preventative services and longitudinal care. As stand-alone clinics have been the norm, one newer delivery model that has yet to be established in Milwaukee County is a mobile health clinic (MHC). This once novel endeavor has sprung up in communities across the nation as an adjunct care provider servicing areas directly where people live, work, and play. Studies show MHCs are an effective tool in reducing health care expenses for health systems and states, decrease emergency department utilization, and improve residents' access and overall health. This study aims to review the safety net resources available in Milwaukee County for the uninsured, underinsured, and low income population, explore partnerships and collaborative efforts that seek to reduce health disparities, and analyze the general landscape for suitability and implementation of an MHC as a new model of healthcare delivery in the community.

***Repeatability and reproducibility of ellipsoid zone intensity measurements on SD-OCT images*****Authors:** Seto SJ, Huckenpahler AL, Warr E, Salmon AE, Carroll J**Project Mentor:** Joseph Carroll, PhD

**Purpose:** The integrity of the ellipsoid zone (EZ) on OCT is a measure of photoreceptor structure in many retinal diseases. Central to advancing the EZ as a photoreceptor biomarker is the development of robust methods for quantifying EZ reflectivity. We assess intra-observer repeatability and intra- and inter-observer reproducibility of a method to measure EZ intensity.

**Methods:** Cross-sectional scans of the retina were acquired using the Bioptigen OCT in 14 normal subjects. For each scan, 20 frames were registered, averaged, flattened and interpolated. Images were analyzed twice by 3 observers of varying proficiency as follows: The fovea was located subjectively using the peak outer segment length, then longitudinal reflectivity profiles (LRPs) were sampled at 0.5mm intervals out to 2.5mm nasally and temporally. Peak EZ intensity was extracted then normalized to the corresponding average IPL intensity for each LRP. Six subjects had repeat imaging 1 week following, analyzed by a single observer. Intra-observer repeatability was estimated using the repeatability coefficients derived from within-subject standard deviation. Intra-observer reproducibility was assessed using within-subject standard deviation.

**Results:** There was no significant difference in EZ intensity measurements between observers ( $p=0.18$ , Friedman test). Repeatability coefficient was comparable across observers -- 0.52 (12.6%), 0.45 (11.1%), and 0.41 (10.0%) for the expert, trained, and naive observer, respectively. Intra-observer reproducibility was worse when comparing longitudinal images (1.12; 34.1%).

**Conclusions:** Measurements of EZ intensity can be obtained with high repeatability regardless of observer proficiency. Longitudinal measurements showed worse reproducibility, which may affect viability of EZ reflectivity as a marker of disease progression.

***Assessment of Aseptic Peripheral Intravenous Catheter Placement Technique***

**Authors:** Shi W, Stein A, Paudel U, Bhatt PR, MacKinney T, Frazer T, Kanak M, Wang T, House D, Baidhya B, Kayastha G.

**Project Mentor:** Theodore MacKinney, MD, MPH

**Background:** Systemic infection following placement of peripheral intravenous catheters (PIVCs) by nursing staff is rare in high-income nations but occurs more frequently in low-income countries such as Nepal. The objective of this study was to identify procedural deficiencies in aseptic technique during PIV insertion that may be unique to a low resource environment and to identify potential low-cost interventions to reduce the incidence of infection.

**Methods:** Observational data was collected for 14 days in Patan Hospital Emergency Department utilizing a checklist of skills emphasizing proper aseptic technique during PIVC insertion. The checklist included modifiable behaviors such as wearing gloves, hand washing, site cleaning, maintaining site sterility, and optimizing dressing sterility.

**Results:** With 323 observations, hand hygiene was observed in 0.3% and gloves were worn in 10.2% of instances. The site was initially cleaned with at least one swipe of rectified spirits in 98.8% of encounters and cleaned with greater than one swipe or scrubbed in 86.7%. The IV insertion site was sterile during needle insertion in 77.4% of observations. Tape dressings had minimal contact with environmental surfaces in 21.7% of instances.

**Conclusion:** Similar to high income countries, hand hygiene is an often-missed aspect of aseptic technique that may be a strong candidate for educational interventions.

***Quality of Life Assessment Increases Referrals for Intervention in Patients with Tetralogy of Fallot***

**Authors:** Siebrasse A, Allen S, Lavoie J, Snippen J, Saudek D

**Project Mentor:** David Saudek, MD

**Background:** Mortality from surgical repair of tetralogy of Fallot (TOF) has decreased dramatically over the last several decades. Despite excellent surgical outcomes, studies reveal that patients with TOF continue to have decreased physical functioning, academic difficulties, and psychosocial impairments. To improve providers' ability to detect deficits, we implemented a quality of life assessment into routine cardiology clinic visits at the Herma Heart Institute. We sought to increase referrals to appropriate intervention programs and ultimately improve the quality of life for patients with TOF.

**Methods:** Between May 2017 and November 2018, TOF patients (5-20 yrs) and/or their families completed a standardized quality of life assessment (PedsQL 4.0) during cardiology clinic visits. Providers were encouraged to refer patients with abnormal PedsQL scores to appropriate services including cardiovascular rehabilitation, psychological evaluation, neurodevelopmental testing, and school intervention. Referrals for the intervention group were compared to those of a reference group using chi-square analysis.

**Results:** The PedsQL was completed by 79 patients at 90 clinic visits. At least one abnormal PedsQL score was identified at 58% (52/90) of all patient encounters and 38% (20/52) of those received at least one referral for intervention. The most commonly placed referrals were for neurodevelopmental testing (16) and school intervention (11). When comparing the number of referrals from the intervention group to those of the reference group, referrals to all intervention services were statistically significant.

**Conclusions:** Our quality improvement initiative establishes the utility of a quality of life assessment for detecting physical, emotional, social, and academic deficits during routine cardiology follow-up. Future studies will address barriers that prevent completion of the PedsQL and assess how interventions impact quality of life scores.



***Exercise as a vital sign for pediatric cardiology patients.*****Authors:** Snippen J, Allen S, Saudek D, Kovach JR**Project Mentor:** David Saudek, MD

**BACKGROUND** Morbidity and mortality in patients with congenital heart disease (CHD) has been associated with exercise capacity. Therefore, it is essential to routinely assess exercise in CHD patients and provide appropriate education. Exercise as a Vital Sign (EVS) is a self-report survey for patients ages 5-18, calculated by multiplying minutes of exercise per day and days of exercise per week. The goal is 300 minutes per week. This project aimed to introduce EVS into the pediatric cardiology clinic at Children's Hospital of Wisconsin with a goal of having nurses document EVS at 80% of visits and physicians document their counseling at 70%.

**METHODS** Between August 2018 and April 2019, EVS was incorporated into the electronic medical record as part of office visits in the Herma Heart Institute. Patients and/or parents were asked to respond to the brief EVS survey at the time of check-in. Nurses then entered the EVS into the record and physicians were encouraged to document exercise counseling in their note. Feedback was solicited from staff to drive Plan-Do-Study-Act cycles which included: 1) education of front desk staff, 2) removal of non-English speaking patients unable to complete the form and 3) weekly reminder emails to all staff.

**RESULTS** EVS documentation by nurses was stable, averaging 78.3% throughout the project. Physician documentation of exercise counseling showed a significant shift over the last 16 weeks improving from 49.8% to 60.3%. 70% of physicians surveyed somewhat or strongly agreed that conversations about exercise increased. The majority of nurses and physicians denied that EVS lengthened clinic visits.

**CONCLUSION** EVS was successfully implemented and subjectively increased the frequency of conversations about exercise without significantly disrupting clinic workflow. Physician documentation of exercise counseling remains a barrier. Future data will assess whether these interventions increase the amount of physical activity in our CHD patients.

***Characterization of age-related changes of the esophageal transition zone*****Authors:** Sobin M, Sanvanson P, Edeani F, Kern M, Kovacic K, Shaker R**Project Mentor:** Patrick Sanvanson, MD

Current evidence depicting the significance of the esophageal transition zone (TZ) in the development of dysphagia is incomplete. This zone represents the mixing of striated and smooth esophageal muscle fibers and is associated with reduced deglutitive pressures. Using high-resolution manometry (HRM), previous studies have identified an increased prevalence of TZ abnormalities in patients with dysphagia. However, past TZ studies have not utilized age as an independent variable. With dysphagia affecting up to 40% of the elderly population in the U.S., a better understanding of TZ characteristics may help improve dysphagia management. **Methods:** 20 young and 20 elderly healthy subjects, as well as 10 young and 21 elderly clinical patients with the primary complaint of dysphagia, underwent HRM. After catheter placement, subjects were prompted to conduct ten 5-ml swallows in a supine position. Transition zone length, duration, and maximum amplitude were measured using isobaric contours of 20, 30, 40, and 50 mmHg. **Results:** There was a significant difference in TZ manometric characteristics between the elderly (2.59 +/- 0.11 cm by 1.62 +/- 0.06 s by 26.66 +/- 0.98 mmHg) and young (1.49 +/- 0.06 cm by 0.85 +/- 0.03 s by 35.42 +/- 1.25 mmHg) healthy populations. However, there was no significant difference in TZ manometric characteristics between healthy and symptomatic subjects for both elderly (2.53 +/- 0.09 cm by 1.47 +/- 0.04 s by 26.02 +/- 1.11 mmHg) and young (2.01 +/- 0.13 cm by 0.94 +/- 0.06 s by 34.41 +/- 1.59 mmHg) populations. **Conclusions:** There is a significant effect of aging on the esophageal TZ, theoretically responsible for increased prevalence of esophageal pathology in the elderly. Additionally, esophageal TZ physiology does not explain dysphagia in undiagnosed clinical patients based on HRM analysis.

***Adoption and Foster Care Elective Course*****Authors:** Wilson S, Song S, Zarif M.**Project Mentor:** Samantha L. Wilson, Ph.D.

The adoption and foster care community present with a unique set of biological, psychological, and social needs that are important for healthcare providers to recognize. Despite the high prevalence of individuals in our society directly affected by adoption and foster care, very little, if any, information is given to medical students about this cohort. In light of this shortfall in training, we set out to create an elective course curriculum for medical students addressing various topics about adoption and foster care, specifically concerning their intersection with the medical field, in order to increase future physician competence in caring well for patients and families directly impacted by adoption and/or foster care. Together with various community partners who are also invested in the adoption and foster care community, we will offer an elective course for medical students at the Medical College of Wisconsin to introduce biological, psychological, and social issues relevant to adoption and foster care; assist students in developing clinical skills for working with patients impacted by adoption and foster care; provide students an opportunity to consider their own attitudes about adoption and foster care; and introduce available community resources for patient education and referral. Through this course, we hope that the Medical College of Wisconsin will graduate physicians who are more competent and compassionate in caring for their patients of the adoption and foster care communities.

***Silencing keratinocytes in a postoperative pain model*****Authors:** Stagg M, Stucky C**Project Mentor:** Cheryl Stucky, PhD

**Introduction:** Acute postoperative pain is experienced by the majority who undergo surgery. In addition, mechanical and thermal hyperalgesia are observed at the site of incision. Treatments for postoperative pain remain suboptimal and understanding the underlying mechanism of this acute pain is vital to developing improved treatments. Previous experiments have demonstrated that in non-injured skin, hyperpolarization of keratinocytes decreases baseline mechanical and heat sensitivity. However, it is unknown if keratinocytes play a role in mediating the mechanical and thermal hyperalgesia observed in a postoperative incision model.

**Objective:** We utilized optogenetics to assess whether silencing keratinocytes by means of hyperpolarization, would reduce post-incisional heat and mechanical hyperalgesia.

**Methods:** Transgenic mice that selectively expressed Archaeorhodopsin (Arch) in keratinocyte cell membranes were used as a model. A 5 mm incision was made through the skin and plantar muscle. The incised paw was exposed to amber light, to activate Arch, or blue light (control). Mechanical and heat sensitivity were measured on the hind paw, using the von Frey mechanical and the Hargreaves heat assay, respectively. Measurements were collected daily, including 2-hours through 7 days post-incision.

**Results:** There was no significant difference in post-incision mechanical hyperalgesia following amber light exposure. However, after 15 minutes of amber light exposure, a possible trend showing decreased heat hyperalgesia in days 4, 5 and 7 may be emerging.

**Conclusion:** The data suggest that transient silencing of keratinocytes is not sufficient to significantly decrease the sensitization experienced in this post-incision model.

**Future Direction:** As pain sensed by injury to the plantar muscle may be concealing the effects of silencing keratinocytes, future studies will isolate the incision to exclusively skin.

***High Glucose Conditioning Induces Overactive Astrocytic Glucose Metabolism*****Authors:** Staricha K, Meyers N, Garvin J, Liu Q, Rarick K, Cohen S**Project Mentor:** Susan Cohen, MD

**Introduction:** The disease process of diabetes is driven by high glucose. In the brain, glucose enters astrocytes through glucose transporter (GLUT1) and either enters glycolysis or the glycogen shunt. Astrocytes meet the energy needs of neurons by building up and breaking down their glycogen supply. High glucose exposure causes astrocyte dysregulation, but its effects on glucose metabolism are relatively unknown.

**Hypothesis:** High glucose conditioning induces a glycogenic state in the astrocyte, resulting in an inefficient mobilization of substrates when challenged with glucose deprivation.

**Methods:** Primary astrocyte cultures derived from the hippocampus of Sprague Dawley rat pups were cultured in normal glucose (NG, 5.5mM) or high glucose (HG, 25mM) media. Immunoblots as well as Glucose Analog, Glycogen, and Metabolic Profile Assays were performed.

**Results:** HG treatment affects neither GLUT1 membrane expression nor GSK3 $\beta$  activity. Baseline glycogen content is higher in HG compared to NG astrocytes ( $p < 0.05$ ). When challenged with glucose deprivation, both NG and HG astrocytes break down glycogen stores (NG=62%, HG=55%). After glucose deprivation, HG astrocytes maintain a higher glycogen level than NG astrocytes ( $p < 0.01$ ). HG conditioning causes increased glucose analog uptake ( $p < 0.05$ ) and a trend towards increased glycolysis.

**Conclusions:** HG conditioning shifts astrocytes towards glycogen storage, which is likely not due to reduced activity of GSK3 $\beta$ . Despite increased glycogen storage, HG astrocytes break down glycogen when challenged with glucose deprivation. HG conditioning leads to increased glucose analog uptake, not explained by increased density of GLUT1 at the membrane. Increased glycolytic activity in HG conditions may indicate altered activity of key enzymes in glucose metabolism.

***Peripheral Intravenous Catheter Associated Phlebitis: Quality Improvement Project in Patan Hospital Nepal*****Authors:** Stein AP, Shi W, Raj Bhatt P, Paudel U, Frazer T, MacKinney T, Khanal M, Wang T, Baidhya B, House DR, Kayastha G.**Project Mentor:** Theodore MacKinney, MD, MPH**Community Partner:** Patan Hospital, Nepal**Background**

Peripheral intravenous catheter (PIVC) insertion is a common procedure, and can be associated with increased morbidity and prolonged hospital stays. Previously reported PIVC-related phlebitis rates in resource-limited settings like Nepal are much higher than in high-income countries. The objective of this study was to use low-cost quality improvement methods to improve PIVC-associated phlebitis at an urban, public hospital in Kathmandu.

**Methods**

Pre-intervention data was collected through observation of PIVC lines on the medical wards at Patan Hospital (PH) during July 2017. Sites were examined once a day for 14 days, using the Visual Intravenous Phlebitis (VIP) scale to assess for phlebitis. After data collection, the research team and hospital staff reviewed baseline data, designed a simple educational intervention including ward meetings and a poster, and was implemented on the participating wards. Observations were again made for 10 days following intervention in August 2017.

**Results**

Pre-intervention, 181 PIVC lines were observed on the medical wards. After the educational intervention, 255 PIVCs observations were made. PIVC complication rates significantly improved in the post-intervention group (20.5 vs. 5.5%,  $P < 0.00001$ ). One case of septic thrombophlebitis was identified in the post-intervention group, compared to zero in the baseline group, but was not statistically significant.

**Conclusion**

Low-cost, simple, education-based quality improvement interventions can help reduce morbidity from PIVC in a resource-limited urban hospital setting.

***Schistosomiasis: Liver Mass Presentation in a Non-Endemic Area. A Case Report*****Authors:** Stewart A, Jha P.**Project Mentor:** Pinky Jha, MD

Schistosomiasis is considered the second most impactful parasitic disease behind malaria. According to the World Health Organization, over 200 million people are infected worldwide, and 600 million at risk. Endemic regions include 52 countries across sub-Saharan Africa, South America, China and Southeast Asia. This is an unusual presentation of schistosomiasis in a 42-year-old Wisconsin residing male with symptoms of abdominal pain, anemia, weight loss, and fever who was found to have malignant appearing liver and peritoneal masses on radiographic imaging. The patient had recently traveled to Liberia and all rapid infectious disease tests were negative. External serology labs for schistosome antibodies returned positive and the patient responded well to treatment with Praziquantel.

As global travel and tourism continues to rise it is important that healthcare providers screen for exposure to these underdiagnosed diseases. Travel history to any endemic region should prompt a workup as many tropical diseases are infectious with minimal exposure. Diagnosis of schistosomiasis in the United States is made difficult by a low index of suspicion, vague symptomatology, and a lack of education about how prevalent infection is in travelers with very brief exposure. Treatment for schistosomiasis with chemotherapeutic Praziquantel is easy, inexpensive, and can prevent long term sequelae of chronic infection with very low iatrogenic risk.

***Sex differences in outcomes following carotid artery interventions*****Authors:** Alyssa Stiff, BS, Stephen Lee, BA, Shariar Alizadegan, MD, Cheong Jun Lee, MD**Project Mentor:** CJ Lee, MD

Background: Carotid endarterectomy (CEAs) and carotid artery stenting (CAS) are used to prevent stroke from carotid artery stenosis. There is controversy whether men and women benefit equally from these interventions. We aim to identify if there are sex-dependent differences in outcomes. Methods: Data were collected by retrospective chart-review from patients that underwent a CEA or CAS during 2014-2017 at a single hospital center. Co-morbidities such as body surface area (BSA) were recorded, as well as peak systolic velocities (PSVs) at follow-up appointments. Restenosis was defined as >50% of carotid narrowing, which was determined based on PSV values. Results were analyzed and a  $P < 0.05$  was considered significant. Results: 174 carotid revascularizations were performed on 165 patients (66 women). In the univariate cox proportion analysis, women demonstrated higher incidence of restenosis compared to males at 1 year following CEA and CAS ( $P = 0.018$ ). However, in a multivariate model, sex was not a statistically significant determinant of restenosis. In both univariate and multivariate models, a higher BSA was found to be protective against the development of recurrent stenosis ( $P = 0.026$ ). Although CAS patients trended toward having increased rates of restenosis compared to CEA patients, this was not statistically significant ( $P = 0.3$ ). Conclusion: Our study found differences in outcomes between sexes that corrected when BSA was accounted for. Men on average have higher BSAs than women, and therefore, have larger artery diameters which is protective against restenosis. Our study also suggests CAS may have increased risk of restenosis compared to CEA.

***National Evaluation of High Ratio Massive Transfusion in the Trauma Quality Improvement Program (TQIP)*****Authors:** Benjamin Stultz BS, David Milia MD, Thomas Carver MD, Christopher Dodgion MSPH, MBA, MD**Project Mentor:** Christopher M. Dodgion, MD, MSPH, MBA

**Objective:** Forty percent of trauma related in-hospital deaths involve massive hemorrhage, but massive transfusion protocols utilizing a high-ratio strategy have been associated with a decrease in mortality. The purpose of this study was to use TQIP to determine the utilization and efficacy of high ratio transfusions.

**Methods:** A retrospective analysis was performed on all adult massive transfusions from 2013-2015 within the TQIP database. Massive transfusions were defined as  $\geq 4$  and  $\geq 10$  units of packed red blood cells (PRBC) at 4 and 24 hours, respectively. High ratio transfusion (HRT) was defined as plasma:platelets:PRBC  $\geq 1:1:2$ . Multivariate logistic regression was used to evaluate morbidity and mortality of patients receiving HRT with ratios of  $\geq 1:1:1$  and  $\geq 1:1:2$ . Utilization rate of HRT transfusion was evaluated by year.

**Results:** Massive transfusions (MT) were identified in 2.8% (20,009/689,072) of patients at 318 level I & II trauma centers. The cohort was 76% male, with a median age of 38, and a median injury severity scores of 26. Thirty-three percent suffered penetrating injuries and 61% underwent operative intervention. MT with ratios  $\geq 1:1:1$  were associated with a significantly decreased mortality in both the 4 and 24-hour cohorts (4hr OR: 0.70, 24hr OR: 0.67;  $p \leq 0.02$ ).

Receiving a MT with ratios  $\geq 1:1:2$  was associated with significantly decreased mortality in the 24-hour cohort (OR: 0.80,  $p < 0.02$ ); however, no significant association was seen in the 4-hour cohort (OR: 0.96,  $p = 0.56$ ). HRT was associated with an increased risk of complication (OR 1.5,  $p < .0001$ ). In 2015, patients were significantly more likely (OR 1.2  $p < .0001$ ) to receive HRTs when compared to 2013 and 2014 though only 11.9% received  $\geq 1:1:1$ .

**Conclusion:** Adoption of HRT is significantly increasing over time with early ratios of  $\geq 1:1:1$  conferring the greatest mortality benefit. However, nearly 90% of patients undergoing MT did not receive the highest ratio, possibly increasing their mortality.

***Characterization of Prescription Drug Monitoring Program's Use by Emergency Physicians at Froedtert*****Authors:** Tackett S, Zosel A**Project Mentor:** Amy Zosel, MD, MSCS

**Background:** To combat the opioid abuse epidemic in the United States, states have created databases of patients' opioid prescriptions named Prescription Drug Monitoring Programs (PDMPs). However, there are not established best practices for PDMPs.

**Objective:** This study characterizes emergency department physicians' use of the Wisconsin PDMP and its effect on medical decision making.

**Methods:** A cross-sectional survey study was performed. Emergency physicians were interviewed about their specific practice on the present shift, as well as their general PDMP use patterns.

**Results:** Emergency physicians varied in their PDMP use, from those who queried the PDMP prior to patient interviewing to those who reported no use of the PDMP.

**Conclusions:** Further research is needed to determine appropriate PDMP use without defining strict boundaries around PDMP use.

***Expanding Psychiatric Treatment in Primary Care Settings: the Child Psychiatric Consultation Program*****Authors:** Taylor T, Broaddus M, Kim R**Project Mentor:** Michelle Broaddus, PhD & Rosa Kim, MD

The national shortage of child psychiatrists is particularly pronounced in Wisconsin. The Child Psychiatry Consultation Program (CPCP) is funded through grants from the Wisconsin Department of Health Services and the federal government and sponsored by the Medical College of Wisconsin. Its purpose is to provide consultation services, referral support, and training in mental health issues to primary care providers throughout the state. As of September 2018, physicians from 65/72 counties were enrolled in the program. Data from the Wisconsin Health Information Organization (WHIO) on enrolled providers was analyzed to evaluate changes in practice patterns post-enrollment. Of 502 enrolled providers, 193 pediatricians and family practitioners met inclusion criteria for this study. Enrollment in the CPCP was correlated with an average increase 3.22 mental health diagnoses per 1000 diagnoses made. Further, pre-enrollment physicians saw a total of 83226 cases over a cumulative 47 months without making a single mental health diagnosis, compared to post enrollment where only 1 physician did not make a mental health diagnosis out of 1039 cases over 24 months. Whether these changes are a result of improved management or improved recognition of mental health disorders remains to be studied.

***Characterization of Aedes mosquito habitat and larvicidal resistance in Northern Belize*****Authors:** Thiel J, Assefa L, Grieco J, Hargarten S, Bautista K, Leiva D, Magana M, Kay J**Project Mentor:** Stephen Hargarten, MD, MPH

The incidence of Dengue viral infection is on an upward trend around the world and the WHO estimates that there are 390 million new cases every year. So far in 2018 Belize has had 294 cases, and 20,859 cases in the last three years. Dengue is spread through its vector the Aedes mosquito and currently the form of control is destruction of the vector itself. This study aimed to analyze the Aedes mosquito habitats and larvicidal resistance in Belize. This was done through collecting water samples from containers found surrounding 94 houses in Belize and measuring multiple parameters. 44 Ovitrap were placed to collect larva and then these larva were tested for resistance to Temephos, a pesticide. Of the 65 containers collected from the houses 12% (8) were positive for Aedes larva, 23% (15) were positive for Culex larva, while only 1 container had both Culex and Aedes. Tires were the most common container for both species. On average, Aedes mosquito's larva were in containers with lower levels of conductivity, salinity, and total dissolved solids. All Aedes larva collected died in the highest concentration of Temephos, however at lower levels of doses 93.7% of those in Zone C survived and 98.75% of those in Zone D survived. This combination of results shows that the Aedes mosquito chooses a cleaner habitat in Belize and their larva may be beginning to show resistance to Temephos. The next steps include expanding the sample size and areas of Belize tested.

***Understanding Chemokine Promiscuity at G Protein Coupled Receptors*****Authors:** Thomas M, Volkman B.**Project Mentor:** Brian Volkman, PhD

Chemokines are small, secreted proteins that share a common tertiary fold and function to induce cellular chemotaxis by interacting with cell surface G protein-coupled receptors (GPCRs). With ~50 known chemokine ligands and only ~20 known chemokine receptors, there exists a high degree of promiscuity in the chemokine system. One chemokine ligand can interact with one or multiple chemokine receptors, and one chemokine receptor can interact with one or multiple chemokine ligands. Interestingly, specificity is maintained in this promiscuous system, and every chemokine ligand does not interact with every chemokine receptor. If the molecular determinants of chemokine-GPCR selectivity, specificity, and promiscuity can be elucidated, we will be better positioned to design specific inhibitors of pathologic chemokine-GPCR interactions. To this end, we have begun to investigate the structural basis for chemokine-GPCR promiscuity utilizing the chemokine ligand CCL28 and its two cognate GPCRs CCR10 and CCR3. We first used comparative modeling to create homology models of human CCR10 and CCR3 and then validated the resulting models using all-atom molecular dynamics simulations. Subsequently, computational docking of the flexible N-terminal peptide of CCL28 was performed. Finally, a mutagenic functional analysis of the N-terminus of CCL28 was performed, and CCR10- and CCR3-specific interaction sites were identified. Using this approach in a broader context, we can begin to understand molecular features that mediate the delicate balance between specificity and promiscuity for chemokine-GPCR interactions.

***The Impact of a novel feedback form on CPR quality*****Authors:** Tillotson KM, Colella MR, Weston BW, Aufderheide TP**Project Mentor:** Tom Aufderheide, MD, MS

Hypothesis: A novel post-event continuous quality improvement (CQI) feedback form, capitalizing on electronic recording of cardiopulmonary resuscitation (CPR) metrics, would significantly improve Milwaukee County emergency medical services provider CPR compression depth and rate. Methods: We retrospectively analyzed CPR quality metrics in adults with non-traumatic out-of-hospital cardiac arrest with at least 5-6 minutes of data. Two identical 9-month periods of data were analyzed before and after implementation of the feedback form. All EMS providers involved in the resuscitation episode received the form within 72 hours for self-review. Quality of CPR performed was compared between all providers (BLS+ALS), basic life support (BLS) only, and advanced life support (ALS) only in the Before and After Groups. Results/Conclusion: Between the Before and After periods, compression rate increased significantly in BLS only, ALS only, and ALS+BLS cases. Compression depth increased significantly in ALS only and ALS+BLS cases and insignificantly increased in BLS only cases.

***Culture of Reporting Adverse Events: Breaks in the Sterile Field*****Authors:** Toburen B, Helm M, Goldblatt M**Project Mentor:** Matthew Goldblatt, MD

**Background:** In the OR, maintaining sterility is of utmost importance leading hospitals to dedicate extensive resources to establish a sterile environment. Fostering a culture and identifying barriers to reports breaks in the sterile field is imperative to upholding standards.

**Methods:** For this study, 392 MCW or Froedtert Hospital OR employees, including nurses, techs, attending physicians, and residents were extended a survey. The study researchers created the survey consisting of 37 questions to discover the attitudes toward reporting sterile field breaks. Data were analyzed using SPSS to determine significant relationships between groups.

**Results:** Fear was the largest contributor to OR employees not reporting sterile field breaks. Surgical techs and anesthesia CRNAs were afraid that reporting an error could be used as evidence in a lawsuit when compared to anesthesia attendings, surgical attendings and surgical residents ( $p=0.006$ ). Employees with 0-2 years of experience are more afraid of being punished for not reporting a sterile field break than those with greater than 11 years of experience ( $p=0.016$ ). Those with 3-10 years of experience agreed that they would encourage their colleagues to report a break in the sterile field than those with either 0-2 years or greater than 11 years of experience ( $p=0.048$ ).

**Conclusions:** This study investigated the barriers and attitudes to employees reporting breaks in the sterile field. Fear is the main determinant in not reporting breaks in the sterile field. Thus, future interventions to improve adherence to sterile technique can target fear in fostering a more positive culture in sterility accountability.

***FIS1 and Drp1 Regulation of Endothelial Function in Diabetic Vascular Disease*****Authors:** Trykall DZ, Kakarla M, Ying R, Wang J, Hill RB, and Widlansky ME**Project Mentor:** Blake Hill, PhD and Micheal Widlansky, MD

Efficacious therapies for diabetic vascular disease are lacking because of a poor understanding of microvascular and macrovascular endothelial dysfunction. Mitochondrial homeostasis is crucial to endothelial function. Abnormal glucose exposure disrupts mitochondrial homeostasis altering NO (nitric oxide) bioavailability, gene transcription, and epigenetics resulting in endothelial dysfunction with fragmented mitochondria, suggesting excessive fission. Previous work reveals increased expression and activity of mitochondrial fission proteins, FIS1 and DRP1, under abnormal glucose conditions. However, their role in regulating endothelial cell function is largely unexplored. It is hypothesized excessive fission leads to endothelial cell dysfunction and inhibition may alleviate dysfunction. We examined the genetic knockdown of FIS1 and DRP1 in endothelial cell function by mitochondrial bioenergetics, RT-qPCR, transepithelial electrical resistance (TEER), and NO production. In addition, determined the effects of high and low glucose conditions on human microvascular endothelial cells-1 (HMEC-1) and siRNA knockdowns. Seahorse analysis of siRNA FIS1 (siFis1) demonstrated decreased mitochondrial respiration. High glucose conditions increased FIS1 and DRP1 HMEC-1 mRNA levels. Low glucose conditions decreased PGC1 $\alpha$ , MFN2, MID49, and OPA1 HMEC-1 mRNA levels. siFIS1 monolayers have decreased TEER compared to HMEC-1 monolayers. Basal and stimulated, FIS1-KO compared to HMEC-1 demonstrated no difference on western blot in phospho-eNOS or total-eNOS levels; siFIS1 knockdown results were similar. Stimulation with A23187 Ca<sup>2+</sup>-ionophore increased NO bioavailability detected by DAF-2DA in DRP1-KO. Patient vessels treated with TAT-213, targeting FIS1, demonstrated increased NO and dilatation compared to controls.



***A case of SAPHO syndrome*****Authors:** Turgul G, Naik K, Jha P.**Project Mentor:** Pinky Jha, MD, MPH

SAPHO syndrome is a rare inflammatory disorder of bone, joints, and skin having an unknown but likely multifactorial etiology including genetic, immunologic, and infectious components. Its primary features, which comprise its acronymic name, include synovitis, acne, pustulosis, hyperostosis, and osteitis. SAPHO's presentation is highly variable, encompassing both monophasic and relapsing-remitting episodes that may include any combination of the aforementioned elements often separated in time. Moreover, it is commonly associated with additional findings including systemic features of fever and fatigue, inflammatory bowel disease, and venous thrombosis, among others, which may further obscure its presentation and complicate its diagnosis. While the prevalence of SAPHO is relatively low, the syndrome presents similarly to numerous infectious and neoplastic conditions that require an urgent response. Accordingly, a prompt diagnosis or rule-out of SAPHO may prevent unnecessary interventions or, conversely, expedite life-saving treatment. Furthermore, a timely recognition and management of SAPHO itself may improve patient outcome and prevent or reduce disease recurrence. Here we present a case of a 28-year-old African-American male with a history of recurrent hidradenitis suppurativa, sickle cell trait, iron deficiency anemia, and a gunshot wound to the left hip. The patient was evaluated following incision and drainage of a sternoclavicular abscess for fever, night sweats, weight loss, weakness, extremity osteoarticular pain and swelling, and a pruritic skin lesion on the left temple. Upon extensive workup and rheumatology and dermatology consultations, the patient was diagnosed with SAPHO. With this report, we aim to educate practitioners on how to recognize SAPHO based on a characteristic constellation of signs and symptoms, as well as to review the current guidelines for diagnosis and management of this rare but important condition.

***Examination of Youth Attitudes Towards Running as a Strategy to Combat Childhood Obesity*****Authors:** Tyler K, Nelson D, Ruffalo L**Project Mentor:** Leslie Ruffalo, PhD; David Nelson, PhD**Community Partner:** Boys and Girls Club of Greater Milwaukee

In 2012, it was found that at least one-third of adolescents were obese. Obese children are at a greatly heightened risk for issues such as sleep apnea, diabetes, cardiovascular disease, and psychological problems. Despite these facts, a 2013 study found that almost 24% of obese children were not counseled on their weight by clinicians. It is known that activity in childhood correlates positively with activity in later life, emphasizing the importance of not only providing children with counseling on exercise but also on effectively appealing to their sources of motivation so that they will follow through on the counseling.

Many theories seek to describe how individuals make positive health behavior changes. One common theory, the transtheoretical model, explains how individuals progress through stages to achieve and maintain healthful behavior changes. Youth running programs may be an effective strategy to assist individuals in progressing through the transtheoretical stages of change model. As such, we designed a weekly running program with a youth serving organization in inner city Milwaukee that sought to identify youth motivation towards exercise. In the process, many lessons were gleaned about community-engaged research and the difference between healing and curing, both in the community and in patient-physician relationships.

***Gender Differences in the Relationship between Social Support and Strain and Mortality*****Authors:** Uhing A, Williams J, Garacci E, Egede L.**Project Mentor:** Joni Williams, MD, MPH

Background: Social support can be perceived as positive or negative and has been shown to influence health-related behaviors and long-term health outcomes. However, few studies have assessed how the source of support, gender of the individual receiving support and quality of the interaction affect long-term health outcomes. In this study, we assessed gender differences in the relationship between all-cause mortality and social support, strain and affectual solidarity received from family, friends and spouses/partners.

Methods: Participants (N=6,259) were drawn from the MIDUS survey. Social support, strain and affectual solidarity measures were determined from the MIDUS questionnaire. Mortality outcomes were collected from the MIDUS studies. We assessed the independent associations between all-cause mortality and social support component using a cox proportional hazards regression analysis and further assessed whether the association varied by gender.

Results: Support from family, friends, and spouses/partners as well as friend affectual solidarity was associated with lower mortality risk for men and women. Friend strain was associated with a higher risk of mortality in men and women. Family support and family, friend, and spouse/partner affectual solidarity associated with a lower risk of mortality for women. Friend and spouse/partner strain were associated with a higher risk of mortality for women. There were no significant independent associations for men between social support, strain, or affectual solidarity from any of the sources.

Conclusion: Support from friends, family and spouse/partner may be beneficial in reducing mortality for both men and women. Friend and spouse/partner strain are targets for minimizing mortality risk in women.

***The Warrior Partnership: Expanding its Presence*****Authors:** VandeWater T, McBride M**Project Mentor:** Michael McBride, MD

Post-Traumatic Stress Disorder (PTSD) remains an enormous health issue for veterans across the United States. Although recent strides have been made in quality of care by improving awareness and access to treatment, lifetime prevalence of PTSD in veterans has been estimated to be 14-16%. Even higher rates of PTSD may be present, as veterans often hesitate to disclose PTSD symptoms due to surrounding stigma and fear of potential repercussions.

The Warrior Partnership exists to help provide better care for veterans, broaching the topic of PTSD and discussing veteran healthcare concerns. Local veterans join medical students from the Medical College of Wisconsin and share experiences from before, during and after deployment. Sharing these stories is often therapeutic, aiding the healing process for veterans while providing valuable insight for students. Students learn how to approach sensitive topics, develop rapport with veteran patients, and reciprocate with life experiences of their own.

This project's goal is to help the Warrior Partnership reach and inform a broader audience via creation of a video that explains the event and includes firsthand accounts from past participants. By constructing this resource to inform students, veterans, and community members of the purpose and benefits of the Warrior Partnership, the video aims to assist the already steady growth of the program. Feedback on the video will help to shape future efforts to share the Warrior Partnership with the community.

***Localizing Neural Correlates of Speech Articulation Speed in Chronic Stroke Patients*****Authors:** Varma S, Pillay S, Ivory A, Humphries C, Binder J**Project Mentor:** Jeffrey Binder, MD

**Background:** About 1/3 of ischemic stroke survivors have some form of aphasia, often comorbid with dysarthria and/or apraxia-of-speech. Previous studies have sought to localize neural correlates of isolated motor speech deficits yielding inconsistent results using “articulatory agility,” which incorporates both accuracy and facility of speech.

**Goals:** We seek to quantify a precise motor speech outcome, articulation speed, and clarify the brain locations associated with its impairment in stroke patients.

**Methods:** In this observational study, cross-sectional analyses were performed on patients who were >180 days post left hemispheric stroke, right handed, and native English speakers. Patients completed a pseudoword repetition task and response times were averaged to assign articulation speed (phonemes per second, PPS) for each patient. 3 Tesla, T1-weighted brain MRI images were obtained and lesioned voxels identified. Lesion status was used as a grouping variable and PPS scores were compared, yielding a t-score for each voxel. Resulting t-maps were thresholded at  $p < 0.005$ .

**Results:** The 52 patients had an average articulation speed of 6.51 PPS (sd=1.39, range=3.38-8.84). Inter-rater reliability for time measurements was high ( $r=0.95$ ). Slow articulation speed was associated with lesions to inferior parietal and posterior insular regions. Specifically, the parietal operculum (OP1-4), anterior supramarginal gyrus (PFcm, PFop), angular gyrus (PGs), and posterior insula (Ig).

**Conclusions:** The inferior/anterior parietal areas identified in this study are associated with monitoring somatosensory feedback during speech production. This study represents a unique measure of motor speech function with focal correlates that may allow for a new distinction between articulatory planning deficits (posterior frontal areas) and somatosensory feedback deficits (inferior parietal areas).

***Emergency Radiology for Medical Students*****Authors:** Velez-Martinez O, Baruah D**Project Mentor:** Dhiraj Baruah, MD

Radiology is an important diagnostic technique that can provide timely and efficient results, especially in the setting of emergency medicine, and it can quickly direct healthcare providers toward the correct treatment plan. While medical school courses do provide some exposure to radiological studies within their curriculum, there isn't really dedicated teaching of radiological findings related to specific disease states until clerkships or even residency. To help fill this gap in education, we are creating an electronic book (e-book) that is designed to help medical students in understanding the basics of emergency radiology. We are emphasizing pertinent imaging modalities such as plain radiographs, CT, and MRI scans. In this e-book, we cover important life-saving diagnoses that will allow students to quickly review important radiological findings of diseases and associate them with important clinical presentations and treatment plans, or “next steps,” in the context of emergency medicine. To make this book, Apple's iBooks Author software was used, images were obtained from Froedtert's PACS, and information was consolidated from Diagnostic Imaging: Emergency by Jeffrey et al and Problem Solving in Emergency Radiology by Mirvis et al.

***Assessing Sonographic Measurements to Predict Birth Weight in Patients with Gastroschisis*****Authors:** Sara Vidovic, BA; Amy Wagner, MD**Project Mentor:** Amy Wagner, MD

**INTRODUCTION:** Prenatal ultrasonography is frequently used in fetuses with gastroschisis to estimate fetal weight and detect those who are small for gestational age (SGA). However, the standard Hadlock formula has been shown to systematically underestimate fetal weight in those with gastroschisis leading to overdiagnosis of intrauterine growth restriction and unnecessary pre-term delivery. While the Hadlock formula uses several biometric measurements including abdominal circumference (AC), femur length (FL), and head circumference (HC), it is inherently flawed in fetuses with gastroschisis as the AC is abnormal since their viscera are extra-abdominal in location. **OBJECTIVE:** This study aims to examine different cutoffs for estimating fetal weight and combinations of estimated fetal weight (EFW) by Hadlock formula and other sonographic biometric measurements to better identify fetuses with gastroschisis who will be born SGA. **METHODS:** Study subjects were identified by retrospective chart review of all pregnant women with fetuses prenatally diagnosed with gastroschisis who received care at Froedtert Memorial Lutheran Hospital between 2001 and 2016. Sensitivity, specificity, PPV, and NPV were calculated for numerous combinations of EFW and biometric measurements taken within 2 weeks of delivery. **RESULTS:** 120 gastroschisis cases were identified, 20 of whom were SGA at birth. An EFW<10% as determined by the Hadlock formula had a sensitivity of 100%, specificity of 37%, PPV of 24%, and NPV of 100%. Combining an EFW<10% with an AC Z-score  $\leq -2$  and FL Z-score  $\leq -2$  increased specificity to 92% and reduced sensitivity to 80% with PPV of 66.7% and NPV of 95.8%. **CONCLUSION:** The Hadlock formula underestimates fetal weight in fetuses with gastroschisis. A combination of EFW calculated by Hadlock formula with very small AC and FL increases the specificity and PPV of predicting which fetuses will be born SGA.

***Evaluation of co-morbid medical conditions in adults with Down Syndrome: Celiac Disease*****Authors:** Wagener D, Capone G, Helm R**Project Mentor:** Robin L. Helm, MD**Community Partner:** Down Syndrome Medical Interest Group

Evidence based clinical management guidelines of gastrointestinal (GI) conditions affecting adults with Down Syndrome (DS) are inadequate. GI disorders have been found to be increased in prevalence in children with DS. Though many sources agree that adults with DS experience a high prevalence of GI disorders compared to the general population, the evidence has not been reviewed to sufficiently inform health care related to co-morbid GI disorders, including Celiac Disease (CD).

A literature search was performed via PubMed to identify information about CD in adults with DS, by combining the MeSH terms "Down Syndrome OR Trisomy 21 OR Down's Syndrome OR Downs Syndrome" with the MeSH terms "Celiac Disease OR (Gluten AND Enteropath\*) OR Sprue".

The search yielded 79 articles, with 9/79 meeting inclusion criteria as per USPSTF guidelines. Included articles informed at least one key question as outlined by the Down Syndrome Medical Interest Group Adult Health Care Work Group, focusing on prevalence, clinical severity, availability/performance and risk-costs of screening, and impact of detection on morbidity/mortality.

Overall, the prevalence of CD in adults with DS was found to be increased, with 37/398 (9.30%) of adults with DS having CD, compared to ~1% in the general population. Data revealed that the majority of adults with DS with CD were symptomatic, with diarrhea being a prominent symptom. Anti-endomysial antibodies were found to be more sensitive and specific than tissue transglutaminase and anti-gliadin antibodies in screening for CD. There is little information available regarding the impact of screening on morbidity and mortality.

In conclusion, there is inadequate evidence available to fully inform consensus-based health care guidelines for caring with adults with DS and co-morbid CD. The available data suggests that it may be reasonable to screen for CD in symptomatic adults with DS, as well as in adults with DS who were never screened previously.

***The Rohingya: Milwaukee's Newest Neighbors*****Authors:** Wagner C, Sanders J**Project Mentor:** James Sanders, MD, MPH

**Introduction:** Since federal fiscal year 2013 Milwaukee has become home to the largest population of Rohingya refugees in the United States with more than 1,500 refugees being resettled. Despite their new surroundings, refugees often face barriers to health care which can have potentially disastrous consequences while providers face barriers to providing adequate and appropriate care.

**Objectives:** To identify health challenges facing the Rohingya refugee population in Milwaukee, describe resources available to assist them, and determine what we as health care providers can do to better serve our Rohingya neighbors.

**Methods:** Face-to-face and phone interviews took place between April 2018 and January 2019. Interviews were done with active volunteer agencies in Milwaukee, public health groups, health systems, and community organizations which are working with Rohingya refugees in Milwaukee.

**Results:** Major themes included trust, adherence to Islam, language barriers, navigating the health care system, and cultural attitudes regarding health care. While some of these themes represent barriers to health for Rohingya in Milwaukee, there are a wide variety of resources and efforts from community organizations and local businesses to address various barriers.

**Conclusions:** The Rohingya face many of the challenges which other refugee groups have faced but fortunately community groups, volunteer agencies, and local businesses have been able to address some of these challenges. We as providers can continue to positively impact the health of the Rohingya in Milwaukee by being aware and addressing barriers to care such as language, establishing trust, and cultural attitudes on health.

***Hydroxocobalamin for the Treatment of Bacteria-Induced Vasoplegia*****Authors:** Walters KM, Schulz ME, Gutterman DD, Barrios CS, Willoughby RE, Freed JK**Project Mentor:** Julie Freed, MD, PhD

**Introduction:** Refractory hypotension (vasoplegia) during bacterial infection, or septic shock, causes significant mortality in ICU patients. It has been found that septic patients have elevated plasma levels of hydrogen sulfide (H<sub>2</sub>S), a vasodilator produced endogenously and by bacteria such as meningococcus. These findings suggest H<sub>2</sub>S may contribute to bacteria-induced vasoplegia. Hydroxocobalamin, an investigational therapy for H<sub>2</sub>S intoxication, has been effective in treating vasoplegia post cardiopulmonary bypass and post liver transplantation. We hypothesized that vasoconstriction would be impaired in arterioles exposed to H<sub>2</sub>S-producing bacteria and that treatment with hydroxocobalamin would restore vasoconstriction despite bacterial exposure. **Methods:** Arterioles were dissected from freshly discarded adipose tissue. Arterioles were incubated overnight in media containing cysteine and H<sub>2</sub>S-producing *Neisseria lactamica*, with or without AOAA, an enzyme inhibitor of H<sub>2</sub>S production. The following day, arterioles were treated with hydroxocobalamin or vehicle. Microvessels were then cannulated onto micropipettes, pressurized, and perfused with Krebs buffer. Changes in vessel internal diameter were measured during the administration of ET-1 or NE. **Results:**

Vasoconstriction to ET-1 was impaired in vessels exposed to H<sub>2</sub>S-producing bacteria compared to control (7.5%±1.7,%constriction±SEM,n=5, versus 45.7%±9.4,n=5, respectively). Constriction to NE was also impaired in bacteria-exposed vessels (8.5%±3.2, n=5, versus 31.8%±5.7, n=5). For ET-1 and NE, constriction improved in arterioles exposed to bacteria incubated with AOAA, (27.6 %±5.7, n=5 and 18.5%±2.4, n=5, respectively) and hydroxocobalamin (25.5 %±2.8, n=5 and 21.7%±2.3, n=5, respectively). **Conclusions:** Bacterial sources of H<sub>2</sub>S may contribute to the vasoplegia seen in patients with septic shock. Hydroxocobalamin is a potential therapy for reversal of bacteria-induced vasoplegia.

***Community and caregiver perceptions of giving care to seniors*****Authors:** Waniger A, Gale K, DeNomie M, Nelson D.**Project Mentor:** David Nelson, PhD, MS**Community Partner:** Eras Senior Network

Background: Family caregivers of seniors and disabled adults frequently bear the responsibility of aiding in instrumental acts of daily living and locating resources, often while raising their own families. As the demand for caregivers rises, these individuals may experience declining physical health and increased social and emotional stress compared to their non-caregiving counterparts. This project aims to better understand the journey of unpaid family caregivers to identify and define opportunities for improvement across organizations, policies, systems and teams. Methods: A purposive sample of 28 current and former unpaid caregivers of seniors or people with disabilities (26 female, 2 male) participated in 4 separate focus groups (duration of 60-80 minutes). Recordings were transcribed verbatim and analyzed using open coding. Results: Six major themes surrounding the experience of caregiving emerged from the coding process: Ambivalence, Family Dynamics, "Boiling Point," Acknowledgment and Acceptance, Coping, and Interaction with the System. Interviews indicated an urgent need to identify and support unpaid caregivers earlier in their trajectory of caring for a senior and provide consistent, right-time resources over the trajectory of the senior's lifespan. Discussion: The rational, emotional and relational components of caregiving represent distinct but overlapping themes within the experience of giving care. The system surrounding caregivers must proactively identify caregivers as equal members of the care team for a senior or disabled adult early in the patient's disease trajectory. At a larger level, the experience of these caregivers needs to be considered when designing systems not only for caregivers, but for hospital systems, providers of medical and psychosocial support and community-based organizations.

***Understanding variation in antibiotic prescribing for uncomplicated URIs among primary care providers*****Authors:** Watson Q, Blommel G, Remy C.**Project Mentor:** Gregory Blommel, MD

From 2016 to 2017 Froedtert & the Medical College of Wisconsin implemented a five-part intervention to reduce inappropriate antibiotic prescribing by ambulatory primary care providers to patients diagnosed with an uncomplicated upper respiratory tract infection. The interventions included improved patient education materials, more efficient EHR tools, CME credit incentives for participation, academic detailing sessions with unblinded provider prescribing rates, and recruitment of physician leaders. At the close of the grant period there was a 12% reduction in inappropriate antibiotic prescribing for URIs across the practices, however there were large variations in provider performance and improvement. To better understand the reasons for such variation and improve cost and waste reduction interventions in the future, certain provider variables were analyzed in a retrospective cohort study to attempt to understand improvement and performance variability. Factors that were assessed included number of academic sessions attended, years of experience, volume of patients seen each month, provider designation, grouped clinic site variation, and relationship to patient satisfaction surveys. Of 106 total providers located at 19 different clinics, there was a greater decrease of inappropriate antibiotic prescribing by providers who performed in the bottom quartiles at the start of the intervention. These providers also saw a significantly greater number of patients per month. Furthermore, attendance at the earlier academic sessions had statistically greater decreases in prescribing rates. Surprisingly, patient satisfaction surveys, experience, and provider designation had no correlation to improvement. These results imply that future quality and improvement projects would have the best impact if greater focus is devoted to providers who are furthest from target goals, towards practices that improve EHR efficiency, and early in-person academic interventions.

***Community Indicators of Health As Evidence Of Need for Medical Education Reform*****Authors:** Weber M, Wadhwani G, Draeger-Pederson C, Nelson D.**Project Mentor:** David Nelson, PhD, MS**Community Partner:** Friedens Community Ministries- Despensa de la Paz Food Pantry

**BACKGROUND:** Health status encompasses more than visits with a physician, and other determinants are critical to outcome and well-being. It is important that future physicians learn about the social determinants of health, and working with community organizations is one way for medical students to obtain exposure to a population's socioeconomic factors. The Despensa de la Paz food pantry in Milwaukee, Wisconsin has worked to build trusting relationships with a low-income community and offers a snapshot of health which can be used to collectively address health gaps.

**METHODS:** A health survey was conducted at Despensa to assess basic needs of community members. Separately, third year medical students from the Medical College of Wisconsin were surveyed to assess their experience during clinical rotations with asking patients these basic needs questions and if the topics had been covered in their curriculum.

**RESULTS:** One of many results at Despensa showed that 10 of the 41 community members lack a regular physician and over 75% are food insecure and 25% lack basic working appliances while over 90% reported having stable housing. Over 90% of students reported their curriculum never taught them how to approach patients with these questions.

**CONCLUSION:** There is an evident gap between medical students' comfort level with regard to asking about the social determinants of health. Curriculum reform to bridge this gap should be considered in order to provide students with confidence to assess social drivers and a broader understanding of how to address health.

***Investigation of Ultrasound as a Diagnostic Imaging Modality for Little League Shoulder*****Authors:** Gunnar Whealy, BS; Shayne Fehr, MD; Xue Cheng Liu, MD, PhD**Project Mentor:** Shayne Fehr, MD**INTRODUCTION**

Proximal humeral epiphysiolysis or Little League shoulder (LLS), is an increasingly common overuse injury of the proximal humeral physis that is caused by repetitive overhead motion (predominantly throwing in youth baseball players).

Diagnosis of LLS is typically based on clinical evaluation with radiographic/x-ray (XR) confirmation. Ultrasound (US) is an imaging modality with increasing use for the evaluation of musculoskeletal conditions. We hypothesized that US would be a valid and reliable modality for evaluating changes seen in LLS, particularly changes in the width of the physis at the proximal humerus.

**METHODS**

Ten male baseball players(12-16) with a new diagnosis of LLS based on clinical exam and XR findings were enrolled in the study at the time of their initial evaluation in clinic. The physeal width at the lateral aspect of the proximal humerus was measured using PACS on an AP view for the affected and unaffected shoulders at the initial and follow-up visits. After XR, US was used to measure the width at both shoulders. T-test was performed on US difference between affected and unaffected arms.

**RESULTS**

Affected and unaffected arms' physeal width (mm) at the initial visit averaged 5.94 1.69 and 4.36 1.20 respectively on XR, and 4.15 1.12 and 3.40 0.85 on US. Median difference of all averaged US measurements between the affected and unaffected arm at the initial evaluation was 0.75 mm (SE=0.12), which was statistically significant (p=0.00016).

**CONCLUSION**

US should be considered as an option for an experienced sonographer for measuring the physis when attempting to confirm and/or follow the diagnosis of LLS. However, radiographs should still be considered the imaging modality of choice in clinical scenarios that are less certain.

***The Effect of the Metal Ion Ratio on Chemokine Production and Binding Protein Expression Related to THA*****Authors:** Whitlock, RH; Struve, JA; Ninomiya, JT; Weihrauch, D**Project Mentor:** James Ninomiya, MD

**INTRODUCTION:** Metal-on-metal (MOM) articulations in hip arthroplasty offer several advantages (slower wear rate, increased stability, and resistance to dislocation). There is developing evidence suggesting that for some implant designs, the use of MOM may be associated with pain, instability, and early failure. Histologic evaluation of the tissues of loose implants shows vascular proliferation and accumulation of lymphocytes. The aim of this study is to examine the effects of Co and Cr when combined in vitro. We hypothesized a synergistic mechanism where the activation of endothelium is increased when the ions are combined, resulting in increased production of chemoattractants and the upregulation of cell binding proteins.

**METHODS:** HUVEC were exposed to 1mM salts of Co+2 and Cr+3 in ratios and individually. Co+2 content ratio was held at 1mM with ion concentration normalized to NaCl. Samples were collected at 6, 12, and 24-hours. Cell toxicity was tested with an LDH assay. ICAM was determined using Western blot and immunohistochemistry. IL-8 and MCP-1 were determined by ELISA. Negative controls: HUVEC with equimolar concentrations of NaCl. Positive controls: HUVEC with 2ng/ml TNF alpha. Statistical analysis: corrected student's t-test.

**RESULTS:** Co+2 and Cr+3 upregulated endothelial cell surface binding proteins, IL-8, and MCP-1. MCP-1 protein was significantly increased following exposure to the 1:1 ratio. MCP-1 production was significantly less in ratio test conditions when related Co+2 individually. The LDH assay displayed no significant cell death.

**DISCUSSION:** These findings demonstrate metal ions act directly on vascular endothelium. This in vitro model mimics ALTR and confirms that this response is elicited by Co+2. The novel aspect displays that the effects of Co+2 are lessened when combined with Cr+3. This implies that MOM articulations may be subject to similar biologic effects to Co+2 alone, but to a reduced degree.

***Disclosure of Herbal Medicine Use with Hmong Americans in Northern California*****Authors:** Wong S, Lor K**Project Mentor:** Kajua Lor, PharmD, BCACP

**Introduction:** Although interactions between Western drugs and complementary and integrative health approaches (CIHA) can be detrimental to patients' health, ethnic minorities are less likely than Caucasians to disclose their usage. Specifically, Asian Americans have the lowest rate of disclosure. Past studies on CIHA disclosure were done on larger ethnic groups, such as Chinese and Filipino, and not in the Hmong population. This study assessed the rate of herbal medicine use disclosure in the Hmong American population.

**Method:** This study was a cross-sectional survey completed in Sacramento, California. Personal interview surveys were conducted. Statistical analyses were conducted using STATA 2014. Categorical data was reported by one-way frequency and percentages. Univariate comparisons were performed with chi-squared, Fisher's exact, or Wilcoxon Rank-Sum test. Two group comparisons were made using chi-square, Wilcoxon Rank-Sum, and t-tests. A p-value of <0.05 was deemed statistically significant.

**Result:** There were 217 responses regarding herbal medicine use. Hmong participants have significantly higher rates of nondisclosure of herbal medicine usage compared to the Caucasian participants to both physicians (76.8% vs 33.3%,  $p<0.001$ ) and pharmacists (82.1% vs 69.4%,  $p=0.035$ ). Reasons for nondisclosure included the providers' lack of inquiry, participants' inability to communicate about use, and participants not knowing the importance of disclosing their usage. Methods to encourage disclosure included having an interpreter and having providers ask about herbal medicine use, providers of the same race/ethnicity, and providers who understand the effects of herbal medicine.

**Conclusion:** Hmong Americans in northern California have significantly lower rates of disclosure of herbal medicine use than the Caucasian American population. Healthcare practitioners should prompt discussions on the use of herbal medicine when interacting with Hmong American patients.



***Childhood Developmental Screening Implementation Initiatives: A Literature Review*****Authors:** Seth Workentine John Meurer, MD, MBA**Project Mentor:** John Meurer, MD, MBA

Background: Identification and intervention rates for developmental delay fall short of estimated prevalence. Many initiatives have been published which implement developmental screening in a wide range of practices. This literature review analyzes seven initiatives for quantitative screening rate improvement as well as qualitative strategies used, and challenges faced. Methods: Search was performed on Ovid, PubMed, and Pediatrics for articles that were published within 15 years in the United States. Articles were narrowed to seven publications based on relevancy. Results: Final screening rates ranged from 45 to 92% over two to a thousand clinics involved. Common techniques used include training providers and staff with screening and referral, dividing responsibilities between staff members, regular reporting of screening rates, use of standardized screening tool, and appointing an initiative leader. Many studies reported time constraints and staff turnover as challenges to implementation. Conclusion: Initiatives have been largely successful to increase screening rates although referral rates often remain stagnant.

***Evaluating medical students and residents knowledge of the science of health care delivery and policy*****Authors:** Wright M, Hueston W.**Project Mentor:** William J. Hueston, MD**PURPOSE:**

To evaluate the knowledge of 1st year medical students, 4th year medical students, and 2nd year medical residents at the Medical College of Wisconsin in the subject of U.S. health care systems, policy, and management.

**METHODS:**

A 20 question multiple choice quiz was created based on the principles of the U.S. health care system and sent out via email to all 1st year medical students, 4th year medical students, and 2nd year medical residents inviting them to voluntarily participate in our study by taking the quiz.

**RESULTS:**

The number of participants was 45 first year students(M1), 38 fourth year students(M4), and 17 second year residents(PGY2). The scores for the overall groups were M1: 44.78% correct, M4: 48.68% correct, and PGY2: 53.53% correct and the differences were statistically significant  $p=0.018$ . M1 and M4 scores were also divided into those who were enrolled in the Health Systems and Policy Management(HSMP) pathway and those who were not. HSMP pathway students performed better than those not in the pathway with larger differences in the M1 students ( $p=0.004$ ) than the M4 students ( $p=0.200$ )

**CONCLUSION:**

The differences in percentages correct between the three groups suggest learning is taken place as students progress through school and residency with the majority of learning between the 1st and 4th year of medical school than 4th year of medical school and 2nd year of residency.

***Cross-Sectional Survey on the Health and Healthcare Utilization Patterns of the Milwaukee Hmong Community***

**Authors:** Wu, Y Lor K, Chen R, Treat R.

**Project Mentor:** Kajua Lor, PharmD

**Introduction:** Hmong Americans have a higher prevalence of chronic diseases and utilize healthcare less than the general U.S. population. However, research on the factors that drive health maintenance and health care utilization patterns in this population remain unclear.

**Methods:** A cross-sectional, semi-structured interview survey was conducted with individuals of Hmong ethnicity living in Milwaukee. A 21-item question survey was presented in both English and Hmong concerning their health conditions, Western healthcare utilization, and perceptions of health/healthcare related factors. Descriptive statistics on baseline characteristics, comparisons to the California Health Interview Survey (CHIS), and multivariate linear regression predicting healthcare visits were conducted.

**Results:** A total of 151 surveys were completed with 37% completing the survey in Hmong. The median age was 36 years, 50% were females, 34% were born in the U.S., and 11% were un-insured. The mean number of visits to a Western healthcare provider in the last year was  $2.2 \pm \text{SD } 3.4$ . Most participants (61%) were very willing to seek care, and 41% felt these visits were very helpful. Most participants (65%) stated cost concerns as a reason not to seek care, and 10.1% had a hard time understanding providers. Compared to the CHIS, more participants were uninsured (11% vs 6%,  $P=0.008$ ), reported lower visits with providers (23% vs 15%,  $P<0.001$ ), felt greater difficulties understanding their provider (9% vs 3%,  $P<0.001$ ), and rated general health lower (3.2 vs 3.3,  $P=0.039$ ). Western healthcare visits were positively predicted ( $R^2=0.154$ ,  $P<0.001$ ) by increased decreased medical cost concern ( $\text{beta}=-0.723$ ), and older age ( $\text{beta}=0.058$ ).

**Conclusions:** Medical cost, communication challenges, willingness to seek Western healthcare, and lower health insurance coverage can contribute to lower healthcare utilization rates and lower health ratings in the Milwaukee Hmong population.

***Comparison and Analysis of U.S. State-Level Concussion Legislation to Find a Model Policy***

**Authors:** Wuensch A. & Nelson, L.

**Project Mentor:** Lindsay Nelson, PhD

In the context of youth contact sports in the United States (U.S.), there has been increased awareness of the physiological effects of concussion and fear about the potential for “second impact syndrome.” Consequently, legislation has been passed in all 50 U.S. States and the District of Columbia (D.C.). While the laws display a great public health response, little attention has been paid to examining how different states have operationalized their concussion laws.

Our primary objective was to code and compare original state concussion legislation and current amendments of the 50 U.S. states and D.C. with a secondary objective of quantifying associations between policy decisions and state demographic characteristics. Both objectives allow for identification of trends in decision making or the presence of a more idiosyncratic process.

Review of legislation disclosed that some policies were virtually universal across states, including: annual information sheets, immediate removal of athlete from play, and signed authorization to return to play. Conversely, other policies were more infrequent and operationalized with more variability across states including: coach training, coverage of private school districts, and approved healthcare providers. Correlational analysis of policy and demographic variables largely yielded no significant associations of interest between legislative variables or state demographics.

Overall, while there is substantial variability in how states have defined their laws around youth concussion, most are following the core guidelines set by the Centers for Disease Control and National Federation of State High School Associations. Further research to determine the degree to which these laws are adhered to by different athlete groups and to establish their influence on concussion management and outcomes would be valuable for informing how to use policy more effectively in the future to improve the clinical care of youth athletes.

***Dose-Volume Parameters for Predicting Outcomes in Transperineal Interstitial Implants for GYN Cancers*****Authors:** Yu G, Zeitlin R, Wheatley M, Bedi M, Erickson B**Project Mentor:** Beth Erickson, MD

**Introduction:** High-dose rate (HDR) brachytherapy provides radiation of tumors from within the body and is an expanding treatment for gynecologic malignancies. However, there is still uncertainty regarding optimization of the dose to achieve tumor control while avoiding toxicity (fistula, ulcer, stenosis) to nearby organs at risk (OARs), including bladder, sigmoid, and rectum. The purpose of this study is to determine dose-volume parameters (dose received by a particular volume of an OAR) that can help predict toxicity in OARs.

**Methods:** Chart review was performed for patients treated for primary or recurrent gynecologic malignancies between July 2001 and December 2016. Radiation plans were reviewed to obtain dose-volume parameters: D0.1cc and D2cc, which refer to the dose received by the most irradiated 0.1cm<sup>3</sup> and 2cm<sup>3</sup> of OARs respectively. Toxicity to OARs was also examined. Statistical analysis involved receiver operating characteristic curves to determine thresholds for toxicity.

**Results:** For comparison of rectum D0.1cc to occurrence of rectal toxicity, area under the curve (AUC) was significantly different from 0.5 (AUC=0.804; p=0.027). Optimal cutoff for predicting rectal toxicity was rectum D0.1cc > 80.4Gy with 80% sensitivity and 83% specificity. Statistical significance was not observed for analysis of bladder or sigmoid dose-volume parameters in relation to toxicity.

**Discussion:** Our finding that rectum D0.1cc predicts occurrence of rectal toxicity suggests a role for dose-volume parameters in establishing guidelines for HDR treatment planning in gynecologic malignancies. Although dose-volume parameters for the other OARs were not predictive of toxicity, additional work needs to be done to expand the study sample.

***Frailty Markers as Predictors of Outcomes in Geriatric Trauma Patients*****Authors:** Yu S, Karandikar A, Brandolino A, Cerniglia R, Webb T, Codner P.**Project Mentor:** Travis Webb, MD, MHPE

**Objective:**

To evaluate the predictive capability of frailty markers -- including the modified Edmonton Frail Scale (EFS), grip strength, and psoas muscle density (PMD) -- on outcomes in geriatric trauma patients 65 years and older at FMLH.

**Methods:**

Patients aged 65 years and older who were admitted to FMLH's Trauma Surgery Service were assessed for markers of frailty using survey tools and functionality testing. CT scans were used to measure PMD in Hounsfield Units. The relationship of the previously stated frailty markers with patient outcomes including the number of complications, discharge disposition, and death were investigated. Data analysis was conducted with the use of SPSS.

**Results:**

180 patients were included in this study, with a mean age of 77.12 years. Of the 180 patients, 78 patients had CT scans analyzed for PMD. Upon discharge, 93 patients were deemed to have favorable discharge dispositions. 87 patients were deemed to have an unfavorable discharge disposition (i.e. were discharged to a facility with higher acuity of care). When compared to their counterparts, patients with favorable discharge dispositions, on average, were found to have lower EFS scores (3.92 vs. 4.32, p=0.327), increased grip strength (49.91lbs vs. 39.94lbs, p=0.007), and larger PMD (47.53HU vs. 42.97HU, p=.040) after an independent sample t-test was performed. No statistically significant correlation was found between the number of complications and EFS (r=0.083, p=0.269), grip strength (r=-0.062, p=0.405) or PMD (r=-0.81, p=0.479). Mortality was not analyzed due to limited data.

**Conclusion:**

In patients who were identified to have higher markers of frailty, there was an increased incidence of unfavorable discharge disposition. A correlation between severity of frailty and the number of complications was not established. Further research is necessary to validate the efficacy of the modified EFS, grip strength and PMD as reliable measures of frailty.

***Adoption and Foster Care Elective Course*****Authors:** Wilson S, Song S, Zarif M.**Project Mentor:** Samantha Wilson, PhD

The adoption and foster care community present with a unique set of biological, psychological, and social needs that are important for healthcare providers to recognize. Despite the high prevalence of individuals in our society directly affected by adoption and foster care, very little, if any, information is given to medical students about this cohort. In light of this shortfall in training, we set out to create an elective course curriculum for medical students addressing various topics about adoption and foster care, specifically concerning their intersection with the medical field, in order to increase future physician competence in caring well for patients and families directly impacted by adoption and/or foster care. Together with various community partners who are also invested in the adoption and foster care community, we will offer an elective course for medical students at the Medical College of Wisconsin to introduce biological, psychological, and social issues relevant to adoption and foster care; assist students in developing clinical skills for working with patients impacted by adoption and foster care; provide students an opportunity to consider their own attitudes about adoption and foster care; and introduce available community resources for patient education and referral. Through this course, we hope that the Medical College of Wisconsin will graduate physicians who are more competent and compassionate in caring for their patients of the adoption and foster care communities.

***Software for Examining the Effects of OCT Imaging Modality on Calculated Foveal Morphology*****Authors:** Zaro B, Linderman R, Carroll J.**Project Mentor:** Joseph Carroll, PhD

**Background:** Optical coherence tomography (OCT) is a non-invasive tool that allows for the imaging of the living retina and for the evaluation of retinal disease. To quantify abnormal, a normative database must first be established to determine a baseline. Here we examined if Optovue and Cirrus images are equivalent in determining foveal morphology using custom MATLAB scripts.

**Methods:** 149 subjects with no known ocular or vascular diseases were recruited. A 3 x 3mm Optovue AngioVue, 6 x 6mm Optovue AngioVue scan, and a 6 x 6mm Cirrus HD-OCT scan was acquired for each subject on the same eye. Axial length for each subject was measured using the IOL Master. Using software generated retinal thickness data, custom MATLAB scripts fitted a difference of gaussians model to approximate to shape of the foveal pit. From the model, foveal morphology including volume, area, and depth were calculated.

**Results:** The mean volume ( $\pm$ SD) of the 6 x 6mm Optovue was  $0.0974\text{mm}^3 \pm 0.031\text{mm}^3$ , 3 x 3mm Optovue was  $0.1016\text{mm}^3 \pm 0.031\text{mm}^3$ , and Cirrus was  $0.0902\text{mm}^3 \pm 0.033\text{mm}^3$ . The mean area volume ( $\pm$ SD) of the 6mm Optovue was  $3.183\text{mm}^2 \pm 0.706\text{mm}^2$ , 3mm Optovue was  $3.992\text{mm}^2 \pm 1.095$ , and Cirrus was  $2.989\text{mm}^2 \pm 0.780\text{mm}^2$ . The mean depth volume ( $\pm$ SD) of the 6 x 6mm Optovue was  $0.1237\text{mm} \pm 0.0228\text{mm}$ , 3 x 3mm Optovue was  $0.12826\text{mm} \pm 0.0225\text{mm}$ , and Cirrus was  $0.1163\text{mm} \pm 0.0225\text{mm}$ . Significant differences using paired t-tests were found when comparing foveal metrics for Optovue and Cirrus ( $p < 0.0001$ ).

**Conclusion:** Retinal images obtained using Optovue and Cirrus are not equivalent for the comparison of foveal measurement including volume, area, and depth. Differences may be due to uncorrected sources of error.

***Epidural Anesthesia Is Associated With Higher Incidence of Complications After Open Ventral Hernia Repair*****Authors:** Zhou S, Helm M, Goldblatt M.**Project Mentor:** Matthew Goldblatt, MD

**Introduction:** Open ventral hernia repair is a common surgical procedure with multiple options for post-operative pain control, including intravenous narcotics or epidural. There is a lack of literature investigating the complications of epidural use in open ventral hernia repairs.

**Hypothesis:** We hypothesized that intraoperative epidural anesthesia use during open ventral hernia repair would increase complication rates.

**Specific Aims:** The primary objective was to determine the morbidity and mortality associated with the use of epidurals for post-operative pain control.

**Study Methods:** This study was a retrospective review of patients who underwent open ventral hernia repair. Data was abstracted from the National Surgical Quality Improvement Program 2015 dataset. Outpatient procedures, emergency cases, patients who did not receive mesh, or patients who remained inpatient for less than two days were excluded from analyses to exclude simple hernias.

**Results:** In total, 1943 patients met inclusion criteria of which 1009 (51.93%) received any combination of non-epidural post-operative pain relief and 934 (48.07%) received an epidural. The patients who received an epidural had a higher incidence of pulmonary embolism (1.4% vs 0.5%,  $p=0.04$ ), urinary tract infection (3.1% vs 1.6%,  $p=0.03$ ) and had a greater length of stay (6.7 vs 5.0 days,  $p<0.0001$ ) compared to those patients without an epidural.

**Conclusions:** The use of epidurals was associated with an increased incidence of pulmonary embolism and urinary tract infections and increased length of stay. This could be attributed to the negative impact of epidurals on mobility in the post-operative period.

***Barriers to Follow Up Care in an Underserved Community Based Tele-Ophthalmology Screening Program*****Authors:** Zolot A, Medic V, Romant J, Castro A, Pacheco MS, Rowland R, Robinson F, Zinkevich N, Ahamed I, Kim J.**Project Mentor:** Judy Kim, MD**Community Partner:** United Community Center; Milwaukee Health Department; Marquette University; Carroll University

**Introduction:** While much is known about the effectiveness of tele-ophthalmology, less has been studied regarding the successes of follow up care once diabetic retinopathy or other abnormalities have been detected. We assessed adherence and barriers to recommended diabetic eye care and the issues encountered by case managers in the Tele-Eye Health Diabetic Retinopathy Screening Program.

**Methods:** The Tele-Eye Health Collaborative is a partnership between the Milwaukee Health Department (MHD), United Community Center (UCC), The Medical College of Wisconsin, and local institutions that brings retinal screenings to community organizations and events through the use of a mobile non-mydriatic fundus camera. Trained community members and MHD nurses provided free screenings for 1107 participants (~40% African American, 36% Latino) with and without diabetes during an eighteen-month period. Images were analyzed for retinal disease and results were sent out. Those with urgent findings received calls from MHD nurses or Spanish language fluent UCC staff members to coordinate care. Call logs were reviewed to identify follow up status, required interventions, and barriers to care.

**Results:** Seventy-six participants required follow up care within 3 months. Cited barriers included lack of insurance (32%), overwhelming health issues (7%), language barriers (30%), and difficulty scheduling appointments. Thirty of these participants were documented as having seen an eye care specialist and many others saw their PCP for diabetes management. Case managers called 62 (82%) of these participants more than once, but 19 were never contacted despite multiple attempts. 24 (32%) of those requiring follow up did not have insurance.

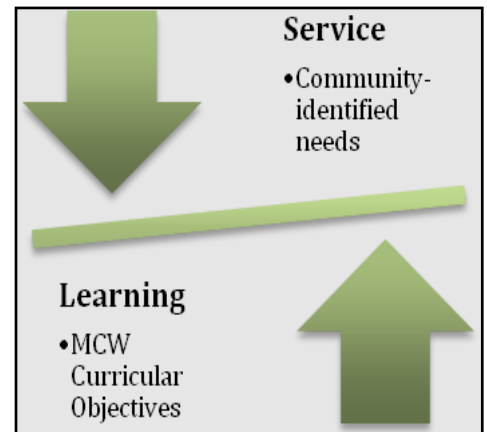
**Conclusions:** Culturally appropriate screening, personalized education, and extensive case management is needed to ensure participants follow eye care recommendations. Even with coordination, only 40% were documented as having seen an eye care specialist within three months.

# Community Engagement in Pathways

**Service Learning** is “a structured learning experience that combines community service with preparation and reflection. Students engaged in service-learning provide community service in response to community-identified concerns and learn about the context in which service is provided, the connection between their service and their academic course work, and their roles as citizens and professionals.” (LCME IS-14-A)

## Key Features of Service Learning

- Curricular – results for academic credit
- Places equal value on community -defined service objectives, and curricular learning objectives
- Is planned and implemented in a 3-way partnership – student, faculty member and site-based community staff



**Pathway students serve the community around MCW while learning how to connect future patients to supportive community resources, and partner with local agencies to promote health.**

## Service Learning

Community partners provide service learning and community-engaged scholarship opportunities that help stimulate critical thinking, civic engagement and cultural understanding.

## Site Visits

Students in GH and UCH Pathways visit organizations that provide health care, resources and social service programs to underserved communities. Visits provide experiential learning through hearing firsthand about services and programs, and meeting the people involved.

## Core Sessions

Some Pathway sessions are held at community sites and include tours and presentations by the host agency. Some sessions at MCW include our partners and patients as educators and facilitators.



Service	Service Learning	Learning
Emphasis on meeting a community need: <ul style="list-style-type: none"> <li>➤ Volunteerism</li> <li>➤ Community Service</li> </ul>	Balances community need with learning objectives	Emphasis on meeting student's learning objectives: <ul style="list-style-type: none"> <li>➤ Field Education</li> <li>➤ Clerkships</li> </ul>
Primary beneficiary: service recipient	Both student and service recipient benefit equally	Primary beneficiary: student
Extra or Co-curricular – no specified structure	Curricular Structure includes: <ul style="list-style-type: none"> <li>➤ Orientation</li> <li>➤ Preparation</li> <li>➤ Service</li> <li>➤ Reflection</li> </ul>	Curricular – structure defined per course requirements

# Community Collaborations

*A special thank you to our community partners for providing input and expertise to Pathway planning, core sessions, site visits, advising and service learning projects.*

Ascension Community Fund	Boys and Girls Club of Greater Milwaukee	Carroll University
Children's Health Alliance of Wisconsin	Children's Hospital of Wisconsin - Midtown Clinic	Children's Hospital of Wisconsin Community Services
Children's Medical Group	COA Youth & Family Centers - Goldin Center	Columbia St. Mary's - Family Health Center
Columbia St. Mary's Foundation	Down Syndrome Medical Interest Group	Emergency Medical Services for Children Wisconsin
Eras Senior Network	Fondy Food Center	Friedens Community Ministries-Despensa de la Paz Food Pantry
Groundwork Milwaukee	Healthier Wisconsin Partnership Program	House of Grace Ministry
James Madison Academic Campus	Marquette University	Martin Luther King Heritage Health Center
Milwaukee Academy of Sciences	Milwaukee Area Health Education Center	Milwaukee Health Department
Milwaukee Women's Center	Orthopaedic Associates of Wisconsin	Orthopaedic Hospital of Wisconsin
Pastors United Milwaukee	Patan Academy of Health Sciences	Patan Hospital (Nepal)
Rethink Resources	United Community Center	Wisconsin Department of Health Services
Wraparound Milwaukee		

## Milwaukee Regional Medical Center (MRMC) affiliates:







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