WELCOME ADDRESS

Welcome to the 2020 Research Symposium sponsored by Central Michigan University College of Medicine and Central Michigan University Medical Education Partners. This is our fifth joint venture celebrating the research accomplishments of our faculty, residents, fellows, and students.

We received over 100 abstracts for the symposium. A judging panel chose eight for oral presentations, and 92 will be presented as posters. The research spans diverse disciplines and includes research from both the Mount Pleasant and Saginaw campuses, as well as from outside research institutions.

The event will be different this year, as we cannot meet face-to-face. However, it is our hope that everyone listens remotely to the oral presentations and asks questions. The posters will be available for viewing for the next 60 days. Please email the poster presenters if you have any questions.

Awards will be given for the best oral presentations in two categories: Basic/Translational Science and Clinical/Quality Improvement/Population Health. Awards for this year’s symposium winners were generously provided by the Saginaw County Medical Society Foundation.

We are proud of the work by our faculty, residents, fellows, and students, and we sincerely thank the presenters and those in attendance for sharing our enthusiasm and celebrating our research accomplishments.

Edward McKee, PhD
Senior Associate Dean, Research
Central Michigan University College of Medicine

Beth Bailey, PhD
Professor and Director of Health Services Research
Central Michigan University College of Medicine

Neli Ragina, PhD
Associate Professor Foundational Sciences and Director Student and Resident Clinical Research
Central Michigan University College of Medicine

Mary Jo Wagner, MD
CAO/Designated Institutional Official
CMU Medical Education Partners and Professor of Emergency Medicine
Central Michigan University College of Medicine
CMED/CMEP 2020 Research Symposium

ACKNOWLEDGEMENTS

FACULTY ORGANIZERS

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Continuing Medical Education
Central Michigan University College of Medicine
**JUDGING PANELISTS**

**CLINICAL AND QUALITY IMPROVEMENT/POPULATION HEALTH ORAL PRESENTATIONS**

**Shayesteh Jahanfar, PhD, MSc, BSc**  
Assistant Professor  
Central Michigan University School of Health Sciences

**S. Sethu Reddy, MD**  
Medical Sciences Discipline Chair and Professor  
Central Michigan University College of Medicine

**Dimitrios Zikos, PhD, MSc, BSN**  
Assistant Professor of Health Administration  
Central Michigan University School of Health Sciences

**BASIC SCIENCE ORAL PRESENTATIONS**

**Richard McCabe, PhD**  
Professor Foundational Sciences  
Central Michigan University College of Medicine

**Robert Petersen, PhD**  
Professor Foundational Sciences  
Central Michigan University College of Medicine

**Rosemary Poku, PhD**  
Assistant Professor Foundational Sciences  
Central Michigan University College of Medicine
Accreditation

Central Michigan University College of Medicine is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

Central Michigan University College of Medicine designates this live activity for a maximum of 2.0 AMA PRA Category 1 Credit™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

To apply for CME credit, go to: med.cmich.edu/cmecert

First time users must sign-in as a “new user” and follow on-screen instructions. The evaluation and certification will remain open for 60 days.

For further information regarding continuing medical education and CME credit(s), please contact Joan Ford, CHCP, at ford1jc@cmich.edu, 989-746-7555 or Melissa Morse, CME Program Specialist at morse1mj@cmich.edu, 989-746-7602.
2020 UPDATE

HOW TO OBTAIN CME CREDIT

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The CME Menu will appear, as below:

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CME Menu

NEW options to enhance your experience
• Select Claim Credit and choose your date view to complete your evaluation (Today's events, 7-day events, 30-day events, or 60-day events)
• Future events to see upcoming sessions

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Please contact us with any questions at CMEDCME@cmich.edu or call 989-746-7602 or 989-746-7555.
The Saginaw County Medical Society Foundation is proud to sponsor the awards for Central Michigan University College of Medicine & CMU Educational Partners 2020 Research Abstract Symposium Friday, April 24, 2020

The Saginaw County Medical Society (SCMS) is the professional association of physicians in Saginaw County and a component of the Michigan State Medical Society (MSMS). The Foundation is the charitable division (501(c)(3) nonprofit) of the SCMS. The Foundation was established in 1968, and originally funded through physician donation of earnings from educational and charity work. The Foundation now relies on donations, along with proceeds from the annual Golf Outing, to fund programs.

WHAT IS THE PURPOSE OF THE FOUNDATION?

• Provides low interest loans to medical students with ties to the Saginaw area, with a maximum of $20,000 over four years.
  • All interest is forgiven if the student returns to Saginaw upon completion of a residency to practice.
  • If the loan recipient returns to Saginaw to practice upon completion of their residency and they are a dues paying member of the SCMS/MSMS, 25 percent of the principal balance will be forgiven at the end of each year they are practicing in Saginaw County, with a maximum of $5,000 per year forgiven.

• Assists the SCMS Alliance (spouses of members) in awarding scholarships to Saginaw County nursing students.

• Awards scholarships to high school juniors and seniors interested in becoming a physician and practicing in Saginaw County.

• Provides scholarships and awards to medical students and residents for research projects.

To assist the Foundation in continuing and increasing their ability to fund the future of medicine in Saginaw County, please see the reverse side for donation information.

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jmcramer@sbcglobal.net

350 St. Andrews Road ♦ Suite 242 ♦ Saginaw, Michigan 48638-5988
(989) 790-3590 office ♦ (989) 790-3640 fax ♦ (989) 284-8884 mobile
www.SaginawCountyMS.com
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jmcramer@sbcglobal.net
ORAL PRESENTATIONS

Moderator for Session 1 – Dr. Neli Ragina
Moderator for Session 2 – Dr. Beth Bailey

There are 8 Oral Presentations.
Each presenter is allowed 15 minutes:
10 minutes for presenting and 5 minutes for questions.
CMED/CMEP 2020 Research Symposium

SCHEDULE OF EVENTS
WebEx Oral Presentations
Friday, April 24, 2020
1:00-3:00 pm

1:00-1:05 pm
Opening Remarks:

Dr. George E. Kikano, MD, Vice President for Health Affairs, Central Michigan University and Dean, College of Medicine

Dr. Mary Jo Wagner, MD, CAO/Designated Institutional Official, Central Michigan University Medical Education Partners and Professor of Emergency Medicine, Central Michigan University College of Medicine

Moderator: Dr. Neli Ragina, PhD

Each presenter will have ten minutes to share their work and five minutes for questions from viewers.

1:05-1:20 pm

Continuous Opioid Administration in Rats Causes Differential Tolerance to Develop in Measures of Respiratory, Behavioral, and Analgesic Effects presented by Christopher Twilling, Medical Student (Harold J. Bell, PhD, Mentor)

1:20-1:35 pm

E-Cigarette Usage and Substance Abuse in Young Adults presented by Nanaki Atal, Medical Student (Beth Bailey, PhD, Mentor)

1:35-1:50 pm

Bioluminescent Optogenetics (BL-OG) for Investigating Functional Synaptic Communication presented by Yuvraj Bhagat, Medical Student (Ute Hochgeschwender, MD, Mentor)

1:50-2:05 pm

Altering Patient Satisfaction of a Residency Clinic by Standardizing New Patient Orientation Processes presented by Olivia Bolen, Resident (Bernard D. Noveloso, MD, Mentor)
Moderator:  **Dr. Beth Bailey, PhD**

Each presenter will have ten minutes to share their work and five minutes for questions from viewers.

**2:05-2:20 pm**

MiR 208a Deficiency Promotes Mitochondrial Biogenesis in the Metabolic Heart presented by Carmen Avramut, Medical Student (Mariana Rosca, MD, Mentor)

**2:20-2:35 pm**

Visual Estimation of Blood Loss presented by Matthew French, Resident (Kathleen M. Cowling, DO, Mentor)

**2:35-2:50 pm**

Depletion of Vertebrate Lipids Dysregulates Aedes aegypti Innate Immunity and Enhances Production of Dengue Virus presented by Clara Tift, Medical Student (Michael J. Conway, PhD, Mentor)

**2:50-3:05 pm**

Evaluating the Most Effective Strategies for Treating Heroin Addiction presented by Ishan Patel, Levi Mazza, Sunny Patel, and Adithya Bala, Medical Students (Ariel Cascio, PhD, Mentor)

**3:05 pm**

Closing Remarks:

**Dr. Mary Jo Wagner, MD, CAO/Designated Institutional Official, Central Michigan University Medical Education Partners and Professor of Emergency Medicine, Central Michigan University College of Medicine**

**Dr. Edward McKee, Ph.D.,** Senior Associate Dean of Research, Central Michigan University College of Medicine
<table>
<thead>
<tr>
<th>Oral Presentation #</th>
<th>Oral Presentation Title</th>
<th>Presenting Author’s Name &amp; Training</th>
<th>Submission Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>#5</td>
<td>MiR 208a Deficiency Promotes Mitochondrial Biogenesis in the Metabolic Heart</td>
<td>Carmen Avramut Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#3</td>
<td>Bioluminescent Optogenetics (BL-OG) for Investigating Functional Synaptic Communication</td>
<td>Yuvraj Bhagat Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#4</td>
<td>ALTERING PATIENT SATISFACTION OF A RESIDENCY CLINIC BY STANDARDIZING NEW PATIENT ORIENTATION PROCESSES</td>
<td>Olivia Bolen Resident</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#6</td>
<td>Visual Estimation of Blood Loss</td>
<td>Matthew French Resident</td>
<td>Clinical</td>
</tr>
<tr>
<td>#2</td>
<td>E-Cigarette Usage and Substance Abuse in Young Adults</td>
<td>Nanaki Atal Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#8</td>
<td>Evaluating the Most Effective Strategies for Treating Heroin Addiction</td>
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</tr>
<tr>
<td>#1</td>
<td>Continuous Opioid Administration in Rats Causes Differential Tolerance to Develop in Measures of Respiratory, Behavioral, and Analgesic Effects</td>
<td>Christopher Twilling Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
</tbody>
</table>
Background: A high caloric regimen causes metabolic syndrome, which is a pre-requisite for type 2 diabetes mellitus, and increases the risk for cardiovascular disease. Both metabolic syndrome and diabetes induce a common cardiac phenotype known as metabolic cardiomyopathy with an early onset of diastolic dysfunction that may progress to systolic dysfunction and congestive heart failure. While the normal heart is able to freely switch between glucose and fatty acid (FA) oxidation for ATP production, the metabolic heart becomes almost completely reliant on FA oxidation for ATP production. This energetic dysregulation is supported by increased mitochondrial metabolism, which includes an increased mitochondrial mass and function. Objective: Based on the reported cardiac specificity of the microRNA (miR) 208a, we investigated its role in bioenergetic metabolism in the metabolic heart. Methods: Lewis rats exposed to a high fat diet (HFD) exhibit obesity, systemic insulin resistance, hyperglycemia, hyperlipidemia, cardiac diastolic dysfunction, and cardiac fibrosis. Microarray studies highlighted an altered miRNA expression profile in the heart upon a HFD, including a decrease in miR 208a. CRISPR deletion of the miR 208a in cultured human SV40 cardiomyocytes exposed to diabetogenic conditions (high glucose, high albumin-bound palmitate) led to a bioenergetics profile that favors mitochondrial FA metabolism including an increase in mitochondrial biogenesis signaling, electron transport chain complexes and critical enzymes for FA beta-oxidation. In addition, miR 208a deficiency prevents the switch in the myosin heavy chain isoform expression that occurs in diabetic cardiac tissue, thus promoting normal cardiac contractility. We analyzed in silico for putative miR 208a targets, focusing on mitochondrial outcomes using the TargetScanHuman database (http://www.targetscan.org/cgi-bin/targetscan/vert_71/targetscan.cgi). Results: We found, confirming with RT-PCR, that mitochondrial ribosomal protein 28 (involved in mitochondrial translation and generation of mitochondrial DNA-encoded electron transport chain subunits), MINOS1 (a conserved component of mitofilin complexes required for mitochondrial function and cristae organization), and MED7 (component of the Mediator Complex that regulates the transcription by facilitating the interaction between nuclear receptors, transcriptional co-activator and co-repressors, and chromatic modification factors with RNA Pol II) are rescued by miR 208a deficiency in cardiomyocytes exposed to diabetogenic conditions. Conclusion: In summary, miR 208a deficiency in cardiomyocytes exposed to diabetogenic conditions. Conclusion: In summary, miR 208a regulates nuclear and mitochondrial transcription, mitochondrial cristae organization and integrity in the diabetic heart, and supports the metabolic remodeling towards increased FA oxidation. Significance: Our data suggest that miR 208a may be a therapeutic target to promote mitochondrial biogenesis in chronic diseases associated with mitochondrial defects.
In BioLuminescent driven OptoGenetics (BL-OG) a luciferase (light emitter) and an opsins (light-sensing optogenetic element) are tethered as luciferase-opsin fusion proteins (luminopsins, LMO). Neuronal modulation can be achieved by light production upon application of the luciferase substrate that changes the membrane potential of the cell expressing the LMO. Here we explored the concept of “interluminescence”, where the light-emitting luciferase is expressed in presynaptic neurons and the light-sensing opsin in postsynaptic neurons. Application of the luciferase substrate will enforce communication across this “optical synapse”, thus allowing experimental control of functional connections. Here we tested this concept by expressing the Gaussia luciferase variant sbGLuc in cortical neurons co-cultured with hippocampal neurons expressing the channelrhodopsin variant ChR2(CS). Neurons isolated from E18 rat cortex and hippocampus were nucleofected with a pre-synaptically targeted luciferase construct (POMC-sbGLuc-dTomato) and an excitatory opsin construct (ChR2(CS)-EYFP), respectively, and were plated on multi-electrode array (MEA) dishes using two-chamber silicon insert to separate the two populations. Multi-electrode arrays have become the preferred means of analyzing brain activity due to its ability to capture a wide range of neural phenomena such as spiking within small clusters to larger oscillations in entire populations. In our experiment, neuronal processes originating from both populations formed synaptic contacts. Bioluminescence emission by cortical neurons generated with application of the luciferase substrate coelenterazine was used to drive hippocampal neurons across synapses. Bioinformatics analysis of recordings revealed that the overall effect of CTZ application on the activity of opsin-expressing hippocampal neurons in the co-cultures was significantly higher compared to that of non-expressing hippocampal neurons and of the cortical neurons in the co-cultures. Our analysis centered on identifying areas of activity that were related spatially and temporally between the two populations. We further characterized the rates of activity across populations that demonstrated a spatial and temporal relationship. Analysis of firing rates and subsequent calculation of synaptic delay further strengthened evidence of synaptic connectivity between cortical and hippocampal neuron populations. Thus, our data supports the feasibility of biological light activation across synaptic partners.
Title: ALTERING PATIENT SATISFACTION OF A RESIDENCY CLINIC BY STANDARDIZING NEW PATIENT ORIENTATION PROCESSES
Authors: Mahwish Alam, MD, Olivia Bolen, MD, Seth Coombs, MD, Joshua Forsyth, MD, Michael Gallo, MD, Joginder Singh, MD, Bernard Noveloso, MD

Background: Resident-run family medicine clinics encompass a unique experience for both patients and providers. Differing providers, varying levels of medical knowledge, having to leave the encounter to precept patients, and multiple different aspects of a resident clinic can be confusing and frustrating for patients.

Objective: We sought to streamline the new patient orientation process to alleviate confusion regarding how a family medicine resident clinic is run and to improve overall patient satisfaction of our clinic.

Methods: By employing quality improvement at the Central Michigan University Family Medicine Clinic, we created a patient orientation video entailing what a resident run clinic encompasses. The video was tailored to common concerns expressed by our clinic patients. The experimental group watched the standardized orientation video at the beginning of their office visit, followed by two questionnaires evaluating their understanding of a resident clinic and their satisfaction with the orientation process. Our control group received the status quo, resident-provided non-standardized verbal orientation process, followed by the same two assessments.

Results: We surveyed 81 patients from October 2019 to February 2020, with 36 individuals in the non-video group and 45 in the video group. During this time our clinic had 146 new patients above the age of 18yo, amounting to approximately 55% participation rate. For the attitude survey, the question 1-9 mean average for the non-video group was 4.176 (0.7472) and the average for the intervention group was 4.685 (0.5502) with a t-test (p-value) of 0.214 (0.831). There is insufficient evidence to conclude the average scores on Q1-Q9 and overall average of Q1-Q9 are different for participants between the standard track and video track.

For the orientation quiz, the mean average for questions 1-9 were 7.44 (1.731) in the non-video group, and 7.27 (1.338) for the video group, with the Chi2, Fisher’s Exact*/t-test (p-value) of 0.521 (0.604). There is insufficient evidence to conclude the proportion of correct answers on Q1-Q9 are different for participants between the standard track and video track. There is also insufficient evidence (p-value=0.604) to conclude the average scores on the orientation quiz for Q1 to Q9 are different for participants between the standard track and video track.

Conclusion: Patient satisfaction and knowledge of The CMU Family Medicine Residency Clinic had no statistically significant improvement between the control and experimental groups. More research should be done to assess additional ways in which satisfaction of resident clinics may be improved.

Significance: Although there was no statistically significant differences in attitudes or knowledge between the video and non-video groups, the benefits of standardization of orientation and the ability for providers to focus on the issue at hand at an initial visit may still justify the use of an orientation video.
Abstract Title: Visual Estimation of Blood Loss
Authors: Matthew French, DO, MS; Kathleen Cowling, DO, MS, MBA; Neli Ragina, PhD; Stephen Zyzanski, PhD
Abstract Category: Clinical
Advisor: Kathleen Cowling, DO
Affiliation: Central Michigan University College of Medicine

Background: Blood loss is a major cause of morbidity and mortality in trauma. Blood loss estimation in the surgical literature is well studied, but there is limited data outside of the operating room (OR). However, blood loss in trauma mostly occurs at the scene of the injury, in the transporting vehicle, and where they are initially treated in the hospital, which is usually the Emergency Department (ED). These locations, unlike the OR via sponges or suction containers, do not allow for the collection of blood, which prevents accurate measurement. Instead, oftentimes an estimate of blood volume that has been lost is made purely by visual estimation alone. The literature is limited in regard to emergency personnel evaluation, isolating variables, and assessing various levels of training.

Objective: In this study, we evaluated the ability of attending emergency physicians (EPs), paramedics, and residents to estimate volumes of simulated blood. Methods: To evaluate this, we showed EPs, paramedics, and residents four, premeasured volumes of simulated blood, in a randomized order, on a non-absorbent, flat, white surface, in a relatively uniform circle. Exclusion criteria for EPs was being less than 5 years out of residency, and residents was prior surgical, prehospital or military experience. Participants were asked to give their estimations of the amount of simulated blood, write them down, and were unable to change their responses once they had moved on to the next station. Pearson correlations were performed to analyze the data. Results: Findings showed no statistical significance or the primary outcome in the ability to estimate blood based on level of training (p=0.27). Only one of the secondary outcomes showed statistical significance, and that was, within the residency cohort, Family Medicine residents were more accurate at volume estimation than both Emergency Medicine and Psychiatry residents (p=0.000). Overall, the participants in the study consistently underestimated the volumes of simulated blood, with underestimations increasing in volume as the actual volume increased. Conclusion: These data suggest that Emergency Medicine personnel are inaccurate at estimating volumes of blood visually, with a propensity to underestimate the volume.

Significance: Using ATLS guidelines, the patient’s vital signs determine which class of hemorrhagic shock they are currently in, which theoretically correlates with the percentage of the patient’s blood volume that has been lost. This does not take many factors into account, including medications, comorbidities, or mechanism of injury. During traumas, an estimate of blood loss is often given by providers, however, aside from chest tube drainage systems, suction canisters, or syringes, there is not an accurate way to measure uncontained blood loss. This study raises further concerns that the visual estimates of blood loss we are both getting and providing are underestimates, which become even less accurate with more clinically significant hemorrhages.
Background: Electronic cigarette (e-cigarette) usage has been increasing among young adults since their introduction in the early 2000s. Although many studies have sought to determine risk factors for e-cigarette usage, such as use of other substances, or psycho-social factors, there is little continuity in these findings, especially regarding relationship of e-cigarette use to other substance use. We evaluated the rates of e-cigarette use from 2016-2018, and associations between e-cigarette use and the use of traditional combustible cigarettes, alcohol, and marijuana in a nationally representative sample of young adults, aged 18-24, in the United States. Methods: Population data was obtained from the publicly available Behavioral and Risk Factor Surveillance System (BRFSS) database and codebooks from the years 2016-2018. BRFSS data is an annual questionnaire dispensed and collected through the Center for Disease Control (CDC). The survey collected data on “ever” e-cigarette use, minimum 100 traditional cigarettes smoked, alcoholic binge drinking, and past 30 days marijuana or hashish use. Chi squared analysis of the data was performed to determine associations and statistical significance between variables. Results: From 2016-2018 there was a decrease in traditional cigarette smoking \[p=0.000\] and an increase in e-cigarette use \[p=0.000\] in the age range of 18-24-years-old. There were no statistically significant trends in marijuana use \[p=0.531\], or alcoholic binge drinking \[p=0.059\]. Rates of traditional cigarette use, alcohol use, and marijuana use were all higher in e-cigarette users compared to non-users \[p=0.000\]. Conclusion: Our study examined rates of young adult engagement in various substance risk behaviors coinciding with e-cigarette use. Our early results indicate that e-cigarette use may be associated with different types of substance use. An increase in e-cigarette usage and a decrease in traditional tobacco cigarette use, binge drinking, and marijuana use was observed in young adults from 2016 to 2018. Notably, young adults who used e-cigarettes had significantly higher rates of engagement in all examined risky behaviors compared to young adults who did not use e-cigarettes. Significance: While our data indicates that associations may exist between some risky or detrimental behaviors and e-cigarette use in the study population, further research is required to expand upon and understand these associations to be able to evaluate them appropriately. The lack of research on e-cigarette use among young adults, combined with e-cigarette’s exponential growth in popularity, renews the need for discussion and increased understanding to guide public policy. Further studies are needed to examine the complete physical, mental, and social challenges that e-cigarettes may pose to the general population.
The purpose of this systematic review is to evaluate the most effective treatment and therapy strategies for heroin addiction. The search aimed to examine published studies which compared the efficacy of medical treatments and therapies for heroin cessation, mortality, and retention in treatment programs. Articles that met the search criteria were selected and analyzed for significant outcome data demonstrating efficacy in respective treatment modalities. Studies were organized by treatment comparison in Microsoft Excel and then read to identify specific treatment outcomes. The results indicate that there are no clear superior treatments for combating heroin addiction, however each treatment offers its own advantages. Buprenorphine and methadone are much more accepted by patients and have higher rates of adherence. When comparing buprenorphine with naloxone, there are no significant differences found in treatment retention, heroin craving, or withdrawal symptoms ($p = 0.02$). Buprenorphine in conjunction with psychosocial treatment proved to be an effective treatment option when compared to placebo group ($p = 0.0001$). Additionally, multiple studies displayed buprenorphine as an effective treatment with significant reduction in heroin self-administration compared to placebo treatment ($p < 0.001$).
Background: Dengue fever is an emerging mosquito-borne disease and a major public health concern, infecting an estimated 390 million and killing up to 25,000 people each year. A better understanding of the mechanisms by which dengue virus infects and is shed from mosquitoes could lead to novel methods of dengue fever prevention. Objective: This project aims to ascertain whether there are significant differences in infectivity of dengue virus on mosquito cells fed on vertebrate lipids versus mosquito cells deprived of vertebrate lipids, as well as whether mosquito cell gene expression changes during dengue virus infection. Methods: Aag2 (Aedes aegypti) cells were adapted to lipid-depleted conditions via culturing in a lipid-depleted media over the course of several passages. The resulting cells have a very low cholesterol content and can be thought of as modelling cells of mosquitoes fed on a non-vertebrate diet. Control Aag2 cells were raised on a standard lipid-containing media and can be thought of as modelling cells of mosquitoes that feed regularly on vertebrates. Results: When gene expression of lipid-depleted and control Aag2 cells was compared during dengue infection and non-infection conditions, many genes involved in innate immunity and metabolic processes were found to have altered levels of expression. Specifically, some innate immunity genes had increased expression and some sugar and lipid metabolism-related genes exhibited decreased expression when complete Aag2 cells were infected with dengue virus, while no significant change was observed in expression of these genes when lipid-depleted cells were infected. Additionally, when the cell lines were infected with dengue virus, the lipid-depleted Aag2 cells were found to shed more viral RNA than the control, and dengue virus infection formed more focus forming units on the lipid-depleted cells than on the control cells. Conclusions: We conclude that Aag2 cells, when raised on media containing vertebrate lipids and infected with dengue virus, exhibit increased innate immunity gene expression and decreased expression of some sugar and lipid metabolism genes, while lipid-depleted Aag2 cells do not exhibit such changes. Aag2 cells adapted to lipid-depleted conditions also have increased susceptibility to dengue virus infection and increased dengue virus shedding; this may be related to the lack of innate immune activation in these cells. Significance: The results described here imply that mosquitoes under lipid-depleted conditions may be more susceptible to dengue virus infection and more likely to transmit virus, likely due to decreased activation of innate immunity during viral infection. Further work must be done to ascertain whether vertebrate lipids induce innate immunity expression in mosquitoes or whether the innate immune system is downregulated during lipid-depleted conditions to increase survival.
Opioid drugs cause potent suppression of augmented breaths (ABs). Since many physiological effects of opioids demonstrate tolerance, in this study we sought to determine the temporal pattern and degree of any such tolerance in the suppression of ABs during 6 days of chronic opioid administration. Adult male rats (average 439.8 ± 19 g) received a continuous infusion of either saline (SAL, 0.01 ml/hr, n=5) or methadone (MET, 6 mg/kg/day, n=5) over 6 days via subcutaneously implanted osmotic pumps (Alzet, model 2ML1). Another control group received the cannabinoid receptor agonist WIN 55,212-2 (WIN, 40 mg/kg/day, n=5), as a means of examining the potential confounding effect of altered behavioral activity on variables of interest. Animals were monitored before surgical implantation (D0), and again on days 2, 4, and 6 post-implant (D2, D4, D6, respectively). Respiratory variables were measured using whole-body plethysmography, pain tolerance assessed via tail flick latency (TF), and rearing behavior recorded as an index of behavioral alteration. All outcome variables of interest were analyzed using a mixed model ANOVA and appropriate post-hoc comparisons, with monitoring day being the within-animal factor and experimental group being the between-animal factor considered. We found no differences in baseline measurements between experimental groups. During treatment, MET animals experienced a powerful suppression of ABs (D0 = 6.2 ± 0.383, vs. D2 = 1.4 ± 0.447, p<0.001), with tolerance developing across D4 and D6 (3.0 ± 0.523, p<0.001 and 5.0 ± 0.469, p=0.083 vs D0, respectively). No suppression of ABs was observed in either SAL or WIN animals across D0-D6. Rearing behavior was suppressed in MET (p<0.001 for D2-D6 vs. D0) and WIN animals across D2-D6 (p<0.001 for D2-D6 vs. D0), but not in SAL. However, MET animals demonstrated tolerance in rearing behavior over the 6 days of treatment, increasing back towards baseline on D6 vs. D2, p<0.001). In contrast, WIN animal rearing behavior continued to decrease across D2-D6 vs baseline. TF latency was prolonged in MET (D0 = 2.812± 0.246s vs 11.520± 0.389s, 10.796± 0.152s, & 10.739± 0.281s on D2, D4, D6 respectively), and no significant tolerance was observed across 6 days of treatment in MET animals. TF latency was prolonged in WIN only on D2 vs D0 (6.162± 0.389 s vs 3.826± 0.246, p= 0.002) to a lesser degree than in the MET animals, with no effect observed in SAL animals (p<0.001). We conclude that continuous opioid administration causes profound suppression of ABs with significant tolerance developing towards 6 days of treatment. This tolerance has a temporal pattern dissociated from behavioral effects, and markedly dissimilar to that of the analgesic effect. WIN does not cause any significant alteration of AB production despite a progressively profound suppression of behavioral activity. We propose that the mechanisms of suppression of ABs during opioid treatment follows an opioid-receptor-mediated pathway that is distinct from those mediating either analgesic or behavioral effects. It is therefore promising that targeted adjunct therapies to prevent the suppression of ABs during opioid treatment may be developed, that spare therapeutically desirable analgesic effects.
Posters are listed in order alphabetically by the Presenting Author’s last name.
## Index of Poster Presentations

<table>
<thead>
<tr>
<th>Poster Presentation #</th>
<th>Poster Presentation Title</th>
<th>Presenting Author’s Name &amp; Training</th>
<th>Submission Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Diagnosis and Treatment of Carpal Tunnel Syndrome</td>
<td>fadi aboona Medical Student</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#2</td>
<td>PROMIS CAT forms demonstrate responsiveness in patients following reverse total arthroplasty across numerous health domains</td>
<td>fadi aboona Medical Student</td>
<td>Clinical</td>
</tr>
<tr>
<td>#3</td>
<td>Calcaneal Beak Fracture Repair: Case Study</td>
<td>Matthew Abrell, DPM Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#4</td>
<td>U-47700 – Incidence of a Novel Psychoactive Substance in a Series of Medical Examiner Cases in Oakland County, MI</td>
<td>Lauren Aiello Medical Student</td>
<td>Clinical</td>
</tr>
<tr>
<td>#5</td>
<td>Overexpression of Mutant Rac-1(P29S) Protein Increases the Metastatic Potential of A375 Human Melanoma Cell</td>
<td>Lauren Aiello Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#6</td>
<td>Healthcare barriers for people with disabilities: the physicians’ perspectives</td>
<td>Madelyn Aittama Medical Student</td>
<td>Clinical</td>
</tr>
<tr>
<td>#7</td>
<td>Sacrificing your lungs for Daptomycin may be fatal – A case of Daptomycin Induced Acute Eosinophilic Pneumonia (AEP)</td>
<td>Sindhura Ananthaneni, MD Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#8</td>
<td>Bulk Properties of Dual Poly (ethylene glycol) Capsule are Unaltered Following Freeze-Thaw Cycle</td>
<td>Aarthi Arab Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#9</td>
<td>MiR 208a Deficiency Promotes Mitochondrial Biogenesis in the Metabolic Heart</td>
<td>Carmen Avramut Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>Poster Presentation #</td>
<td>Poster Presentation Title</td>
<td>Presenting Author's Name &amp; Training</td>
<td>Submission Category</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>#10</td>
<td>Distance Supervision and Feedback for Surgical Procedures</td>
<td>Jamsheed Bahaee Medical Student</td>
<td>Medical Education</td>
</tr>
<tr>
<td>#11</td>
<td>Capgras syndrome in a 17-year-old Male following N-dimethyltryptamine and Cannabis use: a case report</td>
<td>Abishek Bala Clinical Fellow</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#12</td>
<td>Improv and talk: Integrating Humanities and Medicine at Central Michigan University's Psychiatry Residency Program</td>
<td>Abishek Bala Clinical Fellow</td>
<td>Medical Education</td>
</tr>
<tr>
<td>#13</td>
<td>Treating Catatonic Excitement in a 14-Year-Old Female: A Case Report</td>
<td>Abishek Bala Clinical Fellow</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#14</td>
<td>Anti-D Immune Globulin Prophylaxis in the First Trimester</td>
<td>Kaitlyn Bates Medical Student</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#15</td>
<td>Rh- Mom, Rh- Dad, Rh- Son: Is Rhogam Prophylaxis Necessary for Pregnancy Number 2?</td>
<td>Kaitlyn Bates Medical Student</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#16</td>
<td>Relationship between Neurological Diseases and Gastroenterological Comorbidities</td>
<td>Kimberly Berke Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#17</td>
<td>Bioluminescent Optogenetics (BL-OG) for Investigating Functional Synaptic Communication</td>
<td>Yuvraj Bhagat Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#18</td>
<td>Job Demands Resource Theory: Can it be applied to better understand gender differences in physician burnout?</td>
<td>Judy Blebea, MD Faculty</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>Poster Presentation #</td>
<td>Poster Presentation Title</td>
<td>Presenting Author's Name &amp; Training</td>
<td>Submission Category</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>#19</td>
<td>Integration of Health Technology Education in the Medical School Curriculum</td>
<td>Samuel Borer, Medical Student</td>
<td>Medical Education</td>
</tr>
<tr>
<td>#20</td>
<td>Patterns of Adult Injury Sustained in Off Road Vehicle Trauma: A Community Hospital Study</td>
<td>Bryan Brazeau, MD, Resident</td>
<td>Clinical</td>
</tr>
<tr>
<td>#21</td>
<td>Antibiotic Prescribing Practices of Primary Care Providers for Respiratory Tract Infections in the United States: A Systematic Review</td>
<td>Kathryn Brucia, Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#22</td>
<td>Severe pulmonary infection in a 20-month-old female: A case report</td>
<td>Kristen Carrillo-Kappus, MPH, Medical Student</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#23</td>
<td>Clinical outcomes of mammogram screening throughout Michigan in 2014</td>
<td>Rachel Cleminson, Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#24</td>
<td>Overcoming Barriers in HPV Vaccination and Increasing Vaccination Rates in Rural Michigan</td>
<td>Rachel Cleminson, Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#25</td>
<td>Correspondence between Federal Food Distribution Program on Indian Reservations and Type II Diabetes in Native Americans</td>
<td>Erik Clutter, Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#26</td>
<td>Post-Intubation Type II Odontoid Fracture Reduction with Video Assisted Laryngoscopy</td>
<td>Daniel Coffey, Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>Poster Presentation #</td>
<td>Poster Presentation Title</td>
<td>Presenting Author's Name &amp; Training</td>
<td>Submission Category</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>#27</td>
<td>Designation of open versus laparoscopic appendectomy depending on socioeconomic statuses</td>
<td>Zachary Crespi Medical Student</td>
<td>Clinical</td>
</tr>
<tr>
<td>#28</td>
<td>Preliminary Clinical Findings of a Targeted Early Detection Program in Men at High Genetic Risk for Prostate Cancer</td>
<td>Sanjay Das, BS Medical Student</td>
<td>Clinical</td>
</tr>
<tr>
<td>#29</td>
<td>A literature review of the effects of canine-assisted therapy in addition to standard therapy on patients with diagnosed psychiatric disorders</td>
<td>Ashley Dean Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#30</td>
<td>Using the intertragic notch to localize the greater occipital nerve for analgesic injection</td>
<td>Ashley Dean Medical Student</td>
<td>Clinical</td>
</tr>
<tr>
<td>#31</td>
<td>Genome-Wide CRISPR-CAS Screen in Pancreatic Cancer Cells Reveals Novel Regulators of Cellular Adhesion</td>
<td>Luke DeHart Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#32</td>
<td>Urinary organ specific neoantigen (OSN) non-invasively diagnoses colorectal adenomas.</td>
<td>Ereny Demian Medical Student</td>
<td>Clinical</td>
</tr>
<tr>
<td>#33</td>
<td>Cord Entanglement in Iatrogenetic Converted Monochorionic-Monoamniotic Twins</td>
<td>Christopher DeVries, MD Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#34</td>
<td>Intracameral Amphotericin B for Recalcitrant Fungal Keratitis – A New Treatment Paradigm</td>
<td>Libing Dong Medical Student</td>
<td>Case Reports</td>
</tr>
</tbody>
</table>
# Index of Poster Presentations

<table>
<thead>
<tr>
<th>Poster Presentation #</th>
<th>Poster Presentation Title</th>
<th>Presenting Author's Name &amp; Training</th>
<th>Submission Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>#35</td>
<td>Recurrent Activity-Induced Headache Associated with Posttraumatic Dural Adhesion of the Middle Meningeal Artery: A Case Report</td>
<td>Lee Elisevich Medical Student</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#36</td>
<td>Multiple Thromboembolic Events in a Pregnant Patient on Anticoagulation - A Case Study</td>
<td>Jessica Faris, MD Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#37</td>
<td>Direct Anterior Approach (DAA) vs. Posterior Approach (PA): A Value Based Decision-Making Approach to Total Hip Arthroplasty (THA).</td>
<td>Brendan Farley Medical Student</td>
<td>Clinical</td>
</tr>
<tr>
<td>#38</td>
<td>Screening Guidelines Towards a Standardized, Safe and Efficacious Approach to Lower Extremity Surgery (LES) in Patients with Peripheral Arterial Disease (PAD)</td>
<td>Brendan Farley Medical Student</td>
<td>Clinical</td>
</tr>
<tr>
<td>#39</td>
<td>Visual Estimation of Blood Loss</td>
<td>Matthew French Resident</td>
<td>Clinical</td>
</tr>
<tr>
<td>#40</td>
<td>Rare Candida Abscess of the Hallux</td>
<td>Austin Friswold Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#41</td>
<td>The Utility of Sulfur Colloid Imaging in Differentiating Charcot Neuroarthropathy versus Osteomyelitis</td>
<td>Christopher Gill, DPM Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#42</td>
<td>Misdiagnosed Cesarean Scar Pregnancy after Transfer of Care: A Case Report</td>
<td>Megan Graham, MD Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>Poster Presentation #</td>
<td>Poster Presentation Title</td>
<td>Presenting Author's Name &amp; Training</td>
<td>Submission Category</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>#43</td>
<td>Case Report: Cerebral Venous Sinus Thrombosis – An Uncommon Presentation Masquerading as Sepsis</td>
<td>David Hansen, DO Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#44</td>
<td>Spinal Cord Compression From Bony Metastasis: A Radiation Oncology Emergency</td>
<td>David Hansen, DO Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#45</td>
<td>The use of scribes in an academic emergency department lead to increases in physician patient per hour, acuity of patients, and RVU production.</td>
<td>David Hansen, DO Resident</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#46</td>
<td>Potential use of PAMAM Dendrimer Nanomolecules as a Delivery Vehicle for Treatment of Ischemic Stroke</td>
<td>Joseph Hellrung, Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#47</td>
<td>The Use of Skin Graft after Crush Injury: A Case Study</td>
<td>Carlyn Hinish, DPM Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#48</td>
<td>Functional Role of the LG-rich Domain of NUP62 in Mitochondrial Function and in Infantile Bilateral Striatal Necrosis</td>
<td>Michael Hudson, Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#49</td>
<td>The sudden aroma of an extra-adrenal pheochromocytoma</td>
<td>Abdur Jamil, Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#50</td>
<td>Re-Inventing How We Teach Venous Return</td>
<td>Rasha Jawad, Medical Student</td>
<td>Medical Education</td>
</tr>
<tr>
<td>#51</td>
<td>Effects of Vitamin D Supplementation on Physical Function in African Americans with Type 2 Diabetes</td>
<td>Sharanya Jayachandran, Medical Student</td>
<td>Clinical</td>
</tr>
<tr>
<td>Poster Presentation #</td>
<td>Poster Presentation Title</td>
<td>Presenting Author's Name &amp; Training</td>
<td>Submission Category</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>---------------------------------------------</td>
<td>------------------------------------------</td>
</tr>
<tr>
<td>#52</td>
<td>Rates of preterm birth in pregnant women with diabetes in rural and non-rural counties of Michigan</td>
<td>Sharanya Jayachandran Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#53</td>
<td>The use of gadolinium based contrast agents in pediatric brain MRIs: The indications and yield.</td>
<td>Anila Kanna, MD Resident</td>
<td>Clinical</td>
</tr>
<tr>
<td>#54</td>
<td>A systematic review of the factors contributing to the outcomes of racial matching in mental health therapy within White Americans, Asian Americans, African Americans, and Hispanic Americans</td>
<td>Vaishali Kapila Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#55</td>
<td>Spontaneous Renal Artery Detachment in a patient with ESRD</td>
<td>Sura Khuder Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#56</td>
<td>Dendrimer and dendriplex distribution across physiological barriers in gravid mice</td>
<td>Eric Kuhn, MD Candidate Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#57</td>
<td>Training on Specific Surgical Skills as Building Units</td>
<td>Breanna Lauinger Medical Student</td>
<td>Medical Education</td>
</tr>
<tr>
<td>#58</td>
<td>A Systematic Review of Endocrine Implications of Testosterone Given to Transgender Males</td>
<td>Olivia Lossia, MD Candidate Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#59</td>
<td>Gender Differences in Burnout and Work Perceptions Among Residents and Attending Physicians</td>
<td>John Lowry Staff</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>Poster Presentation #</td>
<td>Poster Presentation Title</td>
<td>Presenting Author's Name &amp; Training</td>
<td>Submission Category</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>#60</td>
<td>Using Telemedicine for Patients with Psychiatric Disorders to Reduce Suicide Ideation and Behavior: A Systematic Review</td>
<td>Jacob Lynn Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#61</td>
<td>Effects of Estradiol on Glial Acidic Fibrillary Protein levels with varying degrees of exposure</td>
<td>Rabia Mahmood, MD candidate 2021 Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#62</td>
<td>Burn the vape and you burn the lungs</td>
<td>Chandramouli Mandalaparty Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#63</td>
<td>Effect of Hormonal Contraceptives on Athletic Performance: A Systematic Review of the Literature</td>
<td>Nicholas Mangutz, MD Candidate Medical Student</td>
<td>Clinical</td>
</tr>
<tr>
<td>#64</td>
<td>Effect of Hormonal Contraceptives on Injury Risk in Female Athletes: A Systematic Review of the Literature</td>
<td>Nicholas Mangutz, MD Candidate Medical Student</td>
<td>Clinical</td>
</tr>
<tr>
<td>#65</td>
<td>L5 Nerve Root Palsy: A Novel Finding in Distal Junctional Failure of Long Segment Posterior Spinopelvic Fixation</td>
<td>Nicholas Mangutz, MD Candidate Medical Student</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#66</td>
<td>The Use of Semitendinosus Allograft in a Peroneal Salvage Procedure</td>
<td>Owen Morris Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#67</td>
<td>Leptomeningeal carcinomatosis: The Great Headache of an Imitator</td>
<td>Zenobia Ofori-Dankwa Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#68</td>
<td>Emergency Medicine Resident Exposure to Critical Procedures May Differ Based on Presence of Subspecialist Residencies</td>
<td>Andrew Ostosh Resident</td>
<td>Medical Education</td>
</tr>
</tbody>
</table>
# Index of Poster Presentations

<table>
<thead>
<tr>
<th>Poster Presentation #</th>
<th>Poster Presentation Title</th>
<th>Presenting Author's Name &amp; Training</th>
<th>Submission Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>#69</td>
<td><strong>Veress Needle Insertion Simulation Model: A Simple New Module Development for Advanced Surgical Skill Training</strong></td>
<td><strong>Raghuram Palepu</strong> Medical Student</td>
<td>Medical Education</td>
</tr>
<tr>
<td>#70</td>
<td><strong>Altered Mental Status after Eating: A Case of Auto-Brewery Syndrome</strong></td>
<td><strong>Abigail Pittard, MD</strong> Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#71</td>
<td><strong>Evaluating Trends in Opioid Prescriptions, Medication-Assisted Treatment and the Social Determinants of Health</strong></td>
<td><strong>Mariam Zunnu Rain</strong> Medical Student</td>
<td>Clinical</td>
</tr>
<tr>
<td>#72</td>
<td><strong>A Systematic Review: Cesarean Delivery Rates of Incarcerated Persons in the United States</strong></td>
<td><strong>Morsi Rayyan, MS</strong> Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#73</td>
<td><strong>Failure of respiratory pattern switching as the cause for sudden death in neonatal rats following transient asphyxia</strong></td>
<td><strong>Nicholas Rochester, MD Candidate</strong> Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#74</td>
<td><strong>Acute Psychosis in E-Cigarette Withdrawal: Case Report</strong></td>
<td><strong>Kyle Rutledge</strong> Clinical Fellow</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#75</td>
<td><strong>Epigenetics in Psychiatry: a Clinician's Review and Update</strong></td>
<td><strong>Kyle Rutledge</strong> Clinical Fellow</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#76</td>
<td><strong>Medical Student Exposure vs. Perceived Importance of Adverse Childhood Experiences (ACEs)</strong></td>
<td><strong>Kyle Rutledge</strong> Clinical Fellow</td>
<td>Medical Education</td>
</tr>
<tr>
<td>#77</td>
<td><strong>Review of Cognitive Training in Childhood Attention-Deficit / Hyperactivity Disorder</strong></td>
<td><strong>Kyle Rutledge</strong> Clinical Fellow</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>Poster Presentation #</td>
<td>Poster Presentation Title</td>
<td>Presenting Author's Name &amp; Training</td>
<td>Submission Category</td>
</tr>
<tr>
<td>----------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>#78</td>
<td>Identifying Maximal Reactive Astrocyte Proliferation Post Stroke To Set Time Frame for Endogenous Brain Repair</td>
<td>Harrison Schurr Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#79</td>
<td>Deep Trabeculae and Syncope – Ventricular Non-Compaction</td>
<td>Insija Selene Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#80</td>
<td>Applet Design: Risk Assessment in Ischemic Heart Disease Management: A Statistical Model for Healthcare Improvement Designs</td>
<td>Tamara Siblini Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#81</td>
<td>Neonatal Outcomes in Prenatal Opioid Use: A methodological description of a multicenter investigation of the impact of choice and timing of opioid maintenance therapy on neonatal outcomes</td>
<td>Robert Simons Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
<tr>
<td>#82</td>
<td>A Rare Case of Low Flow–Low Gradient Aortic stenosis (LF-LG AS) Presenting as Pleural Effusion</td>
<td>Nadia Sion Medical Student</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#83</td>
<td>Partially Calcified Thrombosed Middle Cerebral Artery Aneurysm with Middle Meningeal Artery Fistula Mimicking Neurocysticercosis: A Case Report</td>
<td>Eleanor Smith Medical Student</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#84</td>
<td>Expansion of Genetic Testing for Breast and Ovarian Cancer Syndromes</td>
<td>Adam Sobilo Medical Student</td>
<td>Case Reports</td>
</tr>
<tr>
<td>Poster Presentation #</td>
<td>Poster Presentation Title</td>
<td>Presenting Author's Name &amp; Training</td>
<td>Submission Category</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------------------------------------------</td>
<td>------------------------------------</td>
<td>------------------------------</td>
</tr>
<tr>
<td>#85</td>
<td>Clinical performance evaluation in a longitudinal integrated clerkship: Students' performance progression</td>
<td>Xiaomei SONG Staff</td>
<td>Medical Education</td>
</tr>
<tr>
<td>#86</td>
<td>Introduction of Advanced Surgical Tasks Simulation for General Surgery Residency Training</td>
<td>Mohammad Ali Tahboub Medical Student</td>
<td>Medical Education</td>
</tr>
<tr>
<td>#87</td>
<td>Posterior Tibial Tendon Dysfunction: Appropriate Surgical Intervention</td>
<td>Taylor Tesoro Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#88</td>
<td>Depletion of Vertebrate Lipids Dysregulates Aedes aegypti Innate Immunity and Enhances Production of Dengue Virus</td>
<td>Clara Tift Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#89</td>
<td>Continuous Opioid Administration in Rats Causes Differential Tolerance to Develop in Measures of Respiratory, Behavioral, and Analgesic Effects</td>
<td>Christopher Twilling Medical Student</td>
<td>Basic &amp; Translational Science</td>
</tr>
<tr>
<td>#90</td>
<td>A Stitch in Time Saves Nine: Early Diagnosis Crucial to Prevent Adverse Outcomes in Secondary Hypertension</td>
<td>Navya Sree Vipparla, MD Resident</td>
<td>Case Reports</td>
</tr>
<tr>
<td>#91</td>
<td>NEONATAL CIRRHOSIS SCREENING AND LIFELONG HEALTH MAINTENANCE METHODS TO PREVENT HEPATOCELLULAR CARCINOMA: A SYSTEMATIC REVIEW</td>
<td>Vivian Wang Medical Student</td>
<td>Quality Improvement / Population Health</td>
</tr>
</tbody>
</table>
# Index of Poster Presentations

<table>
<thead>
<tr>
<th>Poster Presentation #</th>
<th>Poster Presentation Title</th>
<th>Presenting Author's Name &amp; Training</th>
<th>Submission Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>#92</td>
<td>The Management and Maternal Outcomes of Cervical Varicosities in Pregnancy: Spontaneous Vaginal Delivery in the Setting of Cervical Varicosities</td>
<td>Kiara Whitsell, MD Resident</td>
<td>Case Reports</td>
</tr>
</tbody>
</table>
BACKGROUND Carpal Tunnel Syndrome (CTS) is one of the most common problems that impairs hand function; compression of the median nerve at the wrist causes symptoms such as wrist pain, numbness and tingling sensation. Repetitive hand movements such as typing, texting, or holding the phone aggravate the compression and cause inflammation of the median nerve. The diagnosis of CTS is clinical in nature. Electrodiagnostic test may have an important diagnostic role in some circumstances. Non-surgical treatment is the first line treatment of non severe cases. Effective operative treatment is reserved for severe cases of CTS and is done by surgical release of the transverse carpal ligament which is almost always successful. CASE REPORT A 55-year-old female presents to the clinic with complaints of “tingling” sensation affecting her first three fingers of the right hand. The symptoms are not associated with any significant physical trauma and have been progressing over the past three months. She works as a cashier and uses her right hand predominantly during her shift hours. The physical examination showed that light tapping over the wrist area above the point of entrance of median nerve at the level of flexor retinaculum caused paresthesia radiating into the index and middle fingers. Musculature of the thenar eminence was intact. There was no tenderness to palpation in the hand. Flexing the wrist to 90 degrees for 1-minute elicited symptoms of paresthesia and pain in the median nerve distribution. According to the history and physical examination a diagnosis of CTS was made, and the patient was advised to minimize the physical movements that aggravate median nerve inflammation and to begin splinting the hand in wrist brace preventing wrist flexion during sleep. Also, NSAIDs were recommended to provide symptomatic relief. The patient returned for further follow-up six months later with persisting symptoms that became resistant to NSAIDs. CTS was disrupting her work activities to an unacceptable degree; The patient was advised to undergo an open carpal tunnel release surgery. As a result of the surgical release of the transverse carpal ligament the patient experiences an immediate resolution of the pain, paresthesia as well as the other sensory symptoms she had been experiencing. The patient was told to gradually return to her normal daily activities as well as all her work duties after four weeks of the surgical procedure. She was seen for a final follow-up three months after the surgical procedure with her sensory symptoms remaining fully resolved at that time.
Introduction The decision to proceed with surgical management of end-stage glenohumeral joint arthritis has steadily increased in prevalence over the past decades. Recently, reverse shoulder arthroplasty (RSA) became a popularized option. Several patient-reported outcome measures (PROM) have been established to better aid physicians and patients in the understanding of their postoperative outcomes. The purpose of this study was to investigate the responsiveness of multiple PROMIS CAT forms in patients undergoing reverse shoulder arthroplasty. We hypothesize that PROMIS-UE, PROMIS-PI, and PROMIS-D will all significantly improve after surgery. Methods 105 English-speaking adult patients who underwent reverse shoulder arthroplasty between December 2017 and August 2019 were included in this study. Exclusion criteria included patients undergoing revision, presence of infection at the surgical site, or refusal to complete PROMIS CAT forms. Medical charts were reviewed to determine the following preoperative range of motion values: ABER (abduction with external rotation), ABIR (abduction with internal rotation), forward flexion, abduction, internal rotation, and external rotation. Results The patient cohort consisted of 50% males, an average age of 70.3 years, and a BMI of 30.2. Baseline preoperative PROMIS CAT scores were 29.3 ± 6.3, 63.8 ± 5.1, 49.6 ± 10.1, for PROMIS-UE, PROMIS-PI, and PROMIS-D, respectively. All three PROMIS domains showed significant improvement as early as 6 weeks after surgery, with values of 32.4 ± 6.6, 56.2 ± 7.5, and 44.6 ± 8.6 respectively. Discussion The results of the present study suggest that PROMIS CAT domains are responsive in adult patients undergoing reverse shoulder arthroplasty. Furthermore, statistically significant improvements can be seen as early as 6-weeks postoperatively in PROMIS-UE, PROMIS-PI, and PROMIS-D. Many cross-sectional studies of PROMIS CAT domains outline the efficiency, validity, and responsiveness in patients with upper extremity pathology. More specifically, PROMIS CAT domain studies have also been validated as responsive and useful measures for tracking total shoulder arthroplasty patients, but no study to date has demonstrated the responsiveness or efficacy of PROMIS CAT domains in measuring symptomatic states of reverse shoulder arthroplasty patients. The present study confirms our hypothesis that PROMIS-UE, PROMIS-PI, and PROMIS-D all demonstrate responsiveness to postoperative changes among reverse shoulder arthroplasty patients. Unlike other studies evaluating PROMIS effectiveness in shoulder arthroplasty cohorts, our study separated reverse shoulder arthroplasties from total shoulder arthroplasty patients. Conclusion Reverse shoulder arthroplasty patients can be effectively measured postoperatively by use of three PROMIS CAT domains: PROMIS-UE, PROMIS-PI, and PROMIS-D. These three domains show responsiveness and significant improvement as early as 6-weeks postoperatively. No patient-centric factor, other than sex, influenced preoperative PROMIS CAT domains. Thus, clinicians should consider their current patient-reported outcome collection to include PROMIS CAT domains in shoulder arthroplasty patients.
Introduction: Open reduction internal fixation (ORIF) of intraarticular calcaneal fractures typically requires a delay of 1-2 weeks for soft tissue injury to resolve. Beak fractures, however, involve the achilles lifting a large avulsion fragment proximally which can impinge the skin of the posterior heel and cause skin necrosis in as little as 6 hours. This is the case of a patient presenting with an intraarticular beak fracture. Case Presentation: A 69-year-old male with a past medical history of hypertension presented to clinic from the ED with a right calcaneal fracture sustained the day prior after falling 4 feet from a ladder. CT showed a comminuted intraarticular beak fracture of the posterior tuberosity. Fracture blisters were noted with no palpable prominence posteriorly over the beak fragment. No ischemic skin changes were noted. Patient was made non-weight bearing and placed in a Jones compression wrap. Nine days after initial presentation ischemic changes were noted to the posterior heel overlying a palpable prominence associated with the beak fracture. Due to these changes, the patient was taken to surgery with some fracture blistering still being present. ORIF of the fracture was performed utilizing a lateral extensile approach. The patient was then placed in a non-weight bearing splint. At 2 weeks post op an eschar was noted to the posterior heel which was treated with local wound care. Three months later patient was taken back to the OR for resection of prominent bone and debridement of posterior heel ulcer. At six months post-op the ulceration was resolved, subtalar joint range of motion was minimally reduced, and patient rated his heel pain at 1/10. Discussion: Beak fractures of the calcaneus are frequently accompanied by soft tissue complications. These fractures should be closely monitored while waiting for fracture blistering to resolve. In the event of posterior soft tissue compromise, i.e. any palpable prominence or ischemic skin changes, emergent surgical intervention is warranted. Integrity of the skin should help guide incision placement. If optimal incision placement is not possible then a minimally invasive posterior approach may be used and the fracture reduced either by joysticking with a Steinmann pin or utilizing a reduction clamp. While this patient did not initially present with signs of posterior soft tissue compromise, they serve as a valuable example that ischemia can become apparent after the reduction of post-traumatic edema.
The abuse of opioids has been on the rise throughout the United States earning the name “opioid crisis”. There are many types of opioids including natural products, semi-synthetic opioids, and synthetic opioids. Additionally, so-called designer opioids have been increasing on the illicit drug market and have also been linked to the growing opioid crisis in the United States. Prior to 2015, fentanyl was the main synthetic opioid detected in casework, but now fentanyl analogs, as well as non-fentanyl opioid agonists, such as U-47700 have appeared on the recreational market. The number of deaths related to these synthetic opioids is believed to be underestimated since many laboratories do not test for fentanyl or other related analogs or their testing procedures may lack the sensitivity needed to detect these compounds. Despite these limitations, there has still been an estimated fivefold increase in overdose deaths related to synthetic opioids over a three-year period from 2013-2016. U-47700 is one of many drugs that have been part of a group of compounds called novel psychoactive substances (NPS). U-47700 is a synthetic opioid agonist developed by Upjohn pharmaceuticals but never approved. Although it has not been tested on humans, animal testing demonstrated selective u-opioid receptor agonist activity that was about 7 to 8 times the potency of morphine. On the streets, U-47700 is most commonly known as “Pink”, “Pinky”, or “U4” due to its white to light pink color. The Oakland County Medical Examiner’s Office in Pontiac, Michigan began observing this compound in the fall of 2016, primarily in cases with other drugs of abuse and NPS. This communication described 18 drug-related deaths in which U-47700 was detected. Blood U-47700 concentrations ranged from 0.37 – 370 ng/mL (mean 35, median 4.9 ng/mL). These cases were evaluated, and their cause and manner of death and other drugs detected in addition to U-47700 were analyzed. Police reports were examined to determine if any type of powder or tablets or other drug paraphernalia were found at the scene, as well as needle marks for points of entry. Other opioids were detected in 83% of the cases. Only three cases were positive for naloxone suggesting that many deaths occurred prior to medical treatment as the use of naloxone was quite common during the study period in general. While only one death was likely due directly to U-47700, the cases described here demonstrate how NPS have become an important consideration in evaluating drug-related deaths today. As always with NPS, specific drugs come and go and the need to be able to detect and identify new substances can be paramount in death investigations.
Melanoma is the deadliest type of skin cancer in the United States. Currently melanoma is treated with traditional chemotherapy, radiotherapy, or biologic therapy but these therapies non-specifically target rapidly dividing cells or the immune system which lead to a wide variety of side effects which decrease the patient’s quality of life. Targeted therapies are designed to inhibit important signaling molecules that drive cancer progression, and these are better tolerated by patients whose cancer expresses these specific mutations. This study focuses on the use of synthetic lethal screening to identify new targets in the treatment of melanoma. These targets consist of downstream proteins involved in important pathways responsible for driving melanoma growth and metastasis. Recent high throughput exome sequencing revealed that mutations in Rho family small GTPases Rac-1, a driver mutation, plays an important role in driving melanoma growth. A specific mutation, Rac-1 (P29S), has been identified as one of these driver mutations for melanoma. This mutation renders the protein constitutively active and insensitive to internal activation and inactivation signals. Thus, in this study, A375 cells were transfected with mutant Rac-1 (P29S) and its effects on proliferation, migration, invasion, and anchorage independent growth potential were investigated. Western blot analysis showed the overexpression of Rac-1 in Rac-1 (P29S) mutant transfected cells. Invasion potential of Rac-1 P29S mutant transfected cells was assessed using the Matrigel invasion chamber. Rac-1 P29S mutant transfected cells invaded significantly compared to non-transfected cells. Also, anchorage independent growth was investigated using a soft agar colony formation assay. Rac-1 P29S mutant transfected cells showed a dramatic increase in anchorage independent growth. In conclusion, mutant Rac-1 (P29S) transfected A375 cells shows significant increase in Rac-1 expression, invasion, and anchorage independent growth potential.
Abstract Title: Healthcare barriers for people with disabilities: the physicians' perspectives

Authors: Neli Ragina; Madelyn Aittama; Olivia Samoray

Affiliation: Central Michigan University, College of Medicine

Abstract Category: Clinical

Background: It has been found that patients with disabilities face multiple barriers when obtaining healthcare. Due to these barriers, this underserved population is less likely to receive preventative health care services, leading to an increased risk for developing comorbidities. Additionally, upon reviewing the literature, we concluded that there is also a lack of research regarding barriers physicians face when treating this population. Objective: This project aimed to identify barriers physicians encounter when treating their patients with intellectual disabilities in rural and non-rural communities throughout Michigan. Methods: Validated survey questions from the Werner et al. (2017) study, which looked at factors including physician communication and their attitudes when treating their patients with intellectual disabilities, were used to assess physician barriers. Physicians from a variety of specialty fields were recruited via an email linked to Qualtrics or via an in-person paper copy of the survey throughout areas of urban, suburban, and rural settings in Michigan. Physicians anonymously answered a variety of questions regarding their demographics, followed by 39 questions rating their perceptions on treating their patients with intellectual disabilities compared to their patients without disabilities. The completed online surveys were recorded and stored through Qualtrics, which was password protected and only available to the authors of this paper. Results: Sixty-two physicians have completed the survey thus far. Preliminary results have shown that 96.7% of physicians surveyed believe that treating patients with intellectual disabilities is part of their role as a physician. Some of the noted differences among physicians between treating their patients with intellectual disabilities compared to those without include 84.13% of physicians surveyed use simpler language, 63.49% use more gestures and body language, and 66% allocate more time for visits. Even though nearly all physicians surveyed believed it was their role as a physician to treat patients with intellectual disabilities, about half of physicians report that they speak more to the caregiver than to the patient themselves. Conclusion: Our data found that many physicians do have to adapt their practice when treating their patients with intellectual disabilities. This stresses the importance of increasing physician education and training on treating patients with disabilities to ensure that this population receives adequate care. Significance: In the context of healthcare, individuals with disabilities encounter their own unique barriers that vastly limit their access and services compared to those without intellectual disabilities. There are a variety of intellectual disabilities, and, just like each patient is different, the same disability will slightly differ from individual to individual. If a physician is unable to adapt to the diverse disabilities that exist among patients, it may hinder treatment. By identifying current barriers physicians face when treating their patients with intellectual disabilities, future solutions can be integrated into medical practice and medical education to minimize barriers that people with intellectual disabilities face in healthcare. 1 Office of Disease Prevention and Health Promotion. (2016). Healthy People 2020. Healthy People 2020 Progress Review. Retrieved from https://www.healthypeople.gov/sites/default/files/hp2020_dh_and_hrql_wb_progress_review_prese ntation.pdf
Abstract Title: Sacrificing your lungs for Daptomycin may be fatal – A case of Daptomycin Induced Acute Eosinophilic Pneumonia (AEP)

Authors: Sindhura Ananthaneni; Palaniandy Kogulan; Sindhura Ananthaneni, MD

Affiliation: Covenant health care, Internal Medicine

Abstract Category: Case Reports

Advisor: Palaniandy Kogulan

Daptomycin-Induced (AEP) is a rare immune-mediated pulmonary epithelial cell injury which results in respiratory failure and high mortality rates. Here, we present an older male with this rare entity. A 60-year-old male with a history of ischemic cardiomyopathy and uncontrolled insulin-dependent diabetes mellitus type 2 with neuropathy, presented with left foot gangrenous osteomyelitis status post transmetatarsal amputation. Wound cultures revealed vancomycin-resistant Enterococcus faecium (VRE) and Enterobacter cloacae complex and eventually he was discharged on daptomycin and meropenem. Three weeks later, the patient presented with gradual onset of dyspnea and nonproductive cough with fever. Chest X-ray (CXR) and Computed Tomography Angiography (CTA) of the chest revealed diffuse bilateral multilobar infiltrates. CXR on last admission was deemed normal. Complete Blood Count (CBC) revealed eosinophilia of 10% with absolute eosinophilic count of 1240 and elevated immunoglobulin E and G levels. Respiratory pathogen panel, Influenza PCR, vasculitis panel, HIV, and Fungitell testing were negative. Bronchoscopy was performed with bronchoscopic alveolar lavage fluid cytology which revealed around 20-25% eosinophilic count as per pathologist determination confirming eosinophilic pneumonia. Daptomycin was subsequently switched to Linezolid for the treatment of VRE Osteomyelitis. A repeat chest X-ray after 1 week showed complete resolution of the infiltrates with improvement of symptoms. When evaluating patients with gradual onset of dyspnea and on antibiotics for multi-drug resistant infections, a high index of suspicion must be raised for daptomycin-induced (AEP). The timing of drug use and discontinuation of offending drug are important for early diagnosis and prompt management.
INTRODUCTION: Ovarian tissue cryopreservation for restoration of ovarian endocrine function in adolescent cancer survivors presents a new and exciting option to induce physiological pubertal development. Earlier studies (Day J.R., et al, 2018) demonstrated that ovarian tissue encapsulated in a hydrogel-based immunoisolating capsule prepared with poly (ethylene glycol)-vinyl sulfone (PEG-VS) provided support for the ovarian function and protected the ovarian allograft from immune rejection. The immunoisolating properties of the capsule were achieved by encapsulating ovarian tissue in a degradable core that allowed the diffusion of the required hormones and factors to promote folliculogenesis and non-degradable shell that prevented infiltration of immune cells. The purpose of this study was to determine if such a dual PEG-based capsule could maintain its mechanical integrity and porosity while simultaneously preserving encapsulated murine ovarian tissue throughout the cryopreservation process to prolong the shelf-life of the future product and increase availability to patients. METHODS: Swelling ratio, mass of swollen gels divided by the mass of dry gels, was used as a surrogate measurement for pore size. Larger pores allow for a greater absorption of liquid, leading to increased water uptake and a higher post-swelling mass, resulting in a larger swelling ratio. Both empty gels and gels containing murine ovarian tissue were either slow-frozen or vitrified, stored for at least 48 hours in liquid nitrogen, and then thawed. Gels were either processed for H&E staining to assess the morphology of follicles in the tissue or evaluated for swelling ratio. RESULTS: Following slow-freezing or vitrification, 40% of gels lost 25% or more of their mass after thawing. However, the swelling ratio of the intact gels before and after cryopreservation were not significantly different between the groups, regardless of cryopreservation method (slow-freeze vs. vitrification). This similarity in swelling ratio, both before and after slow freezing or vitrification, implies that porosity of the gels largely remained unaltered and intact. Additionally, multiple healthy follicles were identified in histological analysis of the hydrogels with tissue before and after vitrification. CONCLUSION: Our preliminary studies suggest that the microstructure of the PEG hydrogel survives the vitrification and slow freeze processes and therefore maintains its immunoisolating properties. This supports further investigation of the immune response when implanted in animals. The animals' immune response, or lack thereof, would determine if the gels maintained their mechanical and immune isolating properties throughout the cryopreservation process.
MiR 208a Deficiency Promotes Mitochondrial Biogenesis in the Metabolic Heart

Mariana Rosca, MD; Carmen Avramut
Central Michigan University College of Medicine, Department of Foundational Sciences

Background: A high caloric regimen causes metabolic syndrome, which is a pre-requisite for type 2 diabetes mellitus, and increases the risk for cardiovascular disease. Both metabolic syndrome and diabetes induce a common cardiac phenotype known as metabolic cardiomyopathy with an early onset of diastolic dysfunction that may progress to systolic dysfunction and congestive heart failure. While the normal heart is able to freely switch between glucose and fatty acid (FA) oxidation for ATP production, the metabolic heart becomes almost completely reliant on FA oxidation for ATP production. This energetic dysregulation is supported by increased mitochondrial metabolism, which includes an increased mitochondrial mass and function. Objective: Based on the reported cardiac specificity of the microRNA (miR) 208a, we investigated its role in bioenergetic metabolism in the metabolic heart. Methods: Lewis rats exposed to a high fat diet (HFD) exhibit obesity, systemic insulin resistance, hyperglycemia, hyperlipidemia, cardiac diastolic dysfunction, and cardiac fibrosis. Microarray studies highlighted an altered miRNA expression profile in the heart upon a HFD, including a decrease in miR 208a. CRISPR deletion of the miR 208a in cultured human SV40 cardiomyocytes exposed to diabetogenic conditions (high glucose, high albumin-bound palmitate) led to a bioenergetics profile that favors mitochondrial FA metabolism including an increase in mitochondrial biogenesis signaling, electron transport chain complexes and critical enzymes for FA beta-oxidation. In addition, miR 208a deficiency prevents the switch in the myosin heavy chain isoform expression that occurs in diabetic cardiac tissue, thus promoting normal cardiac contractility. We analyzed in silico for putative miR 208a targets, focusing on mitochondrial outcomes using the TargetScanHuman database (http://www.targetscan.org/cgi-bin/targetscan/vert_71/targetscan.cgi). Results: We found, confirming with RT-PCR, that mitochondrial ribosomal protein 28 (involved in mitochondrial translation and generation of mitochondrial DNA-encoded electron transport chain subunits), MINOS1 (a conserved component of mitofilin complexes required for mitochondrial function and cristae organization), and MED7 (component of the Mediator Complex that regulates the transcription by facilitating the interaction between nuclear receptors, transcriptional co-activator and co-repressors, and chromatic modification factors with RNA Pol II) are rescued by miR 208a deficiency in cardiomyocytes exposed to diabetogenic conditions. Conclusion: In summary, miR 208a regulates nuclear and mitochondrial transcription, mitochondrial cristae organization and integrity in the diabetic heart, and supports the metabolic remodeling towards increased FA oxidation. Significance: Our data suggest that miR 208a may be a therapeutic target to promote mitochondrial biogenesis in chronic diseases associated with mitochondrial defects.
Poster Presentation #10  

**Abstract Title:** Distance Supervision and Feedback for Surgical Procedures  

**Authors:** Faiz Tuma, MD, MEd, EdS, FACS, FRCSC; Jamsheed Bahaee  

**Affiliation:** Central Michigan University College of Medicine, Department of Surgery  

**Abstract Category:** Medical Education  

**Advisor:** Faiz Tuma, MD, MEd, EdS, FACS, FRCSC

**Background:** Supervising operative surgical training has been traditionally done in a one-to-one practice during surgical procedures. The trainee performs variable part of the procedure under direct instruction of the supervising surgeon. This approach has produced good quality training when performed optimally. But there are limitations and potentials of improvement in this approach. Limitations include: 1- Trainees may become dependent on the supervising surgeon and wait for instructions or approval on performing the steps which may affect thinking, planning, and learning. It may also cause intimidation. 2- Very often, trainees receive no positive feedback when they perform well. 3- Supervising surgeons may forget to give detailed feedback or they may not use the educational principles of feedback.  

**Objective:** Optimizing the supervision and feedback setting will likely enhance the learning experience. Setting up a well-designed feedback system from a relative distance (same room, outside the OR, lounge, office, or from a distance) will provide a better educational environment.  

**Methods:** The software is operated by the supervising surgeon from the same room or from a distance through continuous and instant feedback using touch pad while observing the procedure on the monitor. It uses simple signs or colors that appear on the trainee monitor to provide feedback. For the introductory level, four colored circles of green (good), blue (OK), yellow (caution), and red (stop) are used. The supervisor provides feedback on the essential or teaching steps of the procedure by selecting one of the colors when needed. The next level of feedback and instructions in this system will include adding a comment or command to the colored circles. The feedback/instruction will include a colored circle with the comment like “speed” or “technique” to indicate the specific aspect of performance on which feedback is provided. Examples of these comments/commands are dissection, movements, hemostasis, speed, identification, technique, approach, delicate tissue, important structure, fine dissection, limited bleeding, change approach, significant bleeding, tissue injury, excessive force, and critical structure. The feedback can be upgraded to higher levels with details when the initial levels become familiar.  

**Conclusion:** Traditional operating room training has produced good quality training when performed optimally. However, there are several limitations that could lead to lower quality of training. A simple to use software that provides instant feedback through symbols, colors, comments, commands, during a procedure can help training surgeons become more independent, receive positive feedback live, and reinforce importance of feedback from supervising surgeon.  

**Future Direction:** The new feedback system is initially for trainees who need minimal supervision. The use could be extended to supervising trainees of various levels on different sites or for proctoring junior and international surgeons. After sufficient use and experience, a bank of information can be founded and used to provide automatic feedback. This system can provide online instant feedback. Proctorship can be made available for various purposes and all users.
Abstract Title: Capgras syndrome in a 17-year-old Male following N-dimethyltryptamine and Cannabis use: a case report

Authors: Abishek Bala; Onoriode Edeh

Affiliation: Child psychiatry inpatient unit - HealthSource Saginaw, Psychiatry

Abstract Category: Case Reports

Background Capgras syndrome is a rare psychiatric disorder characterized by a person acutely exhibiting a fixed, false belief that someone close to them, such as a spouse, sibling or close friend, has been replaced with an identical imposter. Regarding pathophysiology, it has been postulated that Capgras syndrome may be associated with defects of the inferior temporal cortex, amygdala, perirhinal cortex, and hippocampal areas, causing impaired facial recognition, deficits in visual memory recall, and defective identification processes. Mainstays of treatment include treating the underlying comorbidities including psychiatric symptoms, substance use or other medical disorders, with antipsychotics often being used for treatment.

Case In this report, we discuss the case of a 17-year old Male with a past history of ADHD and ODD exhibiting symptoms implicated in the Capgras syndrome after usage of cannabis and endogenous hallucinogen N-dimethyltryptamine (DMT). The patient was admitted psychiatrically after endorsing suicidal and homicidal ideations, while exhibiting symptoms of paranoia, ideas of reference and perceptual abnormalities. He had also recently assaulted his mother after accusing her and his close family members of being impostors.

Discussion In this paper, we will discuss this unique case of Capgras syndrome in an adolescent patient exposed to Cannabis and DMT. We will also study the psychoactive substance, DMT, its history, mechanism of action and its correlation with psychosis. Moreover, youth exposure to DMT through cannabis will also be explored. This report will further contribute to the growing literature regarding substance use in the adolescent population in order to support further research and policies to address this concern.
Background: Understanding the human narrative is incomplete without acknowledging the role of humanities. Many will agree that the foundations of practicing psychiatry from history taking to constructing a cohesive biopsychosocial formulation involves a degree of artistic integration of individualized experiences within a sociocultural framework. Intervention: Improvisational acting (Improv) is a strong tool aimed at building communication, reflection and teamwork through its core mantra of "yes, and". This study is aimed at integrating psychiatry and humanities through a monthly Improv exercise for psychiatry residents at Central Michigan University. The activity will provide a platform for participating psychiatry residents to engage in dialogue and creative expression through Improv. Besides encouraging an overall culture of intellectual curiosity and introspection within the CMU Psychiatry Residency, it is likely that this endeavor will strengthen therapeutic alliance with patients. Method: Monthly sessions include popular Improv games involving concepts such as free associations, group coordination, awareness of sensory cues, to ultimately engage in an exercise of storytelling. Once participants are comfortable and free to express themselves, they are given a platform to discuss their views on the reading assigned to them. Themes of the readings include physician identity, vulnerability, patient care, cultural cognizance, etc. Discussion: Feedback from the participants will be acquired qualitatively through written feedback on how the themes of the sessions apply to their daily lives as learners and clinicians.
Introduction: The DSM V describes catatonia as a “marked decrease in reactivity to the environment” (cite DSM). A defining aspect of catatonia is psychomotor abnormality, which can vary from retardation to agitation. To diagnose the condition, one needs three out of the following twelve symptoms: stupor, catalepsy, mutism, waxy flexibility, negativism, posturing, mannerisms, stereotypy, agitation, echolalia and echopraxia. Stupor. Few reports have explored the presentation and treatment of catatonia in the pediatric population. Furthermore, catatonic excitement, which includes symptoms such as hyperactivity, restlessness, hyperverbosity, with other features of catatonia, is clinically rare and scarce in literature. This paper will discuss the case of a 14-year-old female, who presents with symptoms consistent with catatonic excitement, psychosis, who was treated with a combination of Haldol, Ativan and Ramelteon. Case: Ms. H, a 14-year-old otherwise healthy African-American female presented to the emergency department (ED) with new-onset seizures and altered mental status. One-week prior, the patient had not slept for four days, exhibited unusual impulsiveness, tangential thought process, persecutory delusions and ideas of reference. Her past medical history was only significant for menstrual abnormalities treated with hormone contraceptives and two-week-long menorrhagia prior to her change in behaviour. Labs were significant for metabolic derangement including hypokalemia, elevated magnesium, lactic acidosis, and elevated ammonia. In the ED, new-onset seizures, abnormalities in labs, change in behaviour and inability to care for self prompted admission for observation and evaluation. Following normal EEG, CT, and MRI, Ms. H was transferred to inpatient psychiatry as she continued to exhibit such changes in behaviour. Leading differential diagnosis at this time included psychosis secondary to a general medical condition, possibly due to her recent seizures. For due diligence, rare causes such as NMDA encephalitis were ruled out. On admission, Ms. H was administered Olanzapine to address her symptoms. Despite titration of the medication, she continued to exhibit similar symptoms without improvement. Due to persistent behavioural disinhibition with psychomotor disturbances, catatonia was also considered. She was screened using the Bush Francis Catatonia Scale, which yielded a score of 21 due to her excitement, restlessness, disinhibition, echolalia, stereotypic behaviour, verbigeration, impulsivity, automatic obedience and perseveration. Addition and titration of Lorazepam showed improvement in catatonic symptoms. Olanzapine was discontinued and Haldol was initiated for her psychosis to allow for titration alongside Ativan. She gradually demonstrated greater awareness of her environment with improved sleep pattern, linear thought, organized speech and participation in milieu activities. Discussion: In this report, we have presented the case of a 12-year-old Female with no prior psychiatric hospitalizations or psychiatric treatment, with two-week history of menorrhagia, treated medically following two seizures, who was admitted for psychiatric treatment due to bizarre behaviors like insomnia, paranoia, hyperverbal/illogical speech. With continued evaluation, we grew suspicious of a component of catatonic excitement in her presentation. This case further adds to the literature of catatonic symptoms in the child/adolescent population and emphasizes the need for further research on its diagnosis and treatment.
Introduction: Rh D Incompatibility during pregnancy occurs when a mother is Rh- and the fetus is Rh+. Rh refers to the D antigen of the rhesus factor blood system, and positive denotes its presence on erythrocytes versus negative which denotes its absence. A Rh- patient will inherently have IgM antibodies to the D antigen, but if exposed to the antigen she will become alloimmunized and produce IgG antibodies. IgG antibodies can cross the placenta, and in the case of Rh incompatibility, attack fetal erythrocytes leading to severe hemolytic disease of the fetus and newborn. The most common exposure of Rh- mothers to Rh+ blood is transplacental fetal maternal hemorrhage, typically during a delivery. Other causes of transplacental hemorrhage include ectopic pregnancy, antenatal hemorrhage, abruptio placenta, and maternal abdominal trauma. Antepartum alloimmunization can occur, but prophylaxis with Rhogam (anti-D immune globulin) can prevent it. Case: A 26 year-old G1P0000 with no pertinent past medical history presents with complaints of vaginal bleeding and spotting. Dating by her last menstrual period indicates she is 8 weeks and 3 days along. Her blood type is O negative and her antibody screen is negative. Patient received an injection of 300 micrograms of Rhogam and was instructed to receive this dose again at twenty-eight weeks. Discussion: Current recommendations for antepartum Rhogam administration to Rh- mothers include 300 micrograms at 28 weeks gestation, following invasive diagnostic procedures (such as chorionic villus sampling or amniocentesis), after any abdominal trauma, and antenatal hemorrhage after 20 weeks of gestation. The recommendations for care of women in their first trimester who experience bleeding are less clear. There are conflicting recommendations for administering Rhogam to Rh- women with a threatened abortion in the first trimester. Furthermore, if one is to administer Rhogam, there is debate about whether one would use 300 micrograms or a lesser dose. The D antigen appears on red blood cells at day 38 of gestation. At 12 weeks gestation, there is about 1.5ml of fetal red blood cells which is enough to incite alloimmunization in the mother. Due to the limited fetal blood volume, debate exists as to whether the full 300 micrograms of Rhogam, which is enough to neutralize exposure up to 30ml of fetal Rh+ blood, is necessary or if a smaller dose, such as 120 micrograms, is sufficient for alloimmunization prophylaxis.
Abstract Title: Rh- Mom, Rh- Dad, Rh- Son: Is Rhogam Prophylaxis Necessary for Pregnancy Number 2?

Authors: Kaitlyn Bates; Christopher DeVries, MD; Frederick Eruo, MD, MPH

Affiliation: Central Michigan University, Obstetrics and Gynecology

Abstract Category: Case Reports

Advisor: Frederick Eruo, MD, MPH

Introduction: Human blood type variability is assigned not only by the ABO blood group system, but also the Rhesus blood group system. The Rhesus System has 48 antigens, with the most common to induce antibodies being D, C, c, E, and e. The D antigen is the most famous, with its presence or absence labeling blood as either positive (for the D antigen) or negative (without the D antigen). Rh- individuals will create IgM antibodies to Rh+ positive blood. If exposed to Rh+ blood, Rh- individuals will undergo alloimmunization transforming IgM to IgG. Problems arise if a Rh- individual is continually exposed to those antibodies- a scenario that can come to fruition when a Rh- woman carries a Rh+ fetus. Complications range from fetal anemia to hydrops fetalis. To prevent this scenario, Rh- women are routinely given Rhogam (anti-D immune globulin) at 28 weeks of pregnancy as well as an additional dose within 72 hours of delivery if fetus is Rh+ to prevent alloimmunization. Approximately 60% of Rh- women carry Rh+ fetuses. Case: A 23-year-old G3P1011 whose pregnancy is complicated by severe hyperemesis gravidarum and has a past medical history significant for bipolar depression presented for prenatal care. Her blood type is A negative and her antibody screen is negative. Her first pregnancy ended in a miscarriage and her second ended with a normal spontaneous vaginal delivery of a Rh- boy. The patient received the Rhogam shot at 28 weeks during her second pregnancy. She states that the father of the third pregnancy is the same as the father of the second pregnancy. Discussion: Current clinical guidelines recommend administration of 300mcg of Rhogam at 28 weeks gestation to all Rh- women. However, if the woman states that both she and her partner are Rh-, it would be unnecessary to administer Rhogam as the fetus would surely be Rh- as well. However, in clinical practice these situations are not always transparent. One must not only be certain that the father knows his own blood type, but also that he is the father of the baby. It is currently more cost effective to administer Rhogam than to type and screen the father of the baby. Additionally, there are also variations in Rh phenotypes. One could be weakly positive for the D antigen [as in not all red blood cells contain it] and will incite an immune response, but may be classified as Rh – dependent on the sensitivity of the evaluating blood test. Finally, there is the Grandmother Effect. This theory hypothesizes that a Rh+ mother, who gives birth to a Rh- fetus, will impart some of her blood to the fetus. This fetus will then grow into a Rh- woman, but due to the presence of Rh+ maternal blood, she will become alloimmunized before her first pregnancy. This case highlights the elements one must weigh when counseling a patient about Rhogam prophylaxis.
It has been hypothesized that the gut brain axis plays a role in neurological conditions, but the existence of the link between the two systems is not well understood. Studies have been conducted to illustrate gut bacteria leading to neural pathway activation. The purpose of our study was to study specific neurological and psychological disorders. We specifically looked at Anxiety, Parkinson’s disease, Multiple Sclerosis, Alzheimer’s and Autism to investigate associations between these diagnoses and the gut-brain axis. We looked at the following gut diseases to make this connection: Escherichia coli, Salmonella enterica, Salmonella typhimurium, Campylobacter jejuni, Clostridium perfringens, Helicobacter pylori, Rotavirus, Norovirus, Radiation Gastroenteritis, Allergic Gastroenteritis, Eosinophilic Gastroenteritis, Clostridium difficile, Gastrojejunul Ulcers, Ulcerative Ileocolitis, Irritable Colon Syndrome, and Ulcerative Colitis. Studying the interplay between these two systems can lead to prevention and further understanding of specific mental illnesses leading to better patient outcomes. We reviewed our findings using the HCUP National Inpatient Sample 2012. By using a case control study design with a chi square analysis comparing diagnoses of patients, we found associations between neurological and gut diagnoses, but not always in the expected direction, possibly due to the rarity of these diagnoses. Directions for future research are discussed.
Abstract Title: Bioluminescent Optogenetics (BL-OG) for Investigating Functional Synaptic Communication

Authors: Yuvraj Bhagat; Mansi Prakash; Ute Hochgeschwender

Affiliation: Central Michigan University College of Medicine, Department of Neuroscience

Abstract Category: Basic & Translational Science

Advisor: Ute Hochgeschwender

In BioLuminescent driven OptoGenetics (BL-OG) a luciferase (light emitter) and an opsin (light-sensing optogenetic element) are tethered as luciferase-opsin fusion proteins (luminopsins, LMO). Neuronal modulation can be achieved by light production upon application of the luciferase substrate that changes the membrane potential of the cell expressing the LMO. Here we explored the concept of “interluminescence”, where the light-emitting luciferase is expressed in presynaptic neurons and the light-sensing opsin in postsynaptic neurons. Application of the luciferase substrate will enforce communication across this “optical synapse”, thus allowing experimental control of functional connections. Here we tested this concept by expressing the Gaussia luciferase variant sbGLuc in cortical neurons co-cultured with hippocampal neurons expressing the channelrhodopsin variant ChR2(CS). Neurons isolated from E18 rat cortex and hippocampus were nucleofected with a pre-synaptically targeted luciferase construct (POMC-sbGLuc-dTomato) and an excitatory opsin construct (ChR2(CS)-EYFP), respectively, and were plated on multi-electrode array (MEA) dishes using two-chamber silicon insert to separate the two populations. Multi-electrode arrays have become the preferred means of analyzing brain activity due to its ability to capture a wide range of neural phenomena such as spiking within small clusters to larger oscillations in entire populations. In our experiment, neuronal processes originating from both populations formed synaptic contacts. Bioluminescence emission by cortical neurons generated with application of the luciferase substrate coelenterazine was used to drive hippocampal neurons across synapses. Bioinformatics analysis of recordings revealed that the overall effect of CTZ application on the activity of opsin-expressing hippocampal neurons in the co-cultures was significantly higher compared to that of non-expressing hippocampal neurons and of the cortical neurons in the co-cultures. Our analysis centered on identifying areas of activity that were related spatially and temporally between the two populations. We further characterized the rates of activity across populations that demonstrated a spatial and temporal relationship. Analysis of firing rates and subsequent calculation of synaptic delay further strengthened evidence of synaptic connectivity between cortical and hippocampal neuron populations. Thus, our data supports the feasibility of biological light activation across synaptic partners.
Burnout is an occupational stress that leads to cynicism, emotional detachment, exhaustion, and lack of sense of personal accomplishment. Burnout among physicians is a national public health problem with women physicians at greater risk compared to their male counterparts, which may reflect gender differences in individual, institutional and societal risk factors.

**Background:** The Job Demands-Resources (JD-R) model proposed by Demerouti in 2001 is used to explain occupational burnout and places risk factors into the two categories of job demands and job resources. Job demands can turn into job stressors if high effort is required to meet those demands. Job resources serve to achieve work goals, foster growth, learning and development and can buffer job demands. An imbalance between job demands and job resources can contribute to burnout.

**Objective:** Our aim was to determine if the JD-R model could be utilized to better understand gender differences in physician burnout by examining job demands and job resources.

**Methods:** We administered the 9-item Mayo Clinic Well-Being Index (WBI) to residents and the expanded WBI to attending physicians in our institution and calculated the “at risk” scores based on gender. We also collected qualitative data on perceived job stressors as well as input regarding needed resources and assessed for gender differences.

**Results:** A total of 144 physicians, 105 residents (49 females, 56 males) and 39 attending physicians (22 females, 17 males), completed the WBI. Response rate was 92% for residents and 68% for attending physicians. Female residents had higher scores for burnout (1.8 X higher) as did female attending physicians (1.3 X higher) compared to their male colleagues. There were gender differences seen in rank order importance of requested resources. Female resident physicians requested more resources in every category compared to their male counterparts. Female attending physicians requested more resources for depression, alcohol/substance abuse and others versus male attending physicians who requested more resources on money management, retirement planning, medical errors and malpractice. Job stressors were similar for female and male physicians except for a higher perception of job stress for females in dealing with difficult people/situations (32% vs 11%).

**Conclusions:** The JD-R model enables a more detailed assessment of specific job demands and needed resources to allow for the development of targeted wellness interventions and more effective wellness program implementation. The additional value of the JD-R model is that it can provide information about gender specific perceptions of job demands and resources that can serve to guide an individual institution in developing the most appropriate resources required to counteract those demands. It is especially important to identify those characteristics that may contribute to the higher overall burnout rates among female physicians and residents in training.

**Significance:** Our study further suggests that additional resources are needed to address job demands for female residents and physicians and that some of the needed resources are gender specific. Conducting engagement and burnout surveys alone is not sufficient if an assessment of job demands and needed resources is not also performed.
Abstract Title: Integration of Health Technology Education in the Medical School Curriculum

Authors: Christopher Twilling; Samuel Borer; Michael Elftman, PhD

Affiliation: CMU College of Medicine, CMU College of Medicine

Abstract Category: Medical Education

Advisor: Michael Elftman, PhD

Background: Patients and Doctors across the country are becoming more reliant on digital health to assist in the management and treatment of medical conditions (Thimbleby, 2013). Despite this growing integration of technology and devices in healthcare, traditional medical school curriculums lack the framework and content needed to train future physicians in the world of digital health they will one day practice in. Method: Our curriculum is divided into three core competencies. First is Digital Health Application Triage, which intends to teach future physicians how to navigate through the ever-evolving world of different digital health applications and select the best ones for their patients. Next is Distillation of Digital Health Information which guides students on how to be able to quickly evaluate and determine what application information is applicable to their patients. Third is Effective Digital Health Implementation which focuses on the tools available for physicians to better treat their patients, such as telemedicine or continuous health device monitoring. Results/Conclusions: The goal of the curriculum is to teach future physicians how to use technology to empower patients in managing their health. The preliminary results gathered from the current Central Michigan University College of Medicine M1 class help initial validation of the need for continued development of a comprehensive digital health curriculum. Students expressed overwhelming support for the content, with 93% agreeing that the sessions increased their understanding of how digital health can be integrated into medical practice. Data is continuing to be collected as classes progress through their medical education, particularly the attitudes towards digital health integration in medical care and best practices for future physicians. As technology continues to be integrated into healthcare these skills are important for any physician to have especially for those working with rural and underserved communities, fulfilling the mission of CMU College of Medicine. Works Cited: Thimbleby, H. (2013). Technology and the Future of Healthcare. Journal of Public Health Research, 2(3). https://doi.org/10.4081/jphr.2013.e28
Abstract Title: Patterns of Adult Injury Sustained in Off Road Vehicle Trauma: A Community Hospital Study
Authors: Bryan Brazeau, MD; Andrew Bazeakis, MD
Affiliation: Covenant Healthcare, Central Michigan University / Emergency Medicine
Abstract Category: Clinical Advisor: Andrew Bazeakis, MD

Background: Off road vehicles (ORVs) encompass a wide variety of motorized, recreational vehicles that are popular amongst many in the United States. However, literature shows these vehicles do not come without risk as off road vehicle accidents are a significant source of morbidity and mortality in this country. Objectives: The purpose of this study was to identify and quantify the association among the types of injuries for various types of off highway vehicles and demographic variables. The vehicles considered were all terrain vehicles (ATVs), dirt bikes, utility terrain vehicles (UTVs), and snowmobiles, and the type of injuries considered include head, spine, trunk, skeleton and soft tissue injuries. Methods: A total of 307 adult patients sustaining injuries were identified from pooled trauma data dating from 2010 to 2018 in mid Michigan. The data was examined to look for associations among injury severity, vehicle types, sex, injury severity score (ISS) and age of the rider. Descriptive statistics including mean and standard deviation for continuous variables, and frequency and percentage for categories variables were provided. Multivariable logistic regressions were utilized to identify the associations. Results: The analysis results indicating age was positively associated with the odds of trunk injury but negatively associated with the odds of head injury. That is, younger patients were more likely to have head injury. Meanwhile, older patients experienced more trunk injuries. When considering the injury severity score (ISS), increased ISS is positively associated with the odds of head injury, spine injury and trunk injury. It was observed that there was a proportional difference for gender on the types of vehicle used. Females were more likely to ride in UTVs than on a dirt bike. When the different off road vehicles were compared there were significant associations based on vehicle type. The odds of having skeleton injury for dirt bike rider is higher when compare with ATV rider. The odds of having soft tissue injury for off road MV rider is higher when compare with ATV rider. The odds of having soft tissue injury for ATV rider is higher when compare with snowmobile rider

Conclusions: It was discovered through our research that there were different injury patterns in patient’s riding different off road vehicles. With known high morbidity related to ORV injury there is compelling evidence to improve safety equipment related to each vehicles use. Further study may include comparisons between pediatric and adult populations or study of specific personal protective equipment.
Abstract Title: Antibiotic Prescribing Practices of Primary Care Providers for Respiratory Tract Infections in the United States: A Systematic Review

Authors: Kathryn Brucia; M. Ariel Cascio

Affiliation: Central Michigan University, College of Medicine

Abstract Category: Quality Improvement / Population Health

Advisor: M. Ariel Cascio

Topic: Antibiotic resistance is a global crisis that is perpetuated by the overuse of antibiotics in modern healthcare. Respiratory tract infections are the most common cause of antibiotic prescribing in primary care settings, but such infections often do not require antibiotics.1 Question: This study aims to elucidate the various factors that impact how and at what rate US primary care providers use antibiotics to treat respiratory tract infections. Methods: A systematic review of current data was performed utilizing the MEDLINE PubMed database to find relevant studies from January 2014-November 2019. 14 studies were selected for review and assessed for commonalities. Significance: Several different factors—interventions, diagnostics, patient factors, provider factors, and multifaceted—were identified as impactful towards provider antibiotic prescribing habits. These factors illustrate multiple trends in the literature as to how primary care providers approach an antibiotic prescription for respiratory tract infections. In addition, this review provides direction for future studies and stewardship techniques that can be investigated as a result.
Introduction

Community Acquired Pneumonia (CAP) is one of the most common reasons for hospitalization in the pediatric population. Occasionally, the pneumonia may be severe enough to be complicated by an empyema. Most common causative organisms are bacterial organisms. Viral causes, while not uncommon, tend to occur less frequently. In this report, we describe an interesting case of CAP complicated by empyema in an otherwise healthy pediatric patient and the hospital course that followed. We emphasize the importance of following culture results while treating complex infections, having a high index of suspicion for viral causes, and the risks and benefits associated with medical vs. surgical management in the treatment of empyema, especially in the pediatric patient as sequelae may be drastic and permanent.

Case Presentation

A 20-month-old female is admitted for suspected CAP. History included week-long cough, fever, dyspnea, single occurrence of seizure-like activity, and sick contact. Physical exam was significant for tachycardia, tachypnea, SatO2 94% and audible respiratory grunting. Initial chest x-ray (CXR) showed left lower lobe pneumonia and parapneumonic effusion with a complex left pleural effusion. After 3 days of supportive care and empiric antibiotic treatment, cultures were negative after 72H, yet vitals continued to decompensate. Subsequently, an ultrasound was ordered. Findings prompted need for contrast-enhanced Computed Tomography (CT) of the chest, which revealed a large pleural effusion, major atelectasis, and mediastinal shift. Pediatric surgery recommended video-assisted thoracoscopic surgical (VATS) decortication and chest tube placement. Due to intraoperative complications, the VATS decortication was aborted and patient was transferred to the pediatric intensive care unit (PICU). A thoracentesis with culture failed to isolate a bacterial organism. Dexamethasone was started after repeat CXR showed persistent infiltrate 2 days later. Subsequent contrast-enhanced chest CT showed a large collection of air and persistent consolidation. Patient received repeat VATS decortication and re-insertion of chest tube. Repeat pleural fluid cultures failed to isolate bacterial organism a second time. Infectious Disease (ID) consult recommended linezolid 140 mg Q8H for 4 weeks. Seven days after second VATS, a respiratory pathogen panel was positive for rhinovirus/enterovirus. With resolution of leukocytosis and clinical improvement, patient was discharged with chest tube in place and pediatric surgery outpatient follow-up. After three months, sequelae from both the infection and interventions presented. Discussion

While we were unable to identify the causative microorganism, her case heightened our suspicion of viral causes of CAP, still emphasizing the importance of following culture results in complex cases of infection. A 2015 study found that rhinovirus was the second most common detected pathogen, second only to RSV. We also note evidence for rhinovirus associated pneumonia presenting as a more severe disease with higher inflammatory markers and clinical presentation that required intensive care. A 2018 study indicated a possible link between febrile seizures (likely the seizure-like activity in our patient) to high levels of pro-inflammatory cytokines released during viral infection in pediatric patients, likely because of the still developing brain. Lastly, we review the evidence for medical vs. surgical management of empyema resolution.
Abstract Title: Clinical outcomes of mammogram screening throughout Michigan in 2014

Authors: Rachel Cleminson; Neli Ragina

Affiliation: Central Michigan University College of Medicine, Central Michigan University College of Medicine

Abstract Category: Quality Improvement / Population Health

Background Breast cancer is one of the most common malignancies in the United States with the highest incidence rate in women. Prevention of the disease is an important step in reducing negative health outcomes, including mortality. Objective This study asked three main questions about various Michigan counties: 1) are breast cancer screening rates correlated to breast cancer incidence? 2) are breast cancer screening rates correlated to breast cancer mortality and 3) do race, income, or age play a pivotal role in health outcomes of breast cancer? Methods Different public health aggregate data sets were utilized from the Michigan Department of Health and Human Services and the United States Census Bureau was used for demographics and income data. The analysis was stratified by county or health department, and statistical analysis was conducted using SPSS. A linear regression analysis was conducted to establish a relationship between mammogram rates per county to breast cancer incidence rate per county using SPSS. A similar analysis was used comparing mammogram rates and breast cancer mortality. A regression was then calculated between breast cancer mortality and having a mammogram within two years, median income, percentage of the population that is white, and median age. Results The aggregate data showed that increased breast cancer screening rates via mammogram correlate with increased incidence of breast cancer, with a Pearson correlation coefficient of 0.447 and p value <0.05. There was not a significant correlation between mammography and breast cancer mortality rates. Race and income were not significant predictors of mortality from breast cancer. Age, however, was shown to have a significant correlation with breast cancer mortality rate with an unstandardized beta coefficient of 1.048 and p<0.05. Conclusions Mammography has been shown as an effective screening tool for breast cancer. Detection of breast cancer is critical as the earlier it is identified, the more responsive it is to treatment and may decrease the likelihood of mortality. Our study demonstrated while there is not a statistically significant difference in mammography and mortality in Michigan counties or health departments, there is a correlation between mammography and breast cancer incidence. When looking at different social determinants of health, age is a predictor for breast cancer mortality. Our study demonstrates that mammography should be continued to be used as a breast cancer screening tool, and women who are older should be encouraged to receive a mammogram as they may be at higher risk for breast cancer mortality. Significance The goal of the study is to determine the correlation between mammography and breast cancer mortality in various Michigan counties and health departments, and whether social determinants of health impact it. With Michigan having a relatively higher mammography rate, it is an area to evaluate for health outcomes of breast cancer incidence and mortality, as well as if there are racial, age, or socioeconomic differences among the women who do receive the screening.
Abstract Title: Overcoming Barriers in HPV Vaccination and Increasing Vaccination Rates in Rural Michigan

Authors: Rachel Cleminson; Neli Ragina

Affiliation: Central Michigan University College of Medicine, Central Michigan University College of Medicine

Abstract Category: Quality Improvement / Population Health

Background Human Papillomavirus (HPV) is the most prevalent sexually transmitted disease in the United States, and its prevention directly reduces the incidence of several types of cancer. Despite measures to increase HPV vaccination rates since its approval in 2007, Michigan’s HPV vaccination rates are below the national averages. Objective The purpose of this study is to increase HPV awareness through education, within medically underserved communities and identify patient barriers to receiving the HPV vaccination. Methods The study took place health clinics in Isabella and Saginaw counties. An educational video was given to patients waiting for appointments in these clinics about the HPV vaccine. A pre-survey was administered to assess the patient’s current knowledge prior to watching the video, and a post-survey was administered after the education to assess increase in knowledge post the intervention. Paired sample t-test and multivariate analyses were performed to analyze the data. P values of less than 0.05 were considered statistically significant. This study was approved the CMU IRB. Results 57 participants were able to complete the intervention before being called from the waiting room to their appointment. Our data demonstrated that the educational intervention led to a statistically significant increase on patients’ knowledge regarding the HPV's ability to cause cancer, how HPV infection may not be cured but could be prevented through vaccination, and that the HPV vaccine series are not limited to adolescents aged 11 or 12. Participants did not have a gain in knowledge (p>0.05) regarding the mode of transmission of the HPV virus, and that the HPV vaccine series has been recently approved by FDA up to the age of 45. Conclusions Our data demonstrated that patients’ education can overcome misconceptions about HPV and in long term, improve vaccination rates. Significant improvement of knowledge was found for one of the main effects of HPV: “HPV can cause cancer.” This demonstrates that many patients are not aware of the cancerous effects that HPV can have. Without this knowledge, patients could be less inclined to receive the HPV vaccine. Statistically significant increase in knowledge was also found for patients’ knowledge surrounding the HPV vaccine series, as demonstrated with the questions: “HPV can be prevented through vaccination,” and “HPV vaccine is only for 11 and 12-year old.” These results demonstrate that there are gaps in knowledge about the HPV infection and HPV diseases, commonly held misbeliefs about the effectiveness of the HPV vaccine series and the age group that can receive it. All the above have provided unnecessary barriers to HPV vaccination and prevention in our population. Thus, patients’ education during clinical visits is a feasible and effective manner to minimizing barriers and increasing HPV vaccination rates. Significance The expansion of the current study to all medically underserved and rural areas in Michigan has the potential to increase access to health care and HPV vaccinations in medically underserved areas of Michigan through patient education and encourage conversations with their physicians about the HPV vaccine.
Type II Diabetes is endemic in North America. By 2030, it is predicted that over 40% of the population of North America will have diabetes. Native Americans as a subset of this population have been subject to a higher prevalence of type II diabetes due to a host of contributing factors including attacks on their food sovereignty, and reduced healthcare resources. As well, the change in Native American diet can be correlated to the increasing prevalence of type II diabetes. Notably, the Food Distribution Program on Indian Reservations (FDPIR) which provides direct to consumer foodstuffs, incorporated fatty and processed foods that became staples in the Native American diet from its implementation in the 1970’s. The current study aims to find a correlation between the usage of FDPIR and prevalence rates of Type II diabetes. Using data on the prevalence of type II diabetes rates from the 1980’s to the 1990’s in specific populations, more urbanized nations saw slight decreases in diabetes, while rural nations saw slight increases. Further, the US Pima Nation has seen increases in type II diabetes prevalence since the 1970’s. When compared to the Pima Nation residing in the adjacent country of Mexico, the rates of type II are drastically lower. Our data indicate that in rural areas where supplemental food programs granted access to foods that were previously difficult to obtain, as well as adjacent countries that have no access to FDPIR at all, there is a correlation between type II diabetes and availability of FDPIR. This correlation sheds light on the lack of nutritional stability, attack on food sovereignty, and unfortunate damage associated with FDPIR use and calls to question the efficacy of supplemental food programs on Native health.
Case 50-year-old female presented after separating from a motorcycle at an unknown speed. Upon presentation, vital signs were stable, and a cervical collar was in place. She complained of neck and back pain only and did appear clinically intoxicated. Trauma assessment included primary and secondary surveys noting diffuse cervical spine tenderness, point tenderness over the lower thoracic spine, and multiple abrasions of varied location. Non-contrast computed tomography (CT) of the head and cervical spine revealed a C2 Type II Odontoid fracture as well as intracerebral hemorrhage. While obtaining CT imaging the patient became confused and unwilling to follow commands, attempting on multiple occasions to stand up or move about the gurney. Due to concerns related to her known acute cervical spine fracture, the decision was made to intubate the patient using Rapid Sequence Intubation (RSI) with video assisted laryngoscope and in-line cervical spine stabilization. Following intubation, neurosurgery requested emergent MRI, which revealed a reduction of the odontoid fracture. Emergency surgery was not necessary, and she was transported to a neurosurgical critical care unit. Ultimately, recommendations were made for cervical spine fusion and was transferred on hospital day 3, per her request, for the procedure. Discussion The odontoid, also known as the dens, is a bony process that extends superiorly from the body of the C2 vertebra, articulating with C1 allowing rotational movement of the head. Fractures of the odontoid are typically secondary to neck hyperextension or hyperflexion with classification based on location. Type I (avulsion fracture of the dens superior tip) is considered a stable fracture, while Type II (fracture through the base of the odontoid) and Type III (fracture through the C2 body) are unstable cervical spine injuries.[1] Treatment is dictated by the type of fracture and focuses on maintaining cervical spine immobilization and alignment to allow healing. Type I is often treated with more conservative immobilization while Types II and III are potential surgical candidates. Other factors that influence treatment include the degree of displacement and alignment of the odontoid segments, patient age, and general medical risks for surgery.[1,2] The decision to intubate should be based on airway protection needs as well as any concern for further injury to an already unstable fracture. C-spine stabilization is imperative during intubation and equipment choice must also be carefully considered. Laryngeal Mask Airways may not be an option in cervical spine injury as they have been shown to by some authors to increase posterior displacement of the cervical spine, reserving their use for patients that can neither be ventilated or intubated. [7,9] In one cadaver study, it was shown that in Type II odontoid fractures C1-C2 motion during intubation utilizing a Macintosh blade did not show a increased cord compression or hyperextension of the cervical spine, but direct laryngoscopy revealed an obstructed view of the glottis in 45% of cases.[3,7,8] It has been established in literature that video assisted laryngoscopy allows for better visualization of the glottis and a study has shown it reduces cervical spine motion compared to direct laryngoscopy.
**Poster Presentation #27**

**Abstract Title:** Designation of open versus laparoscopic appendectomy depending on socioeconomic statuses

**Authors:** Zachary Crespi; Neli Ragina

**Affiliation:** Central Michigan University College of Medicine, Art of Medicine

**Abstract Category:** Clinical

**Advisor:** Neli Ragina

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**Background**

In non-emergent situations, appendectomy may be performed by either an open or laparoscopic procedure. Previous research has determined that laparoscopic procedures are associated with better surgical outcomes and lower overall costs, though the cost of the procedure alone is more expensive. With this in mind, the aim of this study was to determine whether one's socioeconomic status (SES) has any impact on whether a laparoscopic or open procedure is performed. We would expect that given these parameters, patients would be properly educated about the advantages of undergoing a laparoscopic procedure, yielding there to be no significant difference in laparoscopic procedure rates of those with low SES versus the rest of the population.

**Objective**

The objective of this study was to determine if there is any correlation between one's SES and their odds of undergoing an open appendectomy versus a laparoscopic appendectomy.

**Methods**

The Healthcare Cost and Utilization Project (HCUP) National Inpatient Sample (NIS) database was utilized with 49,832 patients identified and analyzed. Payment type was used as a measure of SES, with the four independent variables being Medicare, Medicaid, private insurance, and self-pay. Our independent variable was appendectomy type: open versus laparoscopic.

**Results**

When comparing rates of closed procedures in reference to self-pay, Medicare and Medicaid had odds ratios of .729 (p=.000) and .775 (p=.000), respectively, and these results were significant, indicating that those with Medicare and Medicaid are more likely to undergo an open procedure. Blacks are also less likely to undergo the closed procedure (odds ratio=.848; p=.000).

**Discussion**

Based on the results of our research, we can conclude that there is some correlation between having a lower SES (as measured by payment type) and undergoing an open appendectomy in a non-emergent setting. With future work, it would be preferred if we could find data that provides income values for specific patients, in order to attain a more accurate measure of SES. Although there is no way to be certain, we are attributing the high frequency of open procedures in the lower SES populations to the perception that laparoscopic procedures are more expensive. However, the overall better outcomes and lack of complications make laparoscopic procedures in the long-run. These facts should be better communicated to patients. Our hope is that the findings of this research and future work will make physicians more cognizant of the need to provide accurate patient education.
Background: Our understanding of the importance of key germline mutations in driving aggressive prostate cancer has dramatically increased in recent years. Yet, despite the increased availability of genetic testing, there is insufficient evidence regarding how best to screen men at increased genetic risk. Thus, we sought to develop an early detection clinic for patients with no personal history of prostate cancer but at high genetic risk of developing the disease. Methods: We have enrolled 45 patients between the ages of 35-70, primarily with known mutations in prostate cancer susceptibility genes. Annual screening consists of a PSA, digital rectal exam (DRE), and SelectMDx urine assay. Indications for biopsy include: 1) abnormal DRE, 2) PSA above threshold (>2 ng/ml for patients 2.5 ng/ml for patients 50-70 years), or 3) SelectMDx above threshold. Results: The study population includes 45 men, mostly with BRCA1 mutations (n=7), BRCA2 mutations (n=16), Lynch Syndrome (n=6), and CHEK2 mutations (n=4). The median age was 57 (range 35-70) and median PSA was 1.5 ng/ml (range 0.5-11.4 ng/ml). Eleven patients underwent biopsy for an elevated PSA (median PSA=3.1 ng/ml), abnormal Select MDx result or abnormal DRE. There were two positive biopsies for prostate cancer. Conclusion: The early data supports the feasibility of opening a dedicated clinic for men at high genetic risk of prostate cancer. This long-term study will help optimize early detection protocols and provide evidence for personalized prostate cancer screening in men with key germline mutations.
Mental illness is very prevalent in the United States. In addition to standard pharmaceutical treatment, exploring the use of different therapeutic options when treating patients with mental illness has been more frequently employed. For example, animal assisted therapy (AAT) has been found to have many benefits when it comes to treating patients of this population. Many current studies on the efficacy of AAT are not specific to any certain age group; may use a variety of different animals and animal intervention types; vary in the training of the animal handlers and vary in the mental health assessment tools being employed to measure encounter outcomes. This literature review aims to determine whether the addition of canine-specific assisted therapy improves mental health outcomes among patients 18 years and older. Initially, 22 articles were found regarding AAT and the treatment of various psychiatric disorders. To adhere to our target population criteria, an exclusion criterion of articles was made based on age groups, non-canine animals used in therapy, and treatment of medical disorders non-specific to psychiatric disorders. A total of 17 final articles were included in this review. Of those 17 articles, 13 articles (approximately 76%) were deemed to have medium or high quality of therapeutic evidence that adults over 18 years old who were exposed to canine assisted therapy had improved mental health outcomes. Current standard mental health therapies have been challenged by the up-and-coming field of AAT. AAT offers an alternative approach to mental health management that may reduce the amount of psychoactive medications prescribed to patients, which can improve patient treatment outcomes. AAT may also provide additional secondary benefits to patients including opportunities to socialize and experience an intimate, unique bonding relationship. This literature has proposed that AAT, specifically canine assisted therapy, has the capabilities to lower health care costs and improve health care outcomes for adult patients suffering from mental illness. More research is needed to confirm the essential components of AAT that are most successful when treating patients with mental illness.
Abstract Title: Using the intertragic notch to localize the greater occipital nerve for analgesic injection

Authors: Ryan Davis; Ashley Dean; Thomas Gest, PhD

Affiliation: Central Michigan University, College of Medicine

Abstract Category: Clinical

Advisor: Thomas Gest, PhD

Background: Chronic daily headache (CDH) is defined as headaches that occur at least 15 days a month, for longer than three months. In evaluation of chronic daily headaches, compression of the greater occipital nerve (GON) is commonly targeted for analgesic administration. A common compression site of the GON is found at the exit from the semispinalis capitis muscle and entrance into the trapezius muscle. Although extra-cranial nerve blocks of the GON have recently seen clinical success, standardized approaches and methods to locating the GON have yet to be established. Objective: Our goal was to better localize the GON using a universal anatomic landmark, the intertragic notch. Methods: Posterior neck dissections were completed on 10 cadavers, revealing 20 GONs exiting the semispinalis capitis muscles bilaterally. The total distance was measured from left intertragic notch to right intertragic notch (ITN-ITN) across the occipital bone in a horizontal plane. The nuchal ligament was pinned in the same horizontal plane and defined as the “Intertragic-Nuchal Zero.” This pin dictated a reference point for GON localization, with horizontal (x) and vertical (y) measurements taken from this point. Results: Using the ITN-ITN distance and dividing by two should place the nuchal ligament within 1.9 mm of the measurement. With the discussed ITN-ITN method, the proposed area for all penetration points of the GON on the left for both sexes was 17.1 mm2, and for the right was 18.9 mm2. Conclusion: The nuchal ligament can be identified on a patient and used as a universal reference point for the GON location. The ITN-ITN method provides injection zones that have minimized areas and are easily identifiable. Furthermore, the “Intertragic-Nuchal Zero” can be used to identify the injection zones bilaterally based on the reliability of ITN-ITN distance divided by two. Significance: The nuchal ligament can be identified on a patient and used as a universal reference point for the GON location. This becomes clinically impactful when trying to identify the midline (or nuchal ligament) in patients rather than cadavers. The ability to easily and non-invasively identify this midline allows the GON penetration points into the semispinalis capitis to be more accurately pinpointed. Decreasing the area of the GON penetration point provides many benefits, including decreased drug administration costs, more accurate and localized administration of analgesics, and subsequent decreased symptoms for the patient with minimized health care costs.
Background Pancreatic ductal adenocarcinoma (PDAC) is an aggressive cancer with an 8 percent 5-year survival rate. One of the primary reasons for the survival rate is a failure to detect it prior to its metastatic phase. Once pancreatic lesions have metastasized the potential for a curative treatment, that being surgical resection, is drastically reduced. Methods We developed a Cas9 stable PANC-1 cell line to use for the pooled genome-wide screen. The construction of the lentiCRISPR library and the Lentivirus production was completed at Dr. Bakke’s previous lab. The Cas9 PANC-1 stable cell lines were transduced with the lentiviral genome-wide CRISPR library at a low multiplicity of infection. We conducted a genome-wide CRISPR screen to identify positive and negative regulators of cellular adhesion in an effort to further understand pancreatic cancer cell invasion, motility, and metastasis. This screen included over 76,000 gRNAs targeting over 19,000 genes. We conducted next-gen sequencing and data analysis to uncover potential targets. Results We identified 17 possible genes involved in adherence that were significantly depleted or enriched in either the 4-hour or 12-minute selection periods. We selected five genes to follow-up on including: aryl hydrocarbon receptor (AHR), AXL receptor tyrosine kinase, SPEN, TATA-box binding protein associated factor 6 like (TAF6L), and SUPT20H. The most significant result was AHR which was depleted in the 4-hour selection in all 4 of the guide RNA’s and enriched in all 4 for the 12-minute selection. AHR has multiple functions including cell-cycle regulation and a paper by Jin et. al. demonstrated that knocking-out the gene inhibited the invasion of breast cancer and pancreatic cancer in chamber assays. Conclusions We conducted a genome wide CRISPR screen and have identified several positive and negative regulators of cell adhesion. The hits generated in this study will be potential targets for treatment of both metastatic and non-metastatic pancreatic cancer. We will be able to follow-up on genes that may be critical in the metastatic pathway of pancreatic cancer or discover genes that are critical to pancreatic cancer growth but not critical for normal pancreatic tissue. Significance Identification of genes involved in cellular adhesion will help develop druggable targets for metastasis, which is a complicated process of cellular movement from the original tumor. We believe the most rapid advances in the treatment of pancreatic cancer will come from early diagnosis. And treatment strategies for early diagnosis are likely to include neoadjuvant chemotherapy and surgical resection. However, addition of direct inhibitors of metastasis would likely improve the odds of surgical resection being a curative treatment.
Background: Deaths from Colorectal cancer (CRC) is only second to lung cancer in men and women of the Western World. Although a preferred test, screening colonoscopy has not yet shown to reduce CRC mortality in prospective, randomized trials. Urine contains abundant of substances reflecting systemic body conditions. Since adenomas are a precursor for CRC and their early detection is likely to reduce the incidence and hence mortality of CRC we embarked upon a study to elucidate the feasibility of prediction the presence of colonic adenomas. Objective: In this study, we evaluated the significance of using Urine biomarker for prospective adenoma detection. Methods: A high-risk questionnaire was used to select patients with patient giving written consent. The study prospectively obtained about 200 urine samples, and 94 samples were studied. Urines were standardized using 200μg/well of creatinine. ELISA was run using BAC 18.1 MAb as it was applied to each well and nonimmune mouse immunoglobulin was added to determine background binding. After washing, bound MAb was detected by goat anti-mouse alkaline phosphatase conjugate binding and color development by adding p-nitrophenyl phosphate substrate minus background. Results: We compared 49 samples from patients without adenomas to 52 with adenomas and established a cut-off of 2 standard deviations above mean of the background (>1.5 [OD-BG]). 60% of urines from patients with adenoma were positive versus 35% of those without polyps which was significantly different (odds ratio OD 2.78 confidence intervals CI [1.26-6.14]; p<0.013). Insignificant adenomas lacking parameters of number (<2); size (<1cm) villous component (<25%) were not significant from normal OD-BG (P=0.3) but advanced adenomas having the above features were significantly greater than normal (67% positive): OR 3.77(CI 1.40-10.16); p=0.009). For all adenomas the sensitivity for the OSN assay as currently performed is 60% and specificity is 65%. We did not stratify results for risk but these parameters are shown in the demographic table. Conclusions: The above sensitivity and specificity for prospective adenoma detection in the urine for a single biomarker are competitive. Our results were derived from only half the samples available and they should be regarded as preliminary. Also, they are based on historic levels of urinary creatinine and we plan to obtain current levels and using these, repeat the ELISA. Organ specific neoantigen originates in the colon and is small enough to be excreted into the urine, so the OSN levels in the urine appear to correlate with colorectal neoplasia (cancers and polyps) and may be used as a cheap and convenient diagnostic tool. Significance: The ability to diagnose adenomas and cancers with single Biomarker and inexpensive test within reach of all.
Introduction: Twin-to-twin transfusion syndrome (TTTS) is a complication unique to monochorionic twin pregnancies in which each fetus receives a disproportionate amount of blood flow due to placental vascular abnormalities. Without intrauterine therapy, fetal mortality in severe TTTS approaches 100%. The gold standard treatment for TTTS is laser ablation therapy, in which the placental anastomoses being unequally shared in-utero are destroyed endoscopically. Membrane disruption and thus iatrogenic conversion to monochorionic-monoamniotic gestation is a known complication of laser ablation therapy. Umbilical cord entanglement with resultant fetal ischemia is a known complication of monochorionic-monoamniotic pregnancies and can also be observed in iatrogenic destruction of separating membranes in diamniotic pregnancies. Case Presentation: A 24-year-old G2P1001 with no significant past medical history presented to prenatal care following diagnosis of spontaneous monochorionic/diamniotic pregnancy. She followed closely with maternal fetal medicine, and at 19 weeks gestation was determined to be developing TTTS. A therapeutic laser ablation was scheduled at University of Michigan. During the procedure, the membrane separating the amniotic sacs was inadvertently disrupted, effectively creating a monochorionic/monoamniotic gestation. In-house monitoring for umbilical cord entanglement surveillance was scheduled for 26 weeks gestation. Growth ultrasound was performed every two weeks while she was admitted for signs of worsening TTTS. At 30w5d gestation, the patient awoke from sleep endorses sharp abdominal pain and a small amount of vaginal bleeding. The decision to proceed with primary cesarean delivery was made due to concern for preterm labor and/or placental abruption. Upon rupture of membranes, frank blood-stained fluid was encountered. Significant umbilical cord entanglement was observed, including two true knots in baby A’s cord. The patient did well post-operatively and was discharged home on POD#3. The infants did well and were discharged home on corrected gestational age 35w6d. Discussion: TTTS and umbilical cord entanglement are known complications of monochorionic and monoamniotic pregnancies, respectively. Cord entanglement can also be observed in pregnancies in which disruption of the dividing membrane occurs in an iatrogenic fashion. Preterm labor and placental abruption are also known complications of multifetal gestations. This case demonstrates the preceding complications shared by one patient, and highlights morbidity of laser ablation therapy. With both fetuses surviving, this is an acceptable risk; however, it is worth consideration. Valuable ultrasonographic and intra-operative photos are also presented and add to value of case discussion.
Purpose: To describe 2 cases of recalcitrant fungal keratitis successfully treated with intracameral Amphotericin B. Methods: Interventional case series Results: A 59-year-old female and a 41-year-old male both presented with fungal keratitis, caused by Bipolaris spp. and Fusarium spp. respectively. Both cases were unresponsive to topical and oral antifungals, causing persistent discomfort and decreased vision. The two patients subsequently received a single dose of intracameral amphotericin B (ICAMB) 10mcg/0.1 mL, in addition to continued topical natamycin. Both patients had remarkable results following ICAMB, with best corrected visual acuity of 20/20 and full corneal reepithelization following treatment. Conclusions: We report 2 cases of intractable fungal keratitis that benefited from intracameral injections of amphotericin B. This route of delivery appears to be very effective because the medication is delivered directly to the deeper layers of the cornea, where fungal infections tend to reside, and where topical and systemic routes have difficulty accessing. Key Words: Fungal Keratitis, Intracameral injection, Amphotericin B
Abstract Title: Recurrent Activity-Induced Headache Associated with Posttraumatic Dural Adhesion of the Middle Meningeal Artery: A Case Report

Authors: Lee Elisevich; Justin Singer

Affiliation: Spectrum Health Butterworth Hospital, Department of Clinical Neurosciences

Abstract Category: Case Reports

Advisor: Justin Singer

Background The middle meningeal artery is surrounded by a plexus of afferent fibers shown to be involved in the progression of some forms of headache, especially migraine. The headache phase of a migraine has been closely associated with the activation of intracranial paravascular nociceptive pathways, which originate primarily from the trigeminal nerve. Activation of these pathways is not normally associated with trauma, and posttraumatic headache disorders sharing characteristics with migraine and involving the middle meningeal artery are not readily available in the literature.

Case Description This report describes a posttraumatic headache disorder in a middle-aged woman in which the causative factor proved to be a pathology of the left middle meningeal artery that resulted from trauma. The tethering of such an acutely sensitive site as the proximal distribution of the MMA underlies the mechanism of pain induction by such relatively innocuous activities as descending stairs. Her pain could be triggered by moderate accelerative changes, occurred in the left frontotemporal region, and shared characteristics with migraine, including a pulsatile quality, persistent unilateral features, and aggravation by routine physical activity. Both contrast injection and transient ballooning of the artery accurately reproduced the pain while lidocaine injection eliminated it. Resection of a portion of the left middle meningeal artery has completely eliminated her pain syndrome.

Conclusion This case further elucidates associations between the middle meningeal artery and headache. Head trauma can bring about a headache syndrome attributable to the tethering of the MMA to the cranium, and resection of the pathological vessel can provide relief. The presentation of posttraumatic headache sharing characteristics with migraine should suggest the possibility of a middle meningeal artery abnormality.
Abstract Title: Multiple Thromboembolic Events in a Pregnant Patient on Anticoagulation - A Case Study

Authors: Jessica Faris, MD; Alexa Shepherd, MD; Anushka Magal, MD; Duane Heilbronn Jr., MD

Affiliation: Obstetrics and Gynecology Residency, CMU; Valley OB/GYN

Introduction: Pregnancy is a state of hypercoagulability. It is estimated there is a four to fivefold increased risk of thromboembolism during pregnancy and the postpartum period, with the greatest risk factors being a history of prior thromboembolism and an underlying thrombophilia. The overall prevalence of venous thrombotic events is 0.5 to 2.0 per 1,000 pregnant women, and these events account for 9.3% of maternal deaths. Case Presentation: A 28-year-old primiparous female with history of Factor V Leiden heterozygosity and prior pulmonary embolism was managed with prophylactic dosing of low-molecular weight heparin. She developed a massive pulmonary embolism at 25-weeks gestation despite anticoagulation compliance. She originally presented to Labor and Delivery with non-distressing, gradually increasing dyspnea and mild tachycardia up to 110. A CT angiogram revealed a large right pulmonary embolus and smaller, subsegmental embolus in the left lower lobe. She underwent mechanical thrombectomy at Covenant Hospital with immediate symptomatic improvement, and her anticoagulation was adjusted to therapeutic dosing. At 34 weeks, the patient presented with severe range blood pressures and the fetus was found to be IUGR at the 4th percentile with absent end diastolic flow. Delivery via primary cesarean section was recommended and went without complications. On post-operative day 3, the patient was found to have a firm and distended abdomen with significant pain. A CT scan of the abdomen and pelvis showed a rectus sheath hematoma and her anticoagulation was held. A CT-guided abdominal drain and an IVC filter was placed by Interventional Radiology and she was discharged home. The patient presented to the Emergency Department on post-operative day 13 after an episode of syncope at home. A CT of the abdomen and pelvis showed extensive thrombosis of the IVC, extending through and above the IVC filter as well as into the renal and iliac veins. The patient was transferred to Henry Ford Hospital for thrombectomy and removal of the IVC filter, which was complicated by an acute pulmonary embolism with decompensation requiring intubation. Echocardiogram showed a right ventricular thrombus. The following day, the patient underwent pulmonary embolectomy, right ventricular embolectomy, and PFO closure. She was extubated, remained stable, and was discharged 16 days later. Discussion: This case demonstrates an atypical presentation of pulmonary embolism symptoms, as well as possible gaps in current anticoagulation recommendations in pregnancy. The patient developed a massive pulmonary embolism despite compliance with recommended dosing of prophylactic anticoagulation. This case also demonstrates an acute complication of cesarean section, and the delicate balance between coagulation and the risk of bleeding. Review of this case reinforces the importance of quick recognition and diagnosis of unusual presentations of pulmonary emboli in pregnancy, as well as highlighting varied approaches in management. It also highlights severe complications of peripartum thrombosis.
Title: Direct Anterior Approach (DAA) vs. Posterior Approach (PA): A Value Based Decision-Making Approach to Total Hip Arthroplasty (THA). Background: THA disease burden continues to rise due to improved management of chronic diseases and prolonged life expectancy. Satisfaction following THA is dependent on POP. Patients show higher expectations for pain relief than postoperative functional improvements. Despite favoritism of DAA due to perceived early outcome benefits, PA may still serve as superior in terms of long-term prosthesis viability. Objective: To display the similarities between DAA and PA for THA for long-term function, postoperative pain (POP), and patient reported outcomes. However, PA may still serve as a superior procedure due to similar outcomes along with a significantly reduced complication rate. Methods: A comprehensive search was conducted via PubMed, Medline, Web of science, and Cochrane Library to identify randomized controlled trials (RCTs) for DAA and PA THAs. Pooled mean differences (MDs), standard MDs, and 95% confidence intervals (CIs) were calculated. The heterogeneity and publication biases were assessed by Cochrane risk-of-bias tool. A correlation analysis was performed to analyze the predictors of postoperative pain and opioid consumption. Results: Reduced POP denoted on days 1 and 2 following DAA yielded lower opioid analgesic consumption when matched to PA (P <0.00001). Literature indicates a 1-5.4% occurrence of intraoperative femoral fractures following DAA. Some authors reported rates up to 27.8%. Revisions due to early femoral fracture are more common in patients with DAA (50.9%) than PA (14.3%). DAA demonstrates a greater number of wound complications that require operation (1.4%) than PA (0.2%). Conclusion: Concern with DAA resounds around its high complication profile, notably through fractures, septic prosthesis, and neurovascular assault leading to increased hospital revenues. The average costs of THA revision is $24,697. Mean charges for THA revisions is $77,851.24. Gross life-time price ranges from $389,307-474,004. Significance: Evidence-based research continues to provide avenues for improving postoperative success in total hip arthroplasties. Ultimately the surgical approach should be based off a surgeon’s preferences and training in residency and fellowship, as well as patient factors (26). It is essential to choose the THA approach that is most advantageous to the patient on a case-by-case basis in relation to the surgeon’s area of expertise and training, in an effort to ensure the lowest severity of postoperative pain and complications. However, the posterior approach may provide a more lucrative, safer treatment modality to those undergoing total hip arthroplasty given its comparative postoperative outcomes, reduced complication rates, and opioid analgesic utilization, relative to the direct anterior approach.
Title: Screening guidelines toward a standardized, safe and efficacious approach to lower extremity surgery (LES) in patients with peripheral artery disease (PAD)

Background: PAD affects up to 8.5 million Americans and 12-20% of those aged 66-72 years. As such, PAD poses detrimental consequences to those planning to undergo orthopaedic LES. To date there is no formulized approach to ascertain reduced LEVI of those wishing to proceed with LES. Objective: To highlight the most important risk factors for those with PAD which should be investigated during the preoperative screening process for possibly reduced lower extremity vascular integrity (LEVI) and to offer a standardized approach toward preoperative evaluation for safely undergoing orthopaedic lower extremity surgery (LES).

Results: Screening for efficacious LES begins with recognizing risk factors (e.g. Diabetes, hypertension, chronic kidney disease, and smoking) and symptoms (e.g. claudication, paresthesia, ulceration) for PAD. Utilization of an ankle brachial index (ABI) is useful for clinical diagnosis of PAD and ascertaining disease severity. Moreover, use of the WIfI classification system by orthopaedic surgeons for preoperative limb ischemia severity can enable determination of surgical risk. Those seen as moderate-to-high risk for LES may necessitate vascular consultation and/or intervention prior to safely undergoing LES. Conclusion: This report serves as a means for orthopaedic surgeons to stratify patients based on underlying PAD and reduced LEVI as a means to determine safety for LES. Lower extremity vascular optimization (LEVO) procedures such as stenting and bypass procedures may be necessary prior to LES. This report offers a flow chart (attached below) for orthopaedic surgeons for establishing which patients require prior vascular intervention as well as those safe for progressing with LES.

Significance: This report could help to stratify patients based on risks related to undergoing major orthopaedic surgical procedures. Implementation of these guidelines into clinical practice could aid in navigating decisions as to which patients require vascular intervention prior to LES. There is hopes these recommendations will mitigate complication rates, minimize reoperations, truncate medical spending by both consumers and healthcare providers, and most importantly, improve PAD patient satisfaction, safety and well-being undergoing LES.
Abstract Title: Visual Estimation of Blood Loss Authors: Matthew French, DO, MS; Kathleen Cowling, DO, MS, MBA; Neli Ragina, PhD; Stephen Zyzanski, PhD Abstract Category: Clinical Advisor: Kathleen Cowling, DO Affiliation: Central Michigan University College of Medicine Background: Blood loss is a major cause of morbidity and mortality in trauma. Blood loss estimation in the surgical literature is well studied, but there is limited data outside of the operating room (OR). However, blood loss in trauma mostly occurs at the scene of the injury, in the transporting vehicle, and where they are initially treated in the hospital, which is usually the Emergency Department (ED). These locations, unlike the OR via sponges or suction containers, do not allow for the collection of blood, which prevents accurate measurement. Instead, oftentimes an estimate of blood volume that has been lost is made purely by visual estimation alone. The literature is limited in regard to emergency personnel evaluation, isolating variables, and assessing various levels of training. Objective: In this study, we evaluated the ability of attending emergency physicians (EPs), paramedics, and residents to estimate volumes of simulated blood. Methods: To evaluate this, we showed EPs, paramedics, and residents four, premeasured volumes of simulated blood, in a randomized order, on a non-absorbent, flat, white surface, in a relatively uniform circle. Exclusion criteria for EPs was being less than 5 years out of residency, and residents was prior surgical, prehospital or military experience. Participants were asked to give their estimations of the amount of simulated blood, write them down, and were unable to change their responses once they had moved on to the next station. Pearson correlations were performed to analyze the data. Results: Findings showed no statistical significance or the primary outcome in the ability to estimate blood based on level of training (p=0.27). Only one of the secondary outcomes showed statistical significance, and that was, within the residency cohort, Family Medicine residents were more accurate at volume estimation than both Emergency Medicine and Psychiatry residents (p=0.000). Overall, the participants in the study consistently underestimated the volumes of simulated blood, with underestimations increasing in volume as the actual volume increased. Conclusion: These data suggest that Emergency Medicine personnel are inaccurate at estimating volumes of blood visually, with a propensity to underestimate the volume. Significance: Using ATLS guidelines, the patient’s vital signs determine which class of hemorrhagic shock they are currently in, which theoretically correlates with the percentage of the patient’s blood volume that has been lost. This does not take many factors into account, including medications, comorbidities, or mechanism of injury. During traumas, an estimate of blood loss is often given by providers, however, aside from chest tube drainage systems, suction canisters, or syringes, there is not an accurate way to measure uncontained blood loss. This study raises further concerns that the visual estimates of blood loss we are both getting and providing are underestimates, which become even less accurate with more clinically significant hemorrhages.
CLINICAL PRESENTATION: Subcutaneous candidal abscess is a very rare infection even in immunocompromised patients. We describe a case of Candida subcutaneous abscess without fungemia. A 25-year-old female presents with progressive pain over the last week to the hallux, she denies any injuries. She was seen at Med Express 1 week ago, prescribed Keflex at that time, she continues to take the Keflex without improvement. The pain is getting worse, she has had increased swelling of the toe, she feels like it is warm. TREATMENT AND SURGICAL TECHNIQUE: Patient was admitted and a surgical debridement of the abscess was realized with delayed primary closure. Specimen collected included light brown, purulent, milky discharge with pseudohyphae seen on Gram stain. Re-evaluation of the histopathology sample for fungi, with PAS staining, revealed brown spongiform projections, compatible with fungi. Specimen was identified as Candida glabrata with no other organisms. Initial treatment should be with IV antifungal agents such as amphotericin, voriconazole, or in this case micafungin, which was preferred to amphotericin B due to renal toxicity, and gave a good clinical outcome in our patient at 24 months and no recurrence. Outpatient PO antifungal therapy based on azolic drugs is the best option for cutaneous and subcutaneous candidiasis due to varying levels of C. glabrata resistance. Fluconazole is a fungistatic drug against Candida species and, used in doses of 400 mg daily, appears to be an adequate treatment. CONCLUSION: In conclusion, a subcutaneous abscess due to Candida albicans is rare, even in patients with classic risk factors. Treatment can be done with drainage, systemic antifungal and removal of invasive devices.
Abstract Title: The Utility of Sulfur Colloid Imaging in Differentiating Charcot Neuroarthropathy versus Osteomyelitis

Authors: Christopher Gill, DPM; Mark Bullock, DPM

Affiliation: CMU Medical Education Partners, Podiatry

Abstract Category: Case Reports

Advisor: Mark Bullock, DPM

Introduction: It has been shown that labeled leukocyte scans experience uptake in uninfected Charcot joints, most likely due to hematopoietically active bone marrow. The addition of a sulfur colloid bone marrow scan, which shows only healthy active marrow, can help differentiate between Charcot and osteomyelitis. This is the case of a patient who presented to the ED with a secondary complaint of a painful left foot from previous surgery. Imaging suggested osteomyelitis; however, a sulfur colloid scan helped to rule this out. Case presentation: A 53-year-old female with PMH of uncontrolled diabetes mellitus type 2, polyneuropathy, CHF, fibromyalgia, and HTN presented to the ED on 10/28/18 with nausea, vomiting and abdominal pain. She was diagnosed with AKI, as well as acute pancreatitis. She began experiencing left foot pain approximately three days into her admission. She admitted that she had a fusion of her left 1st MPJ near the end of July 2018. She was taken for x-rays, which showed comminuted fractures of the 1st metatarsal base along with hardware from a 1st MPJ fusion of the left foot. Based on her level of pain, swelling and warmth noted on physical exam, Hospital Medicine was concerned for the possibility of osteomyelitis. A triphasic bone scan was ordered, which showed increased uptake at the 1st MPJ on blood flow, blood pool and delayed images. These findings suggested possible osteomyelitis, and an Indium-111 leukocyte scan was ordered along with a Podiatry consult. The results of the Indium-111 scan read acute osteomyelitis involving the distal 1st metatarsal and 1st MPJ at the site of fixation. Podiatry evaluated the patient and suspected acute Charcot neuroarthropathy based on the patient’s clinical picture as well as uncontrolled diabetes with a Hgb A1c of 8.8%. Further imaging was discussed with nuclear medicine, who recommended a sulfur colloid scan. The sulfur colloid results showed no evidence of osteomyelitis, as the distribution of skeletal uptake was similar to that of the Indium-111 leukocyte scan. After confirmation of an improved Hgb A1c of 7.0%, the patient underwent a 1st metatarsal-cuneiform arthrodesis along with bone biopsy on 11/7/18. The patient’s last follow-up appointment was on 7/23/19, which showed excellent consolidation at the 1st metatarsal-cuneiform joint with no current signs of progressing Charcot deformity. Discussion: The triphasic bone scan is the imaging modality of choice for identifying osteomyelitis in the absence of complicating factors, however most patients have such factors. An Indium-111 leukocyte scan provides the advantage of increased sensitivity and specificity compared to the use of a triphasic bone scan alone. A problem occurs, however, because Indium-111 can experience localization within non-infected fracture sites, as in Charcot neuroarthropathy. Research has shown that the specificity increases to nearly 98% when a sulfur colloid scan is implemented and used in conjunction with a leukocyte scan. While both a triphasic bone scan and leukocyte scan suggested osteomyelitis in this case, it was the sulfur colloid scan that instead confirmed acute Charcot neuroarthropathy based on spatially congruent findings when compared to the leukocyte scan.
Introduction: Cesarean scar pregnancies (CSPs) are a rare form of ectopic pregnancy that occur when a pregnancy implants into the myometrium at the location of a prior cesarean section scar. Although rare, these pregnancies are associated with high maternal morbidity and mortality if not diagnosed and managed early. With increasing incidence due to increasing cesarean rate, this case highlights the importance of having familiarity with and a high index of suspicion for CSPs. Case summary: A 25 year old G4P1213 female with a history of 3 prior cesarean sections presented as a transfer from an outside facility with abdominal pain, vaginal bleeding, and a suspected right tubal ectopic pregnancy based on transvaginal ultrasound (TVUS). The patient was stable upon transfer with a hemoglobin of 9.0. A diagnostic laparoscopy was performed with normal findings and suspicion of a complete abortion. The patient was discharged with instructions for repeat beta HCG and close follow up. The following day, she presented to the emergency department with worsening symptoms and a hemoglobin of 7.9. The repeat TVUS was equivocal and a pelvic MRI was ordered, which revealed concern for a CSP. The patient was subsequently transferred to a tertiary care center. At the outlying facility, suspicion for CSP was confirmed with a TVUS. The patient declined surgical management and opted for fertility sparing medical management with Methotrexate; she was ultimately lost to follow up. Discussion: Early radiographic diagnosis and treatment of CSPs are instrumental in decreasing the risk of devastating outcomes, as well as optimizing fertility sparing treatment, and even for the potential to carry the pregnancy to term in some cases. Patients with CSP can present asymptomatically or with nonspecific symptoms, complicating early diagnosis. TVUS is the gold standard in diagnosing CSP; however, should the imaging be equivocal or inconclusive, MRI should be utilized. Contrast-enhanced ultrasound is now being considered as a more effective method of diagnosis with higher sensitivity and specificity than TVUS. It is important to be familiar with the sonographic signs of CSP and know the appropriate referral centers with CSP expertise.
Abstract Title: Case Report: Cerebral Venous Sinus Thrombosis – An Uncommon Presentation Masquerading as Sepsis

Authors: David Hansen, DO; Therese Mead, DO, RDMS, FACEP

Affiliation: Central Michigan University, Emergency Medicine

Abstract Category: Case Reports

Advisor: Therese Mead, DO, RDMS, FACEP

It has been hypothesized that the gut brain axis plays a role in neurological conditions, but the existence of the link between the two systems is not well understood. Studies have been conducted to illustrate gut bacteria leading to neural pathway activation. The purpose of our study was to study specific neurological and psychological disorders. We specifically looked at Anxiety, Parkinson’s disease, Multiple Sclerosis, Alzheimer’s and Autism to investigate associations between these diagnoses and the gut-brain axis. We looked at the following gut diseases to make this connection: Escherichia coli, Salmonella enterica, Salmonella typhimurium, Campylobacter jejuni, Clostridium perfringens, Helicobacter pylori, Rotavirus, Norovirus, Radiation Gastroenteritis, Allergic Gastroenteritis, Eosinophilic Gastroenteritis, Clostridium difficile, Gastrojejunal Ulcers, Ulcerative Ileocolitis, Irritable Colon Syndrome, and Ulcerative Colitis. Studying the interplay between these two systems can lead to prevention and further understanding of specific mental illnesses leading to better patient outcomes. We reviewed our findings using the HCUP National Inpatient Sample 2012. By using a case control study design with a chi square analysis comparing diagnoses of patients, we found associations between neurological and gut diagnoses, but not always in the expected direction, possibly due to the rarity of these diagnoses. Directions for future research are discussed.
Introduction Multiple myeloma (MM) is a proliferation of plasma cells in bone marrow. The proliferation of plasma cells results in bony destruction secondary to osteolytic lesions, osteopenia, and pathological fractures. The malignant plasma cells produce a monoclonal immunoglobulin (M protein), which most commonly consists of a heavy (IgG, IgA, IgM, IgD) and light (kappa or lambda) chain. Proliferation of the M protein leads to unbound light chains (Bence Jones proteins), which damage the kidney en route to being excreted in the urine. The resultant clinical picture shows a patient with bone pain and lytic lesions on x-ray, hypercalcemia secondary to bone destruction, unexplained anemia, and acute renal failure. MM occurs approximately 4 to 5 people per 100,000 in the US. It accounts for 17% of hematological cancers and is more common in male African Americans. Average age of diagnosis is 66. Case Presentation A 52 y/o man with a history of MM and non-compliance with systemic therapy presented to the emergency department with a chief complaint of constipation and progressive lower extremity weakness. He had been experiencing urinary retention for about one week prior to this, which was addressed with Foley catheterization. Physical exam showed lower extremity weakness and decreased sensation. Imaging showed metastasis to his spinal column, resulting in both spinal cord compression and pathological vertebral fracture. He was admitted to the hospital and neurosurgery was placed on consult. Laboratory results showed the patient to be profoundly pancytopenic, which was likely secondary to his recent chemotherapy and plasmapheresis as part of his MM treatment. Because of his pancytopenia, the patient was a poor surgical candidate for palliative surgery. However, it was noted that the patient did have a history of radiation for management of a large psoas mass, and his cancer responded well to this treatment. Given the inherent sensitivity of the cancer to radiation, consultation with radiation oncology revealed the patient to be a candidate for emergent radiation. He was taken to the radiation oncology suite following admission to the hospital, and the patient did receive urgent palliative radiation. The mass responded to radiation therapy, and the patient did receive palliation from this intervention. He was able to regain most of his lower extremity functionality, and upon discharge was able to walk. Sadly, the patient’s disease did progress, and he went home on hospice. He expired shortly thereafter. Discussion/Conclusions This case will serve to emphasize the importance of advanced imaging in high risk patients, the need to maintain a high clinical suspicion for bony metastasis in cancer patients, especially MM. Additionally, this case provides an example of a true radiation oncology emergency, and the importance of early radiation oncology consultation and involvement with the patient’s care.
Abstract Title: The use of scribes in an academic emergency department lead to increases in physician patient per hour, acuity of patients, and RVU production.

Authors: Matthew Deibel, MD; John Lowry, PhD; David Hansen, DO

Affiliation: Covenant Health, Covenant Emergency Care Center

Abstract Category: Quality Improvement / Population Health

Background: Scribes have been used in one form or another since antiquity. In modern times, with the near-universal presence of an electronic medical record (EMR), scribes continue to play a critical role in the accurate, efficient, and timely delivery of healthcare in the United States. No place is this more apparent than in the Emergency Department (ED), as studies consistently show that scribes are an asset in the ED in nearly every relevant metric. Objective: In 2011, a scribe program was initiated at Covenant emergency department (ED), an academic, community-based emergency department with resident coverage. The presence and training of new scribes was slowly built up. This study is focused on a specific time where the scribe program had fully developed, with well-trained and experienced scribes supporting 1/3 of all shifts, residents assisting in another 1/3 of shifts, and a final 1/3 without resident or scribe assistance. The goal of this study is to look at relevant emergency department metrics, concurrently comparing shifts with an experienced scribe vs a resident supported shift vs no resident or scribe.

Methods: This study is a retrospective analysis, looking at data generated by physician shifts within the ED between July 1 to December 31, 2014, stratifying them into attending physician alone, attending assisted by a scribe, and attending assisted by a resident. The data was then demarcated with several different endpoints associated with productivity, to include patients seen per hour (PPH), relative value unit (RVU) generation, patient acuity (1-5), and door to disposition time (D2D). Results: Over the time period examined, it was found that the presence of a scribe increased the amount of PPH and RVU/shift, and the number of patients seen who were brought to the ED via ambulance. Additionally, the time from door to disposition and doc to disposition was unchanged from an attending alone shift, indicating that the presence of a scribe did not slow patient flow. A bigger increase in PPH and RVU were found in resident assisted shifts. Conclusions: The assistance of either scribes or residents resulted in increased physician productivity as measured by PPH and RVU/shift, with the largest increase in resident associated shifts, and patients seen who were brought in by ambulance, indicating higher acuity. The presence of a scribe or resident did not negatively impact patient flow. Significance: This study is of interest to any clinical entity that is considering either employing scribes or developing a training program within their department.
Abstract Title: Potential use of PAMAM Dendrimer Nanomolecules as a Delivery Vehicle for Treatment of Ischemic Stroke

Authors: Joseph Hellrung; Julien Rossignol

Affiliation: Central Michigan University College of Medicine, Neuroscience Program

Abstract Category: Basic & Translational Science

Advisor: Julien Rossignol

A potential approach for the treatment of stroke involves the conversion of endogenous astrocytes into functional neurons, which can be done by supplying transcription factors, such as SOX2 (gene). However, in Dr. Rossignol’s lab, polyamidoamine (PAMAM) dendrimer nanomolecules complexed with plasmid/DNA have been shown to facilitate insertion and expression of DNA into cells both in vitro and in vivo. In stroke, there is loss of neurons at the infarct, following by high inflammation evaluated by activated astrocytes. SOX2 is a known transcription factor that has the ability to convert the activated astrocytes into neuroblasts, which could re populate the lost neurons in the brain. As a proof of concept, this project aims deliver the hSOX2 in vitro in rat astrocytes using dendrimer nanomolecules. In addition to delivering large plasmid such as hSOX2, the surface-modified dendrimer nanomolecules was tagged with Cy5.5 (G4-90/10 Cy5.5). The astrocytes were extracted from the adult rat brain and were cultured in appropriate media. Following this, the G4-cys-90/10 Cy5.5, either by themselves or complexed with the hSOX2 plasmids was administered to the cells. Following this, the rats that had undergone ischemic stroke were treated with G4-cys-90/10 by direct intracranial injection into the motor cortex. Following dendrimer treatment, all the rats underwent a battery of behavioral tasks to analyses their motor deficits following treatment post stroke. In vitro analysis showed that the G4-90/10 Cy5.5 and the G4-90/10 Cy5.5 hSOX2 were taken up by the rat astrocytes. There was a stroke effect shown between rats following cylinder behavioral tests, however, following the dendrimer injection, the nanomolecules were taken up by the glial cells and were found around the infarct, but no significance difference on behavior tasks were observed by the nanomolecules themselves. More analysis for the complexes are in progress.
Introduction: Acute compartment syndrome is considered to be a surgical emergency which necessitates emergent fasciotomy. This diagnosis is seen after severe crush injury and/or extremity fractures. Acute compartment syndrome is seen in approximately 12% of pediatric tibial shaft fractures. After initial compartment syndrome treatment, physicians may proceed with surgical invention for additional fractures or concerns. After all fractures have been treated, attention must then be directed toward wound healing. Wound healing after fasciotomy is commonly done through the use of negative pressure wound therapy, secondary intention, use of skin substitutes and skin grafting. The most common complaint after fasciotomy in pediatric patients relates to unpleasant appearance after healing. One way to address this concern is the use of split-thickness skin grafting. Case Presentation: A 17 year-old male patient who presented after crush injury to the lower extremity. Initial emergency department workup demonstrated compartment syndrome to the left foot as well as a significantly displaced tibial fracture and multiple pedal fractures. The patient was urgently taken for operative fasciotomy and open reduction internal fixation of the tibial fracture. After the initial procedure the patient was evaluated for further surgical intervention to treat intra-articular, comminuted and displaced fractures of the 2nd, 3rd, 4th and 5th metatarsal bases, non-displaced fracture of the 5th metatarsal, and avulsion fractures of the distal cuboid, plantar distal navicular and lateral cuneiform. During this surgical procedure a split-thickness skin graft was applied to the left foot due to significant swelling and inability to primarily re-approximate the skin. Patient underwent normal post-operative care for pedal and tibial fractures which included significant period of non-weight bearing. During this time patient healed all incisions and skin grafts without difficulty and now has minimally visible scars without complaints of pain or poor cosmetic appearance. Additionally, at the end of this period the patient was able to bear weight without difficulty and has since returned to sport. Discussion/Conclusion: Acute compartment syndrome can be a devastating diagnosis when not made and treated in a timely fashion. Delay in treatment can lead to necrosis, rhabdomyolysis, kidney failure, nerve damage, and loss of limb or life. Even in those who are treated appropriately and in a timely fashion still have a high rate of dissatisfaction. Within the pediatric population the largest complaint is appearance and large areas of scarring after healing. The use of split-thickness skin grafting during secondary open reduction internal fixation after acute compartment syndrome may not only help to provide a more cosmetic appearance but also reduce the number of surgeries after acute compartment syndrome. This case study provides one instance of successful treatment of acute compartment syndrome with high functional and cosmetic outcome.
Abstract Title: Functional Role of the LG-rich Domain of NUP62 in Mitochondrial Function and in Infantile Bilateral Striatal Necrosis

Authors: Michael Hudson; Staves Kohtz

Affiliation: Central Michigan University, College of Medicine

Abstract Category: Basic & Translational Science

Background: Infantile bilateral striatal necrosis (IBSN) is a neurologic syndrome of bilateral symmetric spongy degeneration of the corpus striatum and globus pallidus. IBSN is classified into two forms, sporadic and familial, associated with varying degrees of prognosis. The familial autosomal recessive IBSN has been shown to be caused by a mutation in the NUP62 gene, while mitochondrial IBSN is caused by mutation in the ATP synthase-6 gene. Prognosis for familial forms is usually poor with patients progressing to spastic paralysis and following death, usually due to infection. Methods: In this study, human cancer cell lines engineered to express point mutations in the nuclear pore complex protein p62 (NUP62) were analyzed and compared to cell lines expressing wild-type NUP62 using Western blot, immunofluorescence, and measurements of oxidative phosphorylation (OXPHOS) activity. Wild-type NUP62 neuroblastoma cell lines were attached to collagen coated microcarriers and induced to differentiate using a combination of retinoic acid and phorbol esters. Wild-type NUP62 neuroblastoma cells were also cultured as spheroids and induced to differentiate using the same combination of retinoic acid and phorbol esters. Lastly, RNA knock out of the NUP62 protein was done on the neuroblastoma cell lines, the neuroblastoma cells were cultured as spheroids and differentiated. The wild-type NUP62 differentiated neuroblastoma cells on collagen microcarriers, wild-type NUP62 differentiated spheroid neuroblastoma cells, and NUP62 RNA knock out differentiated spheroids were all compared to undifferentiated wild-type NUP62 neuroblastoma cells using Western blot, immunofluorescence, and OXPHOS activity. Results: After differentiation with retinoic acid and phorbol esters, Western blot analysis of the differentiated neuroblastoma cell lines demonstrated the appearance of distinct bands when compared to undifferentiated neuroblastoma cell lines when anti-tyrosine hydroxylase and dopamine transporter primary antibodies were used. OXPHOS activity of differentiated wild-type NUP62 neuroblastoma cells on collagen beads showed no activity when compared to undifferentiated wild-type neuroblastoma cell lines. OXPHOS activity of differentiated NUP62 RNA knock out neuroblastoma cells as spheroids showed clear differences in activity of complex I, complex III, and uncoupled when compared to differentiated wild-type NUP62 neuroblastoma cells as spheroids. Conclusion: Differentiated neuroblastoma cell lines can be distinguished from undifferentiated cell lines by distinct bands on Western blot using tyrosine hydroxylase and dopamine transporter primary antibodies. RNA knock-out NUP62 differentiated neuroblastoma cells showed clear differences in OXPHOS activity compared to both differentiated and undifferentiated wild-type NUP62 neuroblastoma cell lines. Significance: Investigation of the molecular basis of regulation of mitochondrial activity by NUP62 will impact our understanding of metabolic regulation in neurogenerative diseases and cancer. Generation of the NUP62 cell lines will not only provide insights into the pathogenesis of IBSN, but other diseases causing degeneration of the striatum, such as Huntington’s disease and other mitochondrial disorders.
Abstract Title: The sudden aroma of an extra-adrenal pheochromocytoma

Authors: Abdur Jamil; Chandramouli Mandalaparty; vivek variar

Affiliation: CMU health, Internal medicine

Abstract Category: Case Reports

Advisor: vivek variar

Introduction: Pheochromocytoma is a rare neuroendocrine tumor arising from chromaffin cells of the adrenal medulla. Approximately 90% of the cases occur in the adrenal medulla and the remaining 10% are extra-adrenal. Here, we present an elderly woman with a malignant hypertensive crisis and extra-adrenal pheochromocytoma. Case Presentation: An 81-year-old African-American female with a past medical history of insulin-dependent diabetes mellitus type II, second-degree heart block with pacemaker, presented with hypertensive emergency and NSTEMI. She complained of persistent vomiting and lightheadedness. CT (Computed Tomography) Abdomen revealed 12.7x8.3 cm left solid retroperitoneal mass. Perigastric EUS (Endoscopic Ultrasound) guided FNA (Fine needle aspiration) was performed prior to hormonal assessment and surgical removal. On direct tumor manipulation, systolic blood pressure was elevated in the 300’s. The surgery was pre-maturely aborted and blood pressure was stabilized with intravenous infusion of nicardipine. Biopsy with cellular morphology and immunohistochemistry revealed pheochromocytoma. The abnormally elevated plasma and urine metanephrines/catecholamines were consistent with the pathological diagnosis. Extremely tight systolic blood pressure control of less than 120 was achieved with prazosin, as phenoxybenzamine has poor absorbability via naso-gastric (NG) tube. Given that she is a high-risk surgical candidate, pre-operative nuclear medicine imaging tests are planned for the investigation of metastatic disease. Conclusion: The early detection of secondary causes of hypertension in elderly patients is absolutely critical as they present with unusual symptomatology and unrecognized complications. Radiological findings of retroperitoneal masses should raise a high index of suspicion for pheochromocytoma so rapid treatment therapy is established.
Guyton’s venous return curve describes venous return in terms of right atrial pressure, mean circulatory filling pressure, and sympathetic activity.1 Guyton’s work revolutionized the understanding of cardiovascular physiology at the time it was published. However, experience shows that venous return curves are difficult to present or understand, and have limited direct clinical application.2,3 Venous return remains of central importance to the pathophysiology underlying many clinical disorders.4,5 We propose a simple, intuitive model to explain venous return that can be progressively presented to explain both venous filling and circulatory mobilization of blood. The latter concept encompasses vеноconstriction as well as other mobilizing factors. We begin with a heart that stopped beating, so that central venous pressure (CVP) and mean arterial pressure (MAP) are equal, and yet are not zero due to circulatory filling pressure. Restarting the heart we illustrate how CVP and MAP develop, explaining that circulatory filling pressure prevents CVP from falling below that needed to maintain a preload sufficient to support normal cardiac output. External filling sources that control filling pressure include the urinary, gastrointestinal, respiratory, integumentary systems. Internal filling results from the balance of total body water between plasma and interstitial fluid, as controlled by transcapillary forces (Starling forces). In addition to filling, CVP is controlled by the redistribution of blood within the circulatory system. This can include sympathetic mobilization of blood from systemic venous circulation and the gastrointestinal tract (including the liver and spleen). Metabolic control of precapillary sphincters, such as the opening of muscular capillary beds during exercise, can also contribute to CVP. The model is qualitative, while the venous return curve is quantitative. However, we anticipate it being more easily understood, more comprehensive, and more easily applied to clinical medicine. 1 Guyton, A. C. (1955). Physiol rev, 35(1), 123-129. 2 Beard, D. A., & Feigl, E. O. (2011). Am J Physiol, 301(3), H629-H633. 3 Henderson, W. R., Griesdale, D. E., Walley, K. R., & Sheel, A. W. W. (2010). Critical care, 14(6), 243. 4 Bressack, M. A., & Raffin, T. A. (1987). Chest, 92(5), 906-912. 5 Funk, D. J., Jacobsohn, E., & Kumar, A. (2013). Critical care med, 41(1), 255-262.
Type 2 diabetes is disproportionately more prevalent in African Americans, leading to increased diabetic complications and mortality, yet the majority of published data about diabetics is in Caucasian adults. Diabetes and its associated cardiovascular complications influence pulmonary function and reduce physical capacity, affecting patient quality of life. Because physical activity is beneficial to weight management and diabetes control, limitation of physical function and diabetic complications then potentiate each other. Vitamin D levels have been linked to physical performance and muscle strength, and African Americans are known to have significantly lower 25(OH) vitamin D levels than Caucasians. Thus, we hypothesized that vitamin D3 supplementation in vitamin-D-deficient diabetic African Americans would increase physical functioning. To address this hypothesis, we utilized a randomized, double-blinded, controlled trial treating patients with 4,000 IU/day (n=35) vs. 600 IU/day (n=38) of vitamin D3 in a patient population of 73 African Americans with diabetes and vitamin D deficiency. Subjects were treated for 1 year, with vital signs, metabolic labs, 25(OH) vitamin D level, 6 Minute Walk Test, and PROMIS (Patient Reported Outcomes - Measurement Information System) Questionnaires for physical function and well-being administered at baseline, 6 months, and 12 months. To analyze the results of the outcomes, we utilized a mixed model analysis with autoregressive covariance structure and with subjects as random effect in the model. For each outcome, age, gender, BMI, systolic and diastolic blood pressure, A1c, and 25(OH) vitamin D levels were investigated as potential confounders. At baseline, groups were similar with respect to gender distribution, age, blood pressure, BMI and A1c. 25(OH) vitamin D levels were also similar at baseline and, as expected, increased significantly more in the high dose (from 18±6.8 ng/ml to 46±13 ng/ml) compared to the low dose group (from 21±6.5 ng/ml to 31±9.9 ng/ml), even after adjustment for age (p<0.0001). After controlling for age and BMI, there was no significant effect between groups on the change in 6-minute walk distance (p=0.8). Regarding the 6 domains of PROMIS, including physical functioning, depression, pain interference, social role satisfaction, fatigue, and anxiety, all were interestingly affected by BMI, but after adjustment for this and other possible confounders, there was no significant effect between groups on the change in any PROMIS outcome. 25(OH) vitamin D levels were not a significant predictor of any outcome. One year of vitamin D3 at either low dose or high dose did not result in improved physical functioning in African Americans with type 2 diabetes and baseline vitamin D deficiency. However, we did demonstrate that many patients reach vitamin D sufficiency [defined by 25(OH) vitamin D levels >30 ng/mL] with no more than the US recommended daily intake of vitamin D, suggesting that additional supplementation beyond a multivitamin may be unnecessary.
Abstract Title: Rates of preterm birth in pregnant women with diabetes in rural and non-rural counties of Michigan

Authors: Aarthi Arab; Sharanya Jayachandran; Neli Ragina

Affiliation: Central Michigan University, College of Medicine

Abstract Category: Quality Improvement / Population Health

Advisor: Neli Ragina

Introduction: The global prevalence of diabetes is on the rise, as are the health complications and healthcare costs associated with this chronic disease. Diabetic prevalence in pregnant women has been shown to be correlated with adverse neonatal outcomes due to complications during pregnancy and higher preterm birth rates, which severely increases the risk of neonatal death and can lead to lifelong disability. Rates of premature births have been found to be higher among specific races, but whether or not this correlates to geographic environment remains uncertain. While the rate of diabetes remains high in both non-rural and rural communities, access to healthcare in both settings is impeded by several factors including distance to healthcare facilities, access to primary care and maternal health services, and limited access to public transportation. The purpose of this study was to explore the relationship between diabetic mothers living in rural versus non-rural counties and preterm birth rates in Michigan. Methods: We performed an independent T-test to evaluate how rates of preterm birth and live births to mothers with diabetes are related to rurality. We also ran a multivariable linear regression evaluating the impact of diabetes and rurality on preterm birth. Results & Conclusion: Women living in non-rural counties in Michigan have a statistically significant difference in rates of preterm live births compared to those in rural counties (99.01 vs 89.2, p = 0.027). Women 40 years and older with diabetes and living in a non-rural area have a statistically significant difference in percent of live births compared to those of the same age who live in rural areas (16.63 vs 8.48, p = 0.046). This data shows that living in a rural area is significantly protective against preterm births (p= 0.032).
Abstract Title: The use of gadolinium based contrast agents in pediatric brain MRIs: The indications and yield.

Authors: Anila Kanna, MD; Amanda Weber, MD

Affiliation: Children's Hospital of Michigan, Detroit, Michigan., Children's Hospital of Michigan

Abstract Category: Clinical

Advisor: Amanda Weber, MD

Background: Recent studies have demonstrated persistent gadolinium deposits in the brains of patients who underwent brain MRIs with gadolinium. The potential long-term risks of these deposits are not clear. The European Medicines Agency recommends restricted use of some gadolinium-based contrast agents (GBCAs) to prevent future risks associated with gadolinium deposits in the brain. FDA’s Medical Imaging Drugs Advisory Committee recommends labels on GBCAs to warn of potential gadolinium retention. We hypothesize that contrast brain MRIs may be over-utilized in infants, and the addition of contrast is often not helpful in clinical decision making.

Objectives: To review the utilization patterns of brain MRI with gadolinium in infants, and determine how often the addition of contrast was beneficial for clinical decision making.

Methods: This is a retrospective chart review, which analyzed 100 brain MRIs with gadolinium in infants between Jan 2017 and June 2019. Patients with inadequate follow-up were excluded. The MRI result was analyzed and the addition of contrast was deemed beneficial if: contrast was required to determine or exclude a specific diagnosis, or the addition of contrast was associated with a change in management.

Results: In 28 of 100 cases analyzed, the addition of gadolinium was considered beneficial. Of those, contrast was most helpful in suspected infectious etiologies (13/16, 81% benefit). The yield in other diagnostic categories include suspected: seizure (6/25, 24%), intracranial mass (3/12, 25%), vascular lesions (1/5, 20%), abnormal head growth (2/14, 14%), visual problems (2/15, 13%), developmental delay (0/4, 0%), neurocutaneous disorders (0/4, 0%) and miscellaneous (hearing loss, facial droop, vocal cord paralysis and scalp lesion)(1/5, 20%).

Conclusion: This data suggests that addition of gadolinium was beneficial in only 30% of the patients and it is probably overutilized in infants.

Significance: Long-term effects of gadolinium deposition in the brain are unknown. Providers should use caution when considering the addition of gadolinium to brain MRIs based on presenting symptoms that may have a lower diagnostic yield. Larger studies are needed to confirm these findings.
Abstract Title: A systematic review of the factors contributing to the outcomes of racial matching in mental health therapy within White Americans, Asian Americans, African Americans, and Hispanic Americans

Authors: Ariel Cascio, PhD; Caroline Gobran; Vaishali Kapila

Affiliation: Central Michigan University, College of Medicine

Abstract Category: Quality Improvement / Population Health

Advisor: Ariel Cascio, PhD

Purpose: Racial/ethnic matching between client and clinician in a mental health setting has been considered to affect therapy outcome. There are several factors that impact the relationship between racial matching and treatment. In efforts to explore these circumstances, we hypothesize that a variety of factors, including patients’ race, language, and geographical location, contribute to an improvement of outcomes. Methods: Relevant articles were identified through a database and screened. After duplicate and irrelevant articles were excluded, data was gathered and analyzed from 10 studies. Each study articulated its results in a variety of self-reported outcomes. Therefore, a qualitative analysis of each study was performed. Result: Because of the small number of studies each with a unique methods and results, it was not possible to conclude which or if any factors (patient’s race, language, and geographical location) contributed to the quality of mental health therapy. Conclusion Racial/ethnic matching between a client and clinician in a mental health therapy setting has been considered to affect therapy outcome at varying degrees. It is essential as clinicians, policy makers, and leaders to identify factors that may encourage or inhibit the effects of racial matching on a patient’s wellbeing. Racial matching in psychotherapy is a complex relationship that requires further analysis.
Introduction: Renal artery rupture is a rare diagnosis to make as it is usually associated with three main circumstances involving the renal system. These include: renal artery aneurysm, Wunderlich syndrome and post-transplantation. However, this particular patient did not fall into any of these categories and we therefore believe it to be the first documented case of spontaneous renal artery rupture. Case presentation: Patient was a 50 year old male with end stage renal disease on dialysis who presented to the emergency department with altered mental status. Upon arrival he was noted to be hypotensive and unresponsive with no history of trauma. He was intubated for airway protection and sedated. During resuscitation initial hemoglobin was noted to be 6, likely attributed to him being a dialysis patient, requiring transfusions in the past. He was given two units of PRBCs and his vitals improved. Prior to admission to the ICU for sepsis, he again became unstable with a repeat hemoglobin of 4. His abdomen appeared more distended, with grey turner sign. Bedside FAST exam showed free fluid in the RUQ. Massive transfusion protocol was initiated. CT scan showed contrast exiting through the left renal artery. Urology was contacted and he was taken emergently to the OR for nephrectomy. He was extubated the following day and ultimately discharged home days later from the hospital. Discussion: This case shows the importance of thorough physical examination, along with the adjunctive diagnostic tools that can be used. FAST exam historically is used for trauma patients but in this particular case with the grey Cullen sign on physical exam, the fast exam helped determine intraperitoneal bleeding and expedited care to the operating room for exploratory laparotomy.
In many diseases that affect the fetus, gene therapy is an important tool that can promote and integrate therapeutic genes into the genome of diseased cells early on. Nanomolecules, especially PAMAM dendrimers, have recently come into wider use as cargo carrying vectors that have several advantages over other viral vectors due to their 1) tunable size and surface chemistry; 2) uniform size; 3) ability to target specific tissues; and 4) carry large biomolecules and drugs. Recently, our group demonstrated that 4th generation (G4) PAMAM dendrimer nanomolecules (D) with a cystamine core; Cys (S=S) with non-toxic 90:10 OH:NH$_2$ (known as D-Cys) surface modification can cross the blood brain barrier following injection into the bloodstream. This study aimed to deliver the PAMAM dendrimers to the fetus in the pregnant C57Bl/6J mothers, with the additional challenge of crossing the placental barrier. In the current study, D-Cys nanomolecules complexed with a 10kb plasmid payload (EF1-Luc2-dTom) having the luciferase and dTomato as the reporter genes (known as a dendriplex) was administered via intraperitoneal injection to pregnant C57Bl/6J mice and the distribution in the maternal brain, placenta and fetal brain was evaluated. Systematic diffusion of the dendriplex and dendrimers were evaluated 3 days after intraperitoneal injection via in vivo imaging, demonstrating that the dendrimers were being taken up into the circulation and away from the injection site. Upon sectioning and fluorescence microscopy it was found that both D-Cys and D-Cys-Cy5.5-EF1-Luc2-dTom complex were able to successfully distribute across the maternal blood brain barrier. However, upon analyzing the fetal brains, there was no appreciable distribution of the dendrimers or complexes across the placenta, but the dendrimers appeared to have been captured in the placenta. Multiple collections of the dendrimer were noted to be localized throughout the stroma. More experiments are necessary to optimize the delivery of cargo to fetus.
Background: Training surgical residents is a challenging and demanding process. The training includes multiple domains, levels of skills and knowledge acquisition. Psychomotor skills training imposes significant challenges and demands. The current training in North America is accomplished throughout 5-year clinical training programs in most of the surgical specialties. This training consists of gradual increase in exposure and skills acquisition beginning with the most basic procedures to the more complex advanced procedures. Current Challenges: One of the biggest challenges is structuring a comprehensive curriculum that involves full spectrum of the surgical skills needed to practice safely after completing training. Surgical residents may display highly variable performances and learning capabilities. This makes the task of compiling a curriculum that accommodate all spectrum of residents learning and training even more challenging. Educators and surgery trainers have been trying to enforce and improve this intra-operative training activity and trainees' satisfaction. The current practice of training is centered on facilitating incremental acquisition of skills through practice in the lab or in real life surgery in a patient’s safe setting. In addition, with this practice, residents are trained on the main and common surgical skills more so than other skills. Consequently, training on skills that are not common or in unusual circumstances may be easily missed, unless specific focus is given to cover. Need of innovation introduction: There is a challenge in learning these skills through the traditional training curriculum. Learning is unpredictable and depends on the availability of training opportunities for these skills, dedication of the supervising faculty, patients’ condition and safety. These skills are better taught separately and early in the training programs like training on suturing and knot tying for surgery residents. The acquisition of many technical surgical skills is moving toward using the lab and simulation. Technology tools presents new ways to deliver evidence-based educational materials. A more structured surgical training provides more optimal quality of surgical education. The most practical and useful model is computer-based simulation where selected skills are structured electronically based on educational components and levels.
Abstract Title: A Systematic Review of Endocrine Implications of Testosterone Given to Transgender Males

Authors: Olivia Lossia, MD Candidate; M. Ariel Cascio

Affiliation: Central Michigan University College of Medicine, Society and Community Medicine

Abstract Category: Quality Improvement / Population Health

The field of transgender medicine is an emerging one, but the population of transgender individuals is growing quickly. Female-to-male medical transitioning treatment comprises the use of the sex hormone, testosterone. The effects of testosterone have been studied extensively in males, but not in people assigned female at birth. Furthermore, there is very little research conducted in the female-to-male transitioning population and no databases for providers and scientists to consult. The goal of this review was to identify and outline all the research conducted on individuals undergoing testosterone therapy for the purpose of transitioning from female to male and its effects on various systems in the body. However, the conclusions of this study depict a field that continues to have juxtaposing results, evident in the varying, and, often times, opposing results seen in reproductive tissue, breast cancer risk, and cardiovascular health. This only strengthens the argument for further primary research in this field.
Abstract Title: Gender Differences in Burnout and Work Perceptions Among Residents and Attending Physicians

Authors: John Lowry

Affiliation: CMU College of Medicine, Office of Faculty Development

Abstract Category: Quality Improvement / Population Health

Background: Burnout is an occupational stress characterized by emotional exhaustion, depersonalization and feelings of decreased personal efficacy. Approximately 35 to 54 percent of physicians in the U.S. report burnout symptoms, and the rate of burnout for medical students and residents is between 45 and 60%. Rates of burnout among female physicians and residents are consistently higher than their male counterparts, yet there remains a paucity of information about the underlying factors associated with gender-related differences in physician burnout. Understanding those factors that contribute to physician burnout especially among women is important in order to design effective wellness programs, maximize physician productivity, increase career satisfaction and improve patient outcomes.  

Objective: We sought to assess gender differences in burnout rates and work perceptions among the physicians and residents at Central Michigan University.  

Methods: We administered the Mayo Clinic Well-Being Index (WBI) to the residents (n = 105) and attending physicians (n = 39) at CMU Health. The WBI contains seven questions about symptoms of burnout, and two work perception questions for attending physicians about how meaningful their work is and about work-life balance. It has strong validity and reliability for use among medical students and residents. A total of 144 physicians, 105 residents (49 females, 56 males) and 39 attending physicians (22 females, 17 males), completed the WBI. Response rate was 92% for residents and 68% for attending physicians. We analyzed the relationship between the WBI questions among all female residents and attending physicians (n = 71) and among all male residents and attending physicians (n = 75). Information on finding meaning in work and work-life balance came only from attending physicians.  

Results: All groups showed high rates of burnout. Female residents and attending physicians had consistently higher scores on the WBI than their male counterparts. Both male and female attending physicians were very likely to agree that their work is meaningful. Male attending physicians were less likely to agree that their work schedule left them enough time for personal/family life.  

Conclusions: Our results show high burnout rates among all physician groups. Grouping all female residents and attending physicians for assessment of burnout and related concerns may allow institutions to develop appropriate gender specific policies and wellness programming that can help reduce burnout. Perceptions of work life balance do not fully account for gender differences in physician burnout. Burnout symptoms may be present even when work is meaningful. Significance: It is necessary to learn more about factors that lead to consistently higher burnout scores in women compared to men for both residents and attending physicians. Assessing burnout among female residents and attending physicians as a group is helpful as female residents become future attending physicians and burnout can persist beyond residency into practice. By supporting organizational changes that mitigate burnout, health care systems can positively address the needs of women physicians to promote career advancement and leadership development. Institutions need to be committed to addressing the systemic and organizational factors beyond work life balance that may lead to burnout, especially for women physicians.
Telemedicine can consist of many different types of telecommunication including phone calls, video calls, digital applications, and more. It is becoming a new and innovative way of providing medical information and health care to patients that may be separated by a substantial amount of distance from their providers. In this systematic review, the use of telemedicine on patients already diagnosed with a psychiatric disorder was compared to receiving no telemedicine or just normal in-office visits to determine the effect of telemedicine on suicide ideation and/or behavior. Six articles were selected based on primary and secondary inclusion criteria and analyzed for this meta-analysis. Five articles contained sufficiently detailed outcome measures to use in the meta-analysis. One article of the six did not report means and standard deviations and thus their measures could not be used. Thus, a total of 18 measures across five studies were analyzed and four different forest plots were created. One plot looked at the positive measures, another looked at the negative measures, another looked at all 18 measures together, and the last looked at the measures weighted based on the corresponding study. Positive measures are those measures of which an increase in its value would cause a decrease in suicide ideation and/or behavior with an example being optimism. Negative measures are those measures that an increase in its value would cause an increase in suicide ideation and/or behavior with an example being hopelessness. Overall, the intervention of telemedicine had a small to moderate effect on the measures studied, indicating a small to moderate effect on the person’s suicide ideation and/or behaviors. Although all average effect sizes seemed to show that telemedicine positively helped the patient when compared to traditional psychotherapy or in-office visits, only one had a 95% confidence interval that showed significance. Telemedicine, delivered in a wide range of ways, appears to be a promising way to reduce suicidal ideation, although how this translates into reductions in self-harm and/or suicide attempts is unclear from this review alone.
Abstract Title: Effects of Estradiol on Glial Acidic Fibrillary Protein levels with varying degrees of exposure

Authors: Rabia Mahmood, MD candidate 2021; Sheba Mohankumar, PhD

Affiliation: Michigan State University, University of Georgia, Department of Pharmacology & Toxicology, Michigan State University Department of Veterinary Biosciences and Diagnostic Imaging, The University of Georgia

Abstract Category: Basic & Translational Science

Advisor: Sheba Mohankumar, PhD

Background: We have previously shown that exposing female Sprague Dawley rats to low levels of estradiol-17ß induces oxidative stress in specific nuclei of the hypothalamus leading to hyperprolactinemia and loss of estrous cyclicity. The source of the oxidative stress appears to be glial cells in these nuclei. When glial cells are activated, they release nitric oxide related free radicals that contribute to nitration of key proteins that are functionally important. They specifically inhibit enzymes that are important for synthesizing norepinephrine and dopamine that regulate reproductive function and prolactin secretion respectively.

Methods: To study this phenomenon, we implanted female Sprague Dawley rats with slow release estradiol pellets (capable of releasing 20ng/day for 90 days). At the end of the treatment period, the rats were sacrificed, their brains removed, frozen and sectioned. Specific hypothalamic nuclei were microdissected and analyzed for the expression of glial fibrillary acidic protein.

Results: Estradiol exposure increased the expression of this protein in the arcuate nucleus. We are currently investigating the underlying mechanisms using primary hypothalamic cell culture.

Conclusions: Exposure to low levels of estrogens for prolonged periods of time can initiate oxidative stress in the hypothalamus by modulating glial cells. Significance: While the use of estrogens during the short term are known to have beneficial effects on the bone, memory, and other functions, caution should be used while using estrogens over prolonged periods of time at low doses.
Introduction: Vaping-Associated Lung Injury (VALI) is a rapidly emerging and growing phenomenon which has led to significant respiratory complications, and even death. Here, we present an older female with moderate-to-severe acute respiratory distress syndrome (ARDS) from vaping. Case Presentation: A 53-year-old Caucasian Female, with a history of anxiety and hypertension, presented to the ICU with hypoxic respiratory failure with significant dependence on Bi-level positive airway pressure (BiPAP) ventilation and moderate-to-severe ARDS. She complained of sudden onset of dyspnea and productive cough, and also admitted to a history of vaping for the last two years. Lab work showed mild leukocytosis with no evidence of sepsis. CTA (Computed Tomography Angiography) of the Chest illustrated extensive bilateral upper and lower lobe ground glass lung opacities. Urine antigen testing for Streptococcus, Legionella, and Histoplasma were negative. Influenza PCR and HIV antigen antibodies were negative. Blood and sputum cultures were also negative. Initial management was begun with high-dose intravenous steroids and empiric antibiotic therapy for suspected community acquired pneumonia. Oxygenation had improved significantly. Thus, intubation was quickly averted, bronchoscopy was not performed, and antibiotics were discontinued. An oral prednisone taper and strict counseling on vaping cessation was provided. A repeat chest X-ray after three weeks showed complete resolution of the diffuse alveolar opacities. Discussion/Conclusion: When evaluating patients who are smokers, a high index of suspicion should be raised for Vaping-Associated Lung Injury. A comprehensive history, including a history of vaping, and physical examination can promote immediate management and aversion of life-threatening lung injury in patients.
Background/Purpose: Hormonal fluctuations during the menstrual cycle have been reported to affect athletic performance. Altering hormonal levels through contraceptives may impact performance in women. The aim of this study is to review the literature on the relationship between hormonal contraceptives and performance. Methods/Study Design: A literature search using Covidence software as the primary screening tool was performed with the inclusion criteria “hormonal contraceptives”, “performance” and “female athletes”. Exclusion criteria were articles in a non-English language, non-hormonal contraception/not distinguished and studies on the effect on bone. Quality assessment was done using the Cochrane Risk of Bias Comparison. Results and Discussion: The initial literature search resulted in 2070 articles that were screened by the software. After primary screening, two independent reviewers assessed the results and further screened the literature down to 84 articles which were included in this review. Several studies examining the relationship between hormonal contraceptives and aerobic endurance revealed no effect on VO2 max in athletes taking hormonal contraception. Studies exploring the relationship between contraceptive use and strength showed there was no difference between non-contraceptive users. Increases in strength were indirectly linked to hormonal contraception when combined with caffeine supplements. In terms of cognitive function, recent literature showed that memory and executive function were improved in athletes taking hormonal contraceptives. Some studies noticed that growth hormone and testosterone levels were altered in athletes taking hormonal contraceptives, but the effect on performance appeared negligible. Conclusions: Overall, hormonal contraceptives do not appear to have a direct effect on athletic performance in women athletes but may improve cognitive function. Some indirect effects of hormonal contraceptives may have implications in performance, but more research is needed in this area to examine the relationship. Significance: Clinicians counseling patients on the effects of hormonal contraception on performance should present the available information to enable female athletes to make an educated, individualized decision.
Abstract Title: Effect of Hormonal Contraceptives on Injury Risk in Female Athletes: A Systematic Review of the Literature

Authors: Nicholas Mangutz, MD Candidate; Lauren Porras

Affiliation: University of North Carolina, UNC Department of Orthopaedics

Abstract Category: Clinical

Advisor: Lauren Porras

Background/Purpose: Female athletes have a higher incidence of certain types of injuries compared to male athletes. Hormonal impact appears to play a role. This study aims to review the literature on the relationship between hormonal contraceptives and injury and if manipulating hormone levels impact injury risk.

Methods/Study Design: A search for articles examining the relationship between hormonal contraceptives and injury was done using Covidence. Inclusion criteria: “hormonal contraceptives”, “injury” and “female athletes”. Exclusion criteria: articles in a non-English language, non-hormonal contraception/not distinguished and studies on the effect on bone. Quality assessment was done using Cochrane Risk of Bias Comparison.

Results and Discussion: Of 2070 articles initially included, two independent reviewers screened the literature down to 31 articles that met inclusion criteria. There was evidence supporting OCPs protecting against ACL injuries in some groups. OCP users had decreased anterior tibial translation, likely secondary to decreased ACL laxity. Eliminating fluctuating estrogen levels during the menstrual cycle is a proposed mechanism as high levels were associated with increased ACL laxity and tear risk. Other studies reported no significant difference in ACL injury incidence between groups, and one reported increased ACL injury risk with OCP use. Evidence was split on OCP effects on general MSK injuries. Overall MSK injury incidence was reported as dependent on OCP status as OCP users had lower injury rates. Other studies showed no significant difference between the groups. OCP users were found to have decreased symptoms and symptom severity following a concussion, but time to recovery was not significantly different.

Conclusions: Despite some evidence on OCPs supporting attenuation of injury risk, most studies were of poor quality, observational, and retrospective. Using OCPs to control hormone levels may potentially stabilize ligamentous laxity; fluctuations that lead to times of increased injury risk may be eliminated. Female athletes may also lessen symptoms experienced following a concussion by taking OCPs. Significance: Overall, physicians should not currently recommend prophylactic oral contraceptives to decrease injury risk in athletes, as more high-quality prospective studies are needed to support this position.
Objective: To inform of a novel finding of L5 nerve root palsy in distal junctional failure after lumbosacral fusion. Summary of Background Data: Distal junctional failure is a rare complication after lumbosacral fusion with few reports that document this occurrence. The vast majority of cases occur as stress risers in osteoporotic bone in which fixation ends caudally in the sacrum, commonly presenting as increasing non-radiating low back and buttock pain. To our knowledge, L5 nerve root palsy manifesting as foot drop has not been described after sacral fracture following lumbosacral fusion. Results: Two patients treated with lumbosacral fusion for adult degenerative spondylolisthesis presented with foot drop postoperatively. Each patient was found to have sacral fracture at the caudal end of fixation with ventral subluxation resulting in L5 nerve root palsy. Both cases improved after nonoperative management for the first and revision fixation to the pelvis for the second. Conclusions: L5 nerve root palsy manifesting as foot drop after lumbosacral fusion should raise the surgeon’s concern for postoperative sacral fracture.
Current operative treatment options for chronic lateral ankle instability include anatomic repairs utilizing existing local tissue and nonanatomic reconstructions sacrificing the peroneus brevis tendon to mechanically stabilize the ankle. This has been successful for most patients with chronic lateral ankle instability; however, a subset of patients has had unsatisfactory outcomes. For those at risk of failure, anatomic reconstruction of the peroneal tendons using a semitendinosus allograft has lead to good long term stability and patient satisfaction. 60 y/o female with significant peroneus longus/brevis tendinosis and chronic ankle instability was previously treated conservatively with immobilization without improvement. Patient underwent initial surgery with peroneus brevis repair and tendon transfer. Patient had continuation of pain post surgical and subsequent MRI was obtained. MRI revealed a complete rupture of the peroneal tendons. The patient underwent intercalary allograft reconstruction utilizing semitendinosus cadaveric graft. The follow-up was 17 months. The postoperative VAS score had decreased. Postoperative eversion strength had improved. There was no subsequent numbness along the sural nerve distribution. There were no postoperative wound healing complications, infections, tendon reruptures, or reoperations. No allograft associated complications were encountered. The patient returned to their preinjury activity levels.
Poster Presentation #67

Zenobia Ofori-Dankwa, Resident

Abstract Title: Leptomeningeal carcinomatosis: The Great Headache of an Imitator

Authors: Zenobia Ofori-Dankwa; Gregory Sutton, MD

Affiliation: Covenant Hospital, OB/GYN

Abstract Category: Case Reports

Advisor: Gregory Sutton, MD

Introduction: Headache is the most common initial symptom of leptomeningeal carcinomatosis (LC). However, headache is also a common symptom of many other illnesses. Therefore, a high index of suspicion is required for diagnosis of LC. This is the case of a patient who presented to the emergency department with a chief complaint of headache, and was found to have leptomeningeal metastasis of her primary ovarian cancer.

Case Presentation: A 58-year old female with past medical history of stage IV clear cell ovarian cancer status post chemotherapy, total abdominal hysterectomy with bilateral salpingo-oophorectomy, and negative 4-month PET scan presented to the emergency department for new-onset headache, neck stiffness, chills, and malaise. Based on her symptoms, Tmax of 39.2°C, and physical exam findings positive for neck stiffness, she was started on vancomycin, zosyn, and rocephin for suspected bacterial meningitis. As part of her workup, a lumbar puncture was performed, but was negative for infection. In addition, CSF PCR for meningitis/encephalitis was negative. At this point, antibiotics were discontinued and malignancy-related meningitis was suspected. Her CSF revealed elevated protein, low glucose, and malignant cells, which confirmed the diagnosis. However, MRI of the brain/spine showed no evidence of neoplastic lesions. Due to the lack of a target lesion, radiotherapy and intrathecal chemotherapy were not recommended.

Discussion: The main tools for diagnosing LC are neuroimaging studies and CSF analysis. MRI demonstrates enhancing lesions in 70-80% of cases. However, CSF analysis is considered the gold standard as it is more specific than brain MRI due to the low false-positive rate of malignant cytology in the CSF. LC is a rare complication seen in 1-5% of patients with solid tumors. Although headache is the most common clinical manifestation, other symptoms include nausea and vomiting, leg weakness, cerebellar dysfunction, altered mental status, diplopia, and facial weakness. Based on the vague symptoms attributable to other diseases, diagnosis requires a high index of suspicion, particularly if patients have a history of malignancy.
Abstract Title: Emergency Medicine Resident Exposure to Critical Procedures May Differ Based on Presence of Subspecialist Residencies

Authors: Andrew Ostosh; Kathleen Cowling

Affiliation: Saginaw, MI, Emergency Medicine

Abstract Category: Medical Education

Advisor: Kathleen Cowling

Emergency Medicine (EM) resident exposure to critical procedures may differ based on presence of subspecialist residencies. The primary objective is to assess the impact of subspecialty training programs on incidence of select procedure performance by EM residents. This survey study included 10 questions distributed by the CORD Program Director List-Serv after IRB approval (Figure 1) from September 9-19th, 2019. Questions included training site demographics, procedural completion, and presence of subspecialty programs. Procedures were paired with corresponding subspecialty (i.e. ENT and Peritonsillar Abscess [PTA] drainage). Groups were compared with chi squared analysis. Incomplete surveys were not included in the final data set. 52 surveys were completed. Presence of an Ultrasound Fellowship increased the likelihood that EM residents performed Serratus Anterior Plane (SAP) blocks from 19% to 75% (Table 1; p <0.005). Fracture reduction was less likely to be performed by EM residents in the presence of an orthopedic residency (89% vs 100%), however this was not statistically significant (p 0.165). PTA drainage, Dialysis Catheter insertion and Thoracentesis were more likely to be performed by EM residents if their corresponding program was present, however these did not reach statistical significance. This pilot study identified variations in EM resident procedure performance based on presence of subspecialty training programs. Presence of an ultrasound fellowship increased EM resident performance of SAP blocks. Although not statistically significant, PTA drainage, dialysis catheter insertion and thoracentesis were more likely to be performed by EM residents if their corresponding subspecialty program was present. There was a decreased rate of EM performed reductions in the presence of an orthopedic residency. Sample size limits impact of the study. Further studies may assess the reason for these varying discrepancies.
Abstract Title: Veress Needle Insertion Simulation Model: A Simple New Module Development for Advanced Surgical Skill Training

Authors: Raghuram Palepu; Faiz Tuma, MD, MEd, EdS, FACS, FRCSC

Affiliation: CMU College of Medicine, Department of Surgery

Abstract Category: Medical Education

Advisor: Faiz Tuma, MD, MEd, EdS, FACS, FRCSC

Introduction Training on advanced surgical skills continues to be a challenge to trainees, instructors, and their training programs. The challenges involve multiple levels of difficulties including mentor availability and training opportunities (Kavic, 2011). Simulation and educational technology offer alternative training opportunities outside the operative room and without putting patients at risk. With simulation, educators can create various learning experiences that are tailored to their educational needs (Frezzo, 2017). Certain surgical skills like Verees needle insertion during laparoscopic surgeries are not amenable to train on outside the operative room. The skill involves the tactile sensation of the trainee to gage the appropriate pressure to apply and the tactile feedback for the insertion to be successful. Such pressure adjustment and tactile feedback that are required for successful and safe insertion of the Verees needle cannot be provided without a specifically designed simulation model. Alternatively, trainees have to learn this skill practicing on patients. In this study, we designed and constructed a simple simulation model that train the residents on safely and competently inserting the Verees needle before they apply it on patients in real practice.

Methods and results Simulation models for surgical training were reviewed. Cochran, EMBASE and PubMed search was conducted to review the literature for advanced surgical skills and Verees needle insertion simulation availability and recommendation. No practical model or proposal was available to provide training on such important skill. The principles of surgical education in simulation were used. The steps and details of Verees needle safe insertion were critically analyzed, summarized and reconstructed in sections. To simulate the steps and layers of the abdominal wall that the Verees needle penetrates during insertion, a heterogenous multi-layer structure of abdominal wall was constructed in three main relative thick layers and a very soft thin layer in between in addition to the overlying skin. The simulated abdominal wall structure is placed on a small empty box with an empty space underneath to simulate the abdominal cavity space. The trainee makes a small incision through the outer layer (simulated skin) then uses a disposable Verees needle to go through the different layers of the structured “abdominal wall” while practicing adjusting the penetration pressure and experiencing the tactile feedback.

Conclusions Training on advanced and specific surgical skills needs special attention. Simulation can be used optimally to facilitate training on specific task requiring tactile feedback. Simple specially designed simulation models can provide safer surgical practice by minimizing the need to train on patients. Simulation can be used creatively to facilitate and enhance surgical training.
Introduction Auto-Brewery Syndrome is a rare condition caused by endogenous fermentation in the GI system which causes patients to become intoxicated with an elevated blood alcohol level in the setting of no exogenous alcohol consumption. Case Presentation A 31 year old female presented to Emergency Department (ED) for episodes of altered mental status that occurred after eating and included “glazed-over look”, delayed reaction time, stumbling, and appearing “intoxicated.” Patient denied any alcohol consumption prior to these episodes and including the 24 hours prior to arrival in the ED. Patient was otherwise healthy without significant medical or surgical history and did not take any medications. No history of seizures. She denied tobacco or drug use. The work-up in ED included CT Head, Urinalysis, Urine Drug Screen, Complete Blood Count, Complete Metabolic Panel, Blood Alcohol Level (BAL), Pregnancy Test. All labs were unremarkable, except BAL was elevated at 0.161. Auto Brewery Syndrome was suspected. She endorsed recently increasing her carbohydrate intake which has been known to correlate with increased symptoms. Patient also denied being a “home brewer” or “home baker”. Patient was admitted to hospital overnight to confirm no alcohol intake. The next day she ate lunch after which, her BAL was checked again and was elevated at 0.040. This confirmed the diagnosis of Auto Brewery Syndrome. Patient was discharged to home to follow-up with her PCP. Discussion/Conclusion Originally described in 1970s, Auto Brewery Syndrome (ABS) is a rare disorder that can be difficult to diagnose and often has a significant impact on the patient’s life. Though rare it should be on the differential for patients presenting with post prandial altered mental status. Patients will often present with symptoms of intoxication including mental status change, mood changes, loss of coordination, disorientation, nausea, dizziness, or fatigue. Work-up of these patients includes ruling out intracranial processes such as stroke, seizure, lesions or bleed. In addition to a CT Head patient should have labs checked for anemia, electrolyte disturbances, include a drug screen, rule out pregnancy, and check blood alcohol level. A thorough history and physical, as well as close observation are necessary to help tease out secret drinking/drug use and psych diagnoses. Official diagnosis requires the patient be abstinent from alcohol and then receive carbohydrate load followed by interval blood alcohol level testing. If the blood alcohol level is elevated after carbohydrate load ABS is confirmed. Possible risk factors for developing this syndrome include previous abdominal surgeries, structural GI abnormalities, and recent antibiotic use. Treatment often starts with dietary changes and/or probiotics. Yeast is most commonly identified as the offending pathogen. Saccaromyces cerevisiae, a common brewing yeast, has been found to be a common culprit for this condition. Patient may need to receive anti-fungal or antibiotic treatment if initial interventions fail to clear the GI system of the microbe causing the endogenous fermentation. Stool cultures and GI consultation should be considered. It is important to diagnosis ABS as it can often have serious health, safety, social and legal consequences.
Background: In 2017, 67.8% of drug overdose deaths involved opioids and synthetic opioids and the opioid crisis was declared a national public health emergency. There was a substantial amount of opioid prescribing with very little monitoring in mid-Michigan in 2016 based on a prior chart review which served as the baseline dataset for this study. Medication-Assisted Treatment (MAT) has shown promising outcomes including decreased cravings and reduction in opioid abuse. Objective: This retrospective chart review explores opioid vs. non-opioid therapy for musculoskeletal conditions in outpatient settings in the Mid-Michigan region ascertaining whether recent legislative changes in opioid prescribing including revised prescribing guidelines have impacted prescribing of opioids and other related medications. Methods: Data was collected from 500 randomly selected charts that were coded for musculoskeletal conditions and opioid-related disorders from January to June 2019. Primary outcomes of interest included use of opioid, non-opioid, or alternative interventions for musculoskeletal conditions and if urine drug screens (UDS), Michigan Automated Prescription Services (MAPS), and pain agreements were monitored. Primary outcomes were compared to data from a 2016 pilot study. Another outcome of interest is whether patients with opioid use disorder were offered MAT. The relationship of social determinants of health (SDOH) with these outcomes were examined. Statistical analysis involved descriptive statistics, testing for difference in means and proportions, and multivariable logistics regression. Results: The ICD-10 search for musculoskeletal conditions resulted in over 32,500 patient records over the 6-month time frame from January 1, 2019 to June 30, 2019, of which 450 were randomly selected. The ICD-10 search for opioid use disorders within the same time frame resulted in 436 medical records, of which 50 (10% of the total roster) were randomly selected to assess whether MAT was prescribed. Of the 500 charts, 31.3% involved a new or current opioid prescription. Among those with an opioid prescription, 60.3% had documented pain agreements, 76.3% had MAPS checked, and 40.4% had UDS. State-sponsored insurance and current and former smokers correlated with opioid prescription. Opioid prescriptions significantly decreased in 2019 (31.3%) compared to 2016 (65.7%) (p=0.001) while pain agreements, MAPS and UDS monitoring all increased (p=0.001, p=0.001, and p=0.08), respectively. However, prescribing of MAT was alarmingly low at 31.7% (p=0.07). Conclusions: The decrease in opioid prescribing and rise in opioid prescription monitoring are likely due to the new Opioid Prescribing Laws and updated prescribing guidelines. On the contrary, MAT prescribing was low in 2019 and does not reflect the declining trend of opioid prescriptions during a public health epidemic. Significance: Comparison of data from 2016 and 2019 may provide insight on the effects of new policies and modified clinical recommendations. Studying the relationship of opioid and MAT prescribing trends with SDOH may also demonstrate whether new initiatives have a proportionate impact on various sociodemographic groups. Additionally, this data reinforces the need for greater access to an evidence-based treatment using MAT to help curtail opioid dependency or abuse when there is a drastic decline in the treatment of chronic musculoskeletal pain using opioids in this 3-year timeframe.
Abstract Title: A Systematic Review: Cesarean Delivery Rates of Incarcerated Persons in the United States

Authors: Sanjay Das, BS; Morsi Rayyan, MS; Beth Bailey, PhD

Affiliation: Central Michigan University, College of Medicine

Abstract Category: Quality Improvement / Population Health

Advisor: Beth Bailey, PhD

Introduction: Though Cesarean delivery rate is tracked by the Joint Commission and the Agency for Healthcare Research and Quality as an important measure of a hospital's healthcare quality, rates of Cesarean delivery among incarcerated persons in the United State is sparsely reported with widely varying results. However, recent studies have quantitatively presented Cesarean delivery rates among incarcerated persons in the US, affording the opportunity to review the literature to date and reexamine this underreported metric in the context of efforts to improve perinatal care both in and out of the prison system. Methods: We used PubMed and CINAHL to search for research articles published since 1990. In limiting our scope to Cesarean outcomes in the US, the eligibility criteria are as follows: 1) the study includes prison births solely in US prisons OR the study has stratified data such that extrapolating their US cohort is possible, 2) the study includes, at a minimum, the following birth outcomes: Vaginal Births, and Cesarean Births. Results: Our search yielded 674 unique articles. 5 studies met the eligibility criteria; 1 of these was a systematic review in which an additional 3 studies met eligibility criteria. Amongst 726 births, 165 of these (23%) were via Cesarean section. One study did not report live birth numbers, but the Cesarean births among each of the state prisons included were 52% and 40%. Conclusion: With few studies detailing Cesarean birth outcomes in prison populations, additional research is necessary to better understand how Cesarean birth outcomes in prisons compare with the general US population, possibly leading to the development interventions to reduce cesarean section rate, assuming cesarean rates in prison are significantly higher to the general population.
Failure of respiratory pattern switching as the cause for sudden death in neonatal rats following transient asphyxia

Authors: Harold Bell, PhD; Nicholas Rochester, MD Candidate

Affiliation: Central Michigan University, Central Michigan University College of Medicine

Abstract Category: Basic & Translational Science

Background SIDS (sudden infant death syndrome) is the leading cause of death in infants under the age of twelve months, and is believed to result in part from failure of respiratory autoresuscitation. Autoresuscitation enables the body to tolerate exposures to transient bouts of asphyxia, and restore normal rhythmic breathing by transitioning between different modes of breathing known as respiratory arrest, gasping breathing and eupnea. There is currently no animal model which reliably replicates the condition, making SIDS research slow-to-progress. Our lab has shown that the injectable anesthetic urethane prevents normal autoresuscitation in adult rats, and creates a reliable animal model of sudden death in response to a single bout of acute severe hypoxemia (Krause et al., 2016). We recently sought to replicate this model of sudden death in a small number of P10-14 neonatal rats, and determine whether urethane also creates an anesthetic model of sudden death in the neonatal period, proving relevant to SIDS. However, we found that while some neonates showed a similar phenotype as observed in adult animals, others were immune to these effects of urethane and were able to mount a robust resuscitation response to transient asphyxia. We hypothesized that there may be a developmental (age-dependent) changes occurring in the neonatal period, with animals more progressively susceptible to sudden death as they approach the age of weaning. Methods Neonatal Sprague-Dawley rats (male and female) were studied across the 4 developmental windows: P10-P12, P13-P15, P16-P18, and P19-30. Animals were anesthetized with urethane (1.5 mg/kg ip) and studied for their ability to tolerate and recover from transient asphyxia (100% inspired N2). Results Transient asphyxia caused respiratory arrest in all animals studied. Table 1 shows there is an inverse relationship between age and likelihood of successful autoresuscitation. While 80% of animals aged 10 to 12 days autoresuscitated, by the age of 16 to 18 days not a single animal survived transient asphyxia. Moreover, gasping breaths were generated in 95% of animals aged 10-12 days, but gasping was unlikely in animals 16 days or older. Age (d) n R (%) NR + (%) NR – (%) P10-12 20 80 15 5 P13-15 13 46 7.7 46.3 P16-18 10 0 20 80 P19-30 9 0 33 67 Table 1. Age-related changes in the success of respiratory autoresuscitation in urethane anesthetized neonatal rats. n = sample size; R = successful resuscitation; NR+ = animal died, but gasped; NR- = animal died, and no gasps were generated. Conclusion We conclude that urethane anesthesia creates a model of sudden death in response to transient asphyxia that is age-dependent in the neonatal period. Urethane causes neonates to become increasingly susceptible to sudden death, and by P16 sudden death is the inevitable outcome of transient asphyxia. Significance Further characterization of this model may allow us to develop a mechanistic understanding of the cellular, synaptic, and network properties of the respiratory rhythm generator to predispose infants to SIDS and therefore develop approaches to identifying infants at risk.
Electronic delivery of nicotine, or "vaping," has a growing evidence base of potential harm through both exposure and withdrawal effects. The current report presents the case of a young man with no psychiatric history but prior hospitalizations for diabetic ketoacidosis who experienced a cluster of symptoms, including nausea, vomiting, and acute psychosis with hallucinations, in the context of quitting his vape pen "cold turkey," by abruptly discontinuing use without a nicotine replacement. During his hospitalization, his symptoms continued until beginning a nicotine replacement patch. A few months later, he had another admission to the hospital for a similar cluster of symptoms, however this time without psychosis, and notably in the context of resuming and continuing use of electronic cigarette. This is the first case reported of acute psychosis related to abrupt vaping withdrawal and adds to the plethora of information regarding risks associated with electronic cigarette use.
Epigenetics – the modification of gene and genome products without alteration of the base sequence – is a field of growing importance in the field of psychiatry. While many biochemical processes can achieve these regulatory modifications, the most commonly discussed mechanisms involve: methylation of gene promoter regions and histones, acetylation or deacetylation of histones, and function of microRNA. In psychiatry, such epigenetic effects have been found to impact gene repression or expression relevant for understanding the relationship between environmental factors, including trauma and chronic stress, and lasting pathophysiological, clinical mental health, and cognitive outcomes. The purpose of the current review is to provide an overview of relevant epigenetic mechanisms within the realm of psychiatry. Examples of clinical application are taken from research on the epigenetic modulation of brain derived neurotrophic factor (BDNF) and downstream associations with neurobiological measures, including brain connectivity, and significant disease manifestations, including suicidality. Additional information related to pharmacoepigenetics – the role of epigenetics in medication response – is also presented. The review highlights auspicious applications of epigenetics to psychiatry, with respect to treatment and prevention, while demonstrating the appropriate caution necessary in making these interpretations and clinical applications.
Adverse Childhood Experiences (ACEs) continue to be under-addressed in our clinics, in part due to limited integration of material on ACEs into the medical school curriculum. Despite the significant impact that ACEs have been shown to have on long term physical and mental health outcomes, the topic’s relevance is not proportionately reflected on the United States Medical Licensing Exam (USMLE) or Comprehensive Osteopathic Medical Licensing Examination (COMLEX), and therefore typically not chosen to be emphasized in medical school curricula. This study aims to add evidence to the discrepancy between perceived importance of the topic and emphasis in medical curriculum. The current study uses a sample of third year medical students from Central Michigan University College of Medicine who were provided information on ACEs in a didactic session during their psychiatry clerkship training. Participants completed surveys including questions regarding their perception of the importance of the topic as well as how important they perceive the topic with respect to studying for the USMLE. Results demonstrated that students felt having an understanding of ACEs in studying for the USMLE Step 1 was significantly less important than having an understanding of ACEs in practice across multiple clinical settings. Furthermore, students rated a high level of importance in being exposed to ACEs in their preclinical education despite its lack of importance for the USMLE Step 1. Results from this study further highlight the importance of ACEs and may encourage national medical examining bodies to adopt the topic into exams, and/or medical schools to more widely adopt ACEs into clinical education programs.
Clinicians, parents, and patients seeking treatment for attention-deficit / hyperactivity disorder (ADHD) most frequently consider pharmaceutical treatments – including stimulants and alpha-agonists – with interventions targeting behavior, including child behavioral treatment and parent education groups. Other modalities, such as neurofeedback, have demonstrated less consistent or robust benefits. One such treatment that has been frequently evaluated through pilot studies and randomized control trials is cognitive training, a process-specific paradigm which targets various aspects of cognition, such as attention and/or working memory. The treatment option has come in several different forms and presentations, typically as a video game, varying in: cognitive domains targeted, frequency and duration of modules, availability of a coach to review progress, and other variables. Despite these efforts to enhance the delivery interface of this treatment, there is no current consensus in the literature whether cognitive training is a beneficial treatment for children and adolescents with ADHD. The current study is part of a larger systematic review that consolidates all available studies on the effectiveness of cognitive training in childhood ADHD. Appropriate databases were searched with results screened for potential inclusion in the systematic review using relevant inclusion and exclusion criteria. The studies selected for review are compared based on quality of evidence, with most pertinent findings summarized here. Considering the wide availability of screens and digital media – from computers and laptops to tablets and smartphones – the potential for providing a treatment for children and adolescents with ADHD that takes advantage of this cultural phenomenon is attractive and exciting; however, despite the number of studies published, there remains a lack of consensus on the degree of effectiveness of such computerized cognitive training programs.
Abstract Title: Identifying Maximal Reactive Astrocyte Proliferation Post Stroke To Set Time Frame for Endogenous Brain Repair

Authors: Harrison Schurr; Julien Rossignol

Affiliation: Central Michigan University College of Medicine, Biochemistry and Neuroscience

Abstract Category: Basic & Translational Science

Advisor: Julien Rossignol

Background: Stroke is a leading cause of disability among adults in the United States; yet, effective restorative therapies are lacking. Currently, an approach focused on transforming endogenous reactive astrocytes into functional neurons using PAMAM dendrimer delivered transcription factors such as hSOX2 is being investigated. For such a therapy to have the greatest effect the dendrimers must be administered when there is maximal reactive astrocyte proliferation. Objective: The objective of this study was to determine the time of maximal reactive astrocyte proliferation post ischemic stroke in order to optimize the delivery of PAMAM dendrimers. Methods: This was done by surgically inducing a 90-minute ischemic stroke via intraluminal middle cerebral artery occlusion in rats. The rats were systematically euthanized at either one, two, four, or seven days after the stroke was induced. Once euthanized, the brains were extracted, sliced, stained, and mounted. A hematoxylin and eosin stain was used to confirm the presence of a stroke while a glial fibrillary acidic protein (GFAP) stain was performed to characterize reactive astrocyte proliferation. Conclusion: By comparing the GFAP stain of the different euthanasia time points, it was possible to determine the temporal profile of astrocyte accumulation. It was found that peak astrocyte proliferation occurred at four days post stroke. Significance: This knowledge will greatly increase the efficiency of any therapy looking to take advantage of endogenous reactive astrocytes post ischemic stroke.
Introducing Ventricular non-compaction (VNC) is a rare cause of cardiomyopathy, which can be either acquired or a congenital structural abnormality characterized by trabeculations and trabecular recesses, hypothesized as a failure in the final phase of cardiac development.

Case: We present a case of a 31-year-old male with a history of cocaine use disorder and HIV infection on antiretroviral therapy who presents with syncope due to VNC. The patient relates that he had several episodes of syncope and near syncope in the last 10 years. There is no sudden cardiac death in family or previous history of any cardiac disease. On presentation he has blood pressure of 113/60, and heart rate of 101. Laboratory investigation showed hemoglobin of 14.2 and normal serum electrolytes. Electrocardiogram revealed normal sinus rhythm, echocardiogram showed ejection fraction of 50% with prominent trabeculations in left and right ventricle, suggestive of non-compaction cardiomyopathy. Cardiac stress test was negative for ischemia. We pursued further evaluation with cardiac MRI. Management of symptomatic VNC follows the general rule of management of cardiomyopathy including anticoagulation, antiarrhythmics and ICD implantation for prevention of sudden cardiac death (SCD).

Conclusion: VNC can range from asymptomatic to heart failure, thromboembolism, or ventricular arrhythmias including SCD. There are no gold standard criteria for diagnosis; echocardiography often misses involvement of the right ventricle, hence cardiac MRI, contrast ventriculography and computed tomography should be used. Isolated cases of syncope were reported with VNC in literature, but as this case report demonstrates VNC needs to be considered as an etiology for syncope needing further evaluation and treatment.
Certain lifestyle factors are associated with the development of clinical conditions that can potentially lead to death. Ischemic heart disease (IHD) is highly correlated with lifestyle and health behavior where the lifetime risk of developing IHD in the presence of two or more major risk factors is 37.5% for men and 18.3% for women. The objective of this study is to, (i) examine the risk factors that contribute to mortality in IHD as outlined by the Global Burden of Disease study, and, (ii) based on this analysis, develop a prototype software applet for easy navigation of the attributable risk provided the risk factors by age group. Data was provided by the Institute for Health Metrics and Evaluation (IHME) between the years 1990 and 2017 for age groups between 25-79 years. Seventeen risk factors (including high BMI, high HDL, tobacco use, etc.) were analyzed. After data extraction, conditional probabilities were used to estimate the likelihood of death from IHD given certain risk factors for various age groups. Attributable mortality risk metrics were calculated. The research outcomes include detailed reports and graphs of the contribution rate of each individual risk factor to mortality in IHD and a working prototype applet intended as a tool for primary care physicians or public health stakeholders. These study results can aid primary care physicians in reviewing attributable factors and considering preventative measures to improve patient safety and overall quality of life for IHD patients.
Abstract Title: Neonatal Outcomes in Prenatal Opioid Use: A methodological description of a multicenter investigation of the impact of choice and timing of opioid maintenance therapy on neonatal outcomes

Authors: Gregory Goshgarian, MSc, MPH; Robert Simons; Neli Ragina

Affiliation: Central Michigan University College of Medicine, Central Michigan University College of Medicine

Abstract Category: Quality Improvement / Population Health

Background: With opioid misuse on the rise in the United States, the maternal use of opioids during pregnancy has consequential effects on the fetus and neonate has become a growing concern. The NIH’s NIDA unit has shown that from 2004-2014 there has been a five-fold increase in neonatal opioid withdrawal syndrome (NOWS), with 32,000 infants born with the syndrome. NOWS is characterized by seizures, respiratory symptoms, and feeding difficulties. Additionally, opioid abuse or dependence during pregnancy has been associated with an increased risk of oligohydramnios, intrauterine growth restriction, premature birth, and stillbirth. Medication-assisted treatment (MAT) is used to treat opioid use disorder, and involves administration of long-acting opioid agonists/antagonists, such as methadone, buprenorphine, and naltrexone. Suboxone and Methadone are both commonly used as maintenance therapies for opioid use disorder. However, little is known about the differences in effects of Suboxone and Methadone, specifically, used as MAT in pregnancy on neonatal outcomes. Therefore, we will examine the neonatal outcomes in infants born to mothers with opioid use disorder and on Suboxone or Methadone at three medical centers in Central and Southeast Michigan, and compare outcomes between these study groups. Methods: There will be no procedures done on human subjects. We will perform a retrospective chart review of three Michigan medical centers medical records (Covenant HealthCare Saginaw, Henry Ford Health System, University of Michigan Ann Arbor Medical Center) to find women treated with Methadone versus Suboxone for opioid use disorder. Subjects will be identified using ICD9 (648.33, 304.00) and ICD 10 (099.320F11.20) codes for pregnancy, opioid addiction, maintenance therapy, and then cross-referenced with the neonate outcomes of APGAR score, incidence of NOWS and Finnegan score, intrauterine growth restriction, premature birth, and oligohydramnios. Only women, aged 18+, with diagnosed opioid use disorder in pregnancy receiving Methadone or Suboxone maintenance treatment will be considered for inclusion in the study. We will cross reference the charts to neonates born to each subject to assess neonatal outcomes of APGAR score, incidence of NOWS and Finnegan scores, intrauterine growth restriction, premature birth, and oligohydramnios. We will perform a multivariate analysis to determine if there is any significant difference in neonatal outcomes between women treated with Suboxone versus Methadone. In addition, number needed to treat and number need to harm calculations for the variables will be calculated for the outcome variables. Study Goal: The goal of our project is to determine if there are any differences in neonatal outcomes between women treated with Suboxone, versus women treated with Methadone during pregnancy as MAT of opioid use disorder. As a multi-center investigation involving large and medium sized, rural and urban medical centers we are creating a database of information to understand how MAT, specifically Suboxone and Methadone, affect neonates in the state of Michigan. Determining the neonatal outcomes between these two groups will help to establish a risk profile for MAT in pregnancy, and help guide physicians in choosing the proper treatment modality for opioid use disorder in pregnancy.
Introduction Aortic valve stenosis (AS) is the most common degenerative valvular heart disease, defined by aortic valve area, mean gradient (MG) and aortic valve jet flow peak velocity. There are subcategories of AS that do not fit the classic picture, where MG < 40 mmHg with AV area < 1 cm². This includes classical low-flow low-gradient aortic stenosis (CLFLG AS) with depressed ejection fraction (EF) < 50% and (2) paradoxical low-flow low-gradient AS (PLFLG AS) with preserved EF > 50%. Symptomatic AS typically presents with a triad of syncope, angina and dyspnea. Sometimes transudative pleural effusions can also occur with increased hydrostatic pressure in left heart failure secondary to severe aortic stenosis. We are presenting an isolated case of an 80-year-old female with no significant lung disease who presented with a large left-sided pleural effusion secondary to CLFLG AS. Case report An 80-year-old elderly female with multiple comorbidities presented with worsening shortness of breath and sharp left-sided chest pain. Additionally, she has a three-month history of recurrent left-sided pleural effusions requiring therapeutic thoracenteses. On physical examination, she was hypoxic with diminished breath sounds on left basilar area and bibasilar crackles and grade 4/6 systolic ejection murmur radiating at the right upper sternal border radiating to the carotid arteries. A chest x-ray is performed and revealed large left-sided pleural effusion with minimal right-sided effusion and bilateral pulmonary congestion. CT angiography of the thorax revealed significantly decreased left pleural effusion following thoracentesis with residual left hydropneumothorax on left side, minimal effusion on right side. Laboratory results revealed an elevated B-type natriuretic peptide (1296) and elevated BUN-to-creatinine ratio (31/1.8), but no leukocytosis, no coagulopathies, no hypoalbuminemia and normal platelet count. Thoracentesis was performed and consistent with transudative pleural effusion with a pleural fluid protein-to-serum protein ratio of 0.2 and pleural fluid-to-serum LDH ratio of 0.5, and pleural fluid LDH of 159. Pleural fluid gram stain and cultures were negative. Pathology reports on two separate occasions revealed no malignant cells. A two-dimensional echocardiogram revealed an EF of 45-50%, AV area of 0.61 cm², indexed AV area of 0.33 cm², MG of 25 mmHg, AV velocity of 3.2 m/sec. Conclusions Her clinical presentation and echocardiogram findings were concerning for CLFLG-AS resulting recurrent effusion. Low-dose dobutamine stress echocardiography (DSE) is the next best step to confirm the diagnosis. Additional components to assist with risk stratification includes AV calcium scoring by cardiac CT to identify severe AS where DSE is contraindicated or inaccurate (i.e. patients with left bundle branch block, atrial fibrillation, or concomitant ≥ moderate mitral regurgitation). According to The Society of Thoracic Surgeons (STS) criteria, first-line recommended treatment of moderate to severe AS is transcatheter aortic valve replacement (TAVR). Our patient’s hospital stay was complicated by worsening kidney function, respiratory decline and hemodynamic compromise, resulting in an extensive ICU course requiring hemodialysis, BIPAP and vasopressors, respectively. Her recurrent effusion which ideally should have been treated by intervention for aortic stenosis which was not feasible for our patient.
Background: Neurocysticercosis (NCC) is an infection of the central nervous system (CNS) and meninges by the tapeworm Taenia Solium. Radiographic manifestations of NCC can vary and mimic other disease processes. The similarity in clinical and radiographic manifestations of calcified cerebral aneurysms and NCC may lead to difficulty in distinguishing the two disease processes. Case Description: We present a 60 y/o woman diagnosed initially with neurocysticercosis who was ultimately determined to have an aneurysm of the middle cerebral artery (MCA) with associated middle meningeal artery (MMA) to MCA fistula. The patient was successfully treated with a craniotomy for ligation/resection of the aneurysm and fistula. Pathology results did not demonstrate any evidence of NCC. Conclusion: This is the first instance of an intracranial aneurysm and arterial-arterial fistula mimicking neurocysticercosis. We discuss the differential diagnosis and workup of a peripheral calcified lesion suggestive of NCC. It is important in those suspected to have NCC to keep a broad differential and employ alternative imaging modalities such as angiography as appropriate. To the best of our knowledge this is the first published instance of both a MMA-MCA fistula with an associated distal MCA aneurysm fistula mimicking neurocysticercosis.
Introduction: The American Society of Breast Surgeons (ASBrS) recommends that all patients with a personal history of breast cancer, those tested prior to 2015, and anyone without a history of cancer who meet NCCN guidelines should be offered whole genome sequencing panel testing. Due to this greatly expanded criteria it is important that breast surgeons, genetic counselors, and other medical professionals knowledgeable in genetic testing be able to provide education and offer genetic testing.

Case Presentation: Patient 1 is a 39 year old female with no family history of cancer who presented with breast pain and a palpable breast mass. She was found extensive invasive ductal carcinoma with metastases to the axillary lymph nodes. Patient 2 is a 53 year old female whose mother had ovarian cancer. She presented with a palpable mass in her right breast and was found to have invasive ductal carcinoma. Patient 3 is a 76 year old male who underwent left mastectomy for breast cancer in 2014 and is of Eastern European descent. His genetic testing was delayed by 5 years after his initial diagnosis due to lack of availability of genetic testing locally and unfamiliarity by his treating providers. Patient 4 is a 42 year old female diagnosed with triple-positive breast cancer whose mother, maternal grandmother, and maternal aunt also had breast cancer. All four patients met criteria from genetic testing based on both NCCN guidelines and the new expanded recommendations by the ASBrS. The closest access these patients had to a genetic counselor is greater than 100 miles. These four patients all tested positive for genetic mutations: Patient 1 with CHEK2, Patient 2 with RAD51, Patient 3 with BRCA2, and Patient 4 with BRCA2. The genetic mutations altered each patient’s ongoing medical care, surgical choices, and will have implications for their first degree relatives.

Discussion: Breast cancer is the most common malignancy in women and the second most common cause of mortality due to malignancy among women in the United States. According to the American Cancer Society, 5-10% of breast cancer cases are hereditary. Currently, there have been 21 genes identified which lead to hereditary breast and ovarian cancer syndromes. The NCCN guidelines for hereditary breast and ovarian cancer syndromes currently recommends testing for a select group of patients with a personal history of breast cancer, a family history of breast, ovarian, pancreatic, and metastatic prostate cancer, as well as Ashkenazi Jewish Heritage. Based on recent data, we know that these selective criteria miss a large amount of genetic mutations. The recommendation by the ASBrS to expand testing criteria will result in genetic findings in breast cancer patients that would be otherwise undetected by NCCN Guidelines criteria alone, which impacts medical decision-making. Therefore, medical education should include genetic counseling training to incoming and existing healthcare professionals to improve access to breast cancer patients in underserved areas. This will allow genetic testing to be used as an effective prevention strategy in families that carry deleterious mutations before a cancer diagnosis is made.
Background: Students at CMU College of Medicine complete a 24-week longitudinal integrated clerkship CCC with focus on ambulatory Family Medicine, Pediatrics and Women's Health in Year 3. Half of students are assigned to CCC during fall semester and the other half complete their CCC in the spring. Using a competency-based analytic rubric which includes 17 Likert-scale questions, preceptors evaluate students’ performance and provide feedback at Week 8, 16, and 24. Current literature demonstrates the complexity of clinical performance assessment (e.g., validity evidence of assessment tools, bias and rater behaviors, and the nature of narrative feedback), and few studies examined progression of student performance based on preceptors’ ratings repeated at different timings that hinged on endorsements for students’ progression. Little is known about the trajectory of medical students’ growth in real clinical settings and how the sequence of their LIC might impact their performance. Objective: The study investigated whether students made progress during the 24 weeks based on preceptors’ ratings using the behaviorally anchored analysis scale. The study also examined how the sequence of the CCC impacted students’ performance. Methods: This study used the data collected in the AY2018-19 fall and spring semesters. Due to violation of normality, nonparametric testing Wilcoxon signed rank test was used to examine students’ progression in 24 weeks and Mann-Whitney Test was used to compare group performance differences. Results: There was a statistically significant improvement of overall student performance from Week 8 to 16 (Z = 15.462, p = .000) as well as Week 16 to Week 24 (Z = 14.292, p = .000). Although students’ performance in all of the six competences were significantly improved, the improvement varied with the largest improvement in Patient Care (Z =14.736, p = .000) and least improvement in Practice-based Learning (Z = 5.141, p = .000). Moreover, Mann-Whitney Test showed students in the spring semester performed significantly higher than the fall group in Week 8 (U = 310562, p = .036). While there was no significance performance difference in Week 16, students in the spring semester performed significantly lower than the fall group in Week 24 (U = 330014, p = .005). Conclusions: Students made progress in all of the six competences in CCC though the degree of improvement varied. Completion of inpatient clerkships prior to the 24-week longitudinal integrated clerkship positively impacted students’ performance in Week 8; however, the impact did not prevail. Significance: The study provides empirical evidence demonstrating the successful trajectory of CMED students’ growth in CCC.
Objective: The objectives of this project are to create and introduce technology-based simulation for advanced surgical skills. It is known that training on advanced surgical skills is challenging to trainees, instructors, and their training programs. The challenges involve multiple levels of difficulties including mentor availability and training opportunities. Surgical trainees go through a long unstructured learning curve to learn such advanced skills. Therefore, the resultant competency is variable and unpredictable. Educational technology offers alternative training opportunities outside the operative room and without putting patients at risk. With technology, educators can create various digital and hands-on learning experiences that are tailored to their educational needs. Virtual simulation has been used to train surgical residents and student on many simple minimally invasive surgical tasks. But, the currently available simulation modules are designed and structured for teaching simple tasks like clipping of a vessel, moving an object, cutting a structure, and other tasks of this level. In this study, we designed and constructed simulation tasks for advanced surgical skills that can be used for advanced surgical training, proctorship, mentorship.

Method and Results: Using the currently available virtual simulation devices and software, seven advanced skills modules are designed and structured according to the educational principles of psychomotor training and evaluation. These modules involve advanced task in 1) dissecting between planes as in separating the gall bladder from the liver bed; 2) mobilizing organs or structures as in mobilizing the spleen; 3) lysis of adhesions as in releasing small bowel obstruction or preparing for incisional hernias repair; 4) running the small bowel as in assessing bowel integrity; 5) control of small vessel bleeding as in bleeding cystic or gonadal vessel; 6) tracing tubular structure like the ureter vas deference; and 7) laparoscopic suturing. The software used for the development of the models involves the following main components: 1) User Interface to guide the trainee through various simulation and difficulty levels using a generic programming language. 2) 3D Models through the development of realistic and responsive 3-dimensional (3D) models to simulate tasks using specialized graphical development kits. 3) Simulation to facilitate the interaction between the tools (hardware) with the 3D models. 4) Feedback and Evaluation to provide a real-time feedback during a simulation session and/or overall evaluation for the simulation session. Conclusions: Advanced surgical skills tasks simulation is the necessary next step in surgical simulation. The structured modules are valuable for training and competency evaluation. They are easily transferable and reproducible that can be made available nation- and world-wide. Proctorship and mentorship can be facilitated with these modules. Additional research and improvements can be conducted upon receiving sufficient feedback from phase 1 of use.
Case Presentation: 47-year-old male presents with main concern of pain in his left ankle and arch, pain worse in arch. Pain present for years, appears to be getting worse. Orthotics ineffective and he stands for long periods of time at work. History of collapsing arches since childhood. Patient has a collapsing pes plano valgus deformity bilaterally, left worse than right. Patient demonstrates “too many toes” sign. Some ability to slightly invert heels, can barely reach neutral. Equinus deformity & Hallux Abducto Valgus deformity with a hypermobile 1st met-cuneiform joint. Convexity medially and concavity laterally upon weight bearing about the ankle joint. X-rays revealed osteochondral lesion about the medial aspect of the talus, increase in talo-calcaneal angle, subchondral sclerosis about the metatarsal joint, increase in the 1st intermetatarsal angle and an elevated 1st metatarsal. Surgical Intervention: Based on the severity and longevity of the patients deformity and pain, surgical intervention was warranted. Operative procedures included endoscopic gastrocnemius recession, medial calcaneal slide osteotomy, calcaneocuboid fusion with bone wedge graft, talonavicular fusion and Lapidus bunionectomy. Upon completion, ankle joint was noted to reach 90 degrees relative to the leg and good anatomical alignment and rectus positioning was noted and confirmed on fluoroscopy. Discussion: Post op was uneventful and patient had no pain upon ambulation. Tibialis posterior tendon dysfunction (Adult Acquired Flatfoot deformity) is a common foot and ankle deformity with various treatment options. Selecting the appropriate procedure and formulating a treatment plan based on the stage of the deformity can be difficult. Not only is it important to understand the available surgical options for the proper treatment of each individual patient, its also important to take in consideration what works best for the patients lifestyle so that you can appropriately treat their deformity while also attempting to meet their expectations.
Depletion of Vertebrate Lipids Dysregulates Aedes aegypti Innate Immunity and Enhances Production of Dengue Virus

Clara Tift; Michael J Conway, PhD

Central Michigan University College of Medicine, Foundational Sciences

Basic & Translational Science

Background: Dengue fever is an emerging mosquito-borne disease and a major public health concern, infecting an estimated 390 million and killing up to 25,000 people each year. A better understanding of the mechanisms by which dengue virus infects and is shed from mosquitoes could lead to novel methods of dengue fever prevention. Objective: This project aims to ascertain whether there are significant differences in infectivity of dengue virus on mosquito cells fed on vertebrate lipids versus mosquito cells deprived of vertebrate lipids, as well as whether mosquito cell gene expression changes during dengue virus infection. Methods: Aag2 (Aedes aegypti) cells were adapted to lipid-depleted conditions via culturing in a lipid-depleted media over the course of several passages. The resulting cells have a very low cholesterol content and can be thought of as modelling cells of mosquitoes fed on a non-vertebrate diet. Control Aag2 cells were raised on a standard lipid-containing media and can be thought of as modelling cells of mosquitoes that feed regularly on vertebrates. Results: When gene expression of lipid-depleted and control Aag2 cells was compared during dengue infection and non-infection conditions, many genes involved in innate immunity and metabolic processes were found to have altered levels of expression. Specifically, some innate immunity genes had increased expression and some sugar and lipid metabolism-related genes exhibited decreased expression when complete Aag2 cells were infected with dengue virus, while no significant change was observed in expression of these genes when lipid-depleted cells were infected. Additionally, when the cell lines were infected with dengue virus, the lipid-depleted Aag2 cells were found to shed more viral RNA than the control, and dengue virus infection formed more focus forming units on the lipid-depleted cells than on the control cells. Conclusions: We conclude that Aag2 cells, when raised on media containing vertebrate lipids and infected with dengue virus, exhibit increased innate immunity gene expression and decreased expression of some sugar and lipid metabolism genes, while lipid-depleted Aag2 cells do not exhibit such changes. Aag2 cells adapted to lipid-depleted conditions also have increased susceptibility to dengue virus infection and increased dengue virus shedding; this may be related to the lack of innate immune activation in these cells. Significance: The results described here imply that mosquitoes under lipid-depleted conditions may be more susceptible to dengue virus infection and more likely to transmit virus, likely due to decreased activation of innate immunity during viral infection. Further work must be done to ascertain whether vertebrate lipids induce innate immunity expression in mosquitoes or whether the innate immune system is downregulated during lipid-depleted conditions to increase survival.
Opioid drugs cause potent suppression of augmented breaths (ABs). Since many physiological effects of opioids demonstrate tolerance, in this study we sought to determine the temporal pattern and degree of any such tolerance in the suppression of ABs during 6 days of chronic opioid administration. Adult male rats (average 439.8 ± 19 g) received a continuous infusion of either saline (SAL, 0.01 ml/hr, n=5) or methadone (MET, 6 mg/kg/day, n=5) over 6 days via subcutaneously implanted osmotic pumps (Alzet, model 2ML1). Another control group received the cannabinoid receptor agonist WIN 55,212-2 (WIN, 40 mg/kg/day, n=5), as a means of examining the potential confounding effect of altered behavioral activity on variables of interest. Animals were monitored before surgical implantation (D0), and again on days 2, 4, and 6 post-implant (D2, D4, D6, respectively). Respiratory variables were measured using whole-body plethysmography, pain tolerance assessed via tail flick latency (TF), and rearing behavior recorded as an index of behavioral alteration. All outcome variables of interest were analyzed using a mixed model ANOVA and appropriate post-hoc comparisons, with monitoring day being the within-animal factor and experimental group being the between-animal factor considered. We found no differences in baseline measurements between experimental groups. During treatment, MET animals experienced a powerful suppression of ABs (D0 = 6.2 ± 0.383, vs. D2 = 1.4 ± 0.447, p<0.001), with tolerance developing across D4 and D6 (3.0 ± 0.523, p<0.001 and 5.0 ± 0.469, p=0.083 vs D0, respectively). No suppression of ABs was observed in either SAL or WIN animals across D0-D6. Rearing behavior was suppressed in MET (p<0.001 for D2-D6 vs. D0) and WIN animals across D2-D6 (p<0.001 for D2-D6 vs. D0), but not in SAL. However, MET animals demonstrated tolerance in rearing behavior over the 6 days of treatment, increasing back towards baseline on D6 vs. D2, p<0.001). In contrast, WIN animal rearing behavior continued to decrease across D2-D6 vs baseline. TF latency was prolonged in MET (D0 = 2.812± 0.246s vs 11.520± 0.389s, 10.796± 0.152s, & 10.739± 0.281s on D2, D4, D6 respectively), and no significant tolerance was observed across 6 days of treatment in MET animals. TF latency was prolonged in WIN only on D2 vs D0 (6.162± 0.389 s vs 3.826± 0.246, p= 0.002) to a lesser degree than in the MET animals, with no effect observed in SAL animals (p<0.001). We conclude that continuous opioid administration causes profound suppression of ABs with significant tolerance developing towards 6 days of treatment. This tolerance has a temporal pattern dissociated from behavioral effects, and markedly dissimilar to that of the analgesic effect. WIN does not cause any significant alteration of AB production despite a progressively profound suppression of behavioral activity. We propose that the mechanisms of suppression of ABs during opioid treatment follows an opioid-receptor-mediated pathway that is distinct from those mediating either analgesic or behavioral effects. It is therefore promising that targeted adjunct therapies to prevent the suppression of ABs during opioid treatment may be developed, that spare therapeutically desirable analgesic effects.
INTRODUCTION Secondary hypertension (HTN) accounts for 5-10% of uncontrolled blood pressure (BP). Primary aldosteronism (PA) is the most common cause of endocrine HTN. Early diagnosis requires a high index of clinical suspicion. CASE PRESENTATION A 70-year old female with a history of long-standing HTN, obstructive sleep apnea, hyperlipidemia, and hypokalemia presented to our clinic. Vitals showed BP of 158/92 mm Hg, heart rate of 84/min. She takes amlodipine, carvedilol, and losartan. Physical exam was remarkable for bilateral pitting leg edema. Pertinent lab results: mildly low Dehydroepiandrosterone sulfate (DHEA-S) at 31 ug/dl (Range:35-430 ug/dl), normal aldosterone level at 24.1ng/ml, low direct renin at 2.4 pg/ml (Range: 3.1-57.1 pg/ml), elevated Aldosterone/Direct Renin Ratio(ARR) of 10 (Range: 0.1-3.7). CT abdomen with contrast showed a 1.8 cm left adrenal mass with washout features most typical of an adenoma. Adrenal venous sampling (AVS) 5 min post-Adrenocorticotropic hormone (ACTH) stimulation showed ARR on the right side to be 2.14 and on the left side to be 1.24, a ratio of more than 4 is required for lateralization. The patient elected medical management and is being currently treated with spironolactone. DISCUSSION All patients with early-onset (< 40-50 years) or resistant HTN should be screened for secondary causes. PA, Cushing's Syndrome and Pheochromocytoma are the most common causes. PA is suspected when HTN is associated with one of the following: severity, resistance, hypokalemia, disproportionate target organ lesions, or adrenal incidentaloma with HTN or hypokalemia. Accordingly, clinicians should be cautious of secondary causes, those suspected be referred to endocrinologists or HTN specialists.
Although the relationship between hepatocellular carcinoma (HCC) and liver cirrhosis is well understood, the screening practices with regards to the development of HCC during the lifetime of patients diagnosed with cirrhosis in the neonatal period is not well outlined. Our review investigated the literature for specialized screening practices in neonatal cirrhosis patients for HCC formation and current guidelines to reduce the risk of developing HCC in this population. A total of 32 full text articles were included in our review. In comparison to the gold standard of HCC screening, additional biomarkers, patient demographics and screening modalities were explored for potential increased efficacy identifying HCC in its early stages in cirrhotic patients. The data offered no standardized approach for HCC screening or to reduce HCC development risk for patients diagnosed with cirrhosis in the neonatal period, thus we outlined suggestions with regards to patient education, lifestyle modifications, and provider considerations for screening of multiple biomarkers, modalities, and more regular HCC screening during routine clinical appointments. This gap in the literature warrants further investigation in methods of reducing HCC development in neonatal cirrhosis patients.
Introduction: According to the CDC, severe maternal morbidity affected more than 50,000 women in the United States in 2014. Postpartum hemorrhage is one of the most common maternal morbidities, which has increased by greater than fifty percent from 1993 to 2014. Although cervical varicosities are rare in pregnancy, cervical varicosities have been associated with placenta previas and low-lying placentas as well as significant antepartum and postpartum hemorrhage. Cervical varicosities are thought to be the result of IVC compression by the expanding uterus in pregnancy. In the literature, only sixteen cases of cervical varicosities have been reported. Due to the rare nature of cervical varicosities in pregnancy, proper management has not been established, but management of antepartum bleeding has required blood transfusions, and placement of vaginal packings, cerclages, and bakri balloons. Reported maternal and neonatal outcomes include preterm delivery, emergency cesarean sections, and hysterectomy. Case: This is the rare case of a Caucasian 18 y.o. G2P0101 diagnosed with cervical varicosities in the third trimester. She presented to labor and delivery at 30w2d with vaginal bleeding and pelvic pressure. A transvaginal ultrasound revealed a hypoechoic structure in the posterior cervix that was suspicious for an arteriovenous malformation. A few weeks later, she presented with preterm contractions and fatigue. She required a blood transfusion for anemia at that time and was initiated on nifedipine for preterm contractions. A maternal fetal medicine (MFM) transvaginal and abdominal ultrasound confirmed cervical varicosities on the posterior wall of the cervix measuring 3.0x2.1x2.8 cm. MFM recommended vaginal delivery in contrast to cesarean section to minimize postpartum bleeding. According to MFM, the passage of the fetal head would compress the cervical varicosities on the posterior wall and minimize bleeding intrapartum. She was induced at 38w0d. In preparation for a postpartum hemorrhage, 4 units of RBCs were prepared, and an interventional radiology consult was placed in case an embolization was required. Subsequently, she underwent a spontaneous vaginal delivery without complication. There was no postpartum hemorrhage. Her total calculated blood loss at delivery was 500cc and there was no significant vaginal bleeding in the postpartum period. Her hemoglobin dropped appropriately from 9.7 to 8.8 upon discharge. Discussion: This rare case of cervical varicosities emphasizes the need to establish management guidelines for cervical varicosities in pregnancy. Guidelines may reduce the occurrence of antepartum and postpartum hemorrhage for these patients. Based on this and previous cases, the location of cervical varicosities and the association with a placenta previa should be established for consideration of the route of delivery to perform a cesarean section versus spontaneous vaginal delivery.