42nd Annual Kalamazoo Community and Health Sciences Research Day

Advancing Health Care Through Translational Science

Western Michigan University
Homer Stryker M.D.
SCHOOL OF MEDICINE

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KEYNOTE SPEAKER

Saranya P. Wyles, MD, PhD

Department of Dermatology, Mayo Clinic College of Medicine

Saranya P. Wyles, MD, PhD, is a dermatologist with specialized training in regenerative medicine and additional focus on skin aging. She also provides care at the Mayo Clinic Center for Aesthetic Medicine and Surgery, and offers her patients individualized and comprehensive treatment plans for prevention and correction of the signs of aging.

The research interests of Saranya P. Wyles, MD, PhD, focus on the science of skin aging and wound healing through the lens of cellular aging (senescence) and regenerative medicine. She also pioneered the development of a novel regenerative medicine curriculum for medical and graduate students to better prepare the next generation of health care workers in regenerative clinical practice. The goal of Dr. Wyles' current work is to develop new regenerative therapies and clinical trials in dermatology to counteract the detrimental impact of senescent cells with aging and age-related skin diseases.

Dr. Wyles' program capitalizes on emerging regenerative technologies to transform therapeutic modalities in dermatology. In particular, the ability to target cellular senescence, the molecular root cause of age-associated chronic disease, through regenerative medicine can advance the dermatological therapeutic armamentarium. Specific contributions include the development of novel biotherapeutics to accelerate regenerative technologies to clinical readiness through the discovery-translation-application platform for patients with chronic age-related diseases including diabetes and associated skin complications, which account for the bulk of worldwide morbidity and mortality.

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Credit amount subject to change.

Credits
AMA PRA Category 1 Credits™ (3.00 hours), Other Learner Attendance (3.00 hours), General Attendance (3.00 hours)

DISCLOSURES
For more information and credit types, visit: **https://wmed.cloud-cme.com/2024ResearchDay**

Saranya P. Wyles, MD, PhD	Rion, AbbVie (Consulting Fee)
Robert Sawyer, MD	Pfizer, Merck, AbbVie, La Jolla, Molnlycke (Consulting Fee)

No one else involved in the planning or presentation of this activity has any relevant financial relationships to disclose

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WELCOME

Dear Colleagues,

On behalf of the Organizing Committee Members, we are very pleased to welcome you to the 42nd Annual Kalamazoo Community Medical and Health Sciences Research Day. We would like to extend our heartfelt gratitude to the administrators, faculty, staff, students, and volunteers whose dedication and support made Research Day 2024 a resounding success. Your contributions have been invaluable in showcasing the spirit of academic inquiry and collaboration within our community. We also thank our colleagues from Western Michigan University and from Ferris State University for their research collaboration with our school and for participating in the event. Overall, 160 research studies will be presented in various formats at our Research Day this year!

In addition, it is our privilege to have worked with this year's Research Day organizing committee. This committee worked diligently over an extended period to bring you an exceptional learning and networking opportunity. Members of this year's committee are:

Co-Chairs:
Dr. Adil Akkouch, Orthopaedic Surgery and Biomedical Engineering Assistant Professor
Dr. Nancy Bjorklund, Assistant Dean for Global and Continuing Education

Vice Chairs:
Courtney Puffer, Vice Chair, Global and Continuing Education Integration Specialist
Dr. Ali Vural, Vice Chair, Pharmacology Assistant Professor

Committee Support Staff:
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We hope this year's Research Day will inspire you to pursue your own research and support the basic, clinical, and healthcare research of our Southwestern Michigan Community colleagues as well.

Adil Akkouch, MSc, PhD
Scientific Committee-Research Co-Chair

Nancy Bjorklund, EdD
Scientific Committee-CE Co-Chair

ACKNOWLEDGMENTS

We extend our grateful acknowledgment to the following members of WMed and WMU professionals.

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Geetha Dhatreecharan, MD
Greg Vanden Heuvel, PhD
Laurence McCahill, MD
David Overton, MD
Saad Shebrain, MD

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WMed W.E. UPJOHN M.D. CAMPUS FLOOR PLANS

WMed W.E. Upjohn M.D. Campus First Floor

Entrance

TBL Hall 1

Lobby

Classroom 111

Auditorium

WMed W.E. Upjohn M.D. Campus Second Floor

TBL Hall 2

Classroom 211

PROGRAM

Thursday, April 4, 2024

7:45 a.m. – 8:30 a.m.	**Check-in**	1st Floor Lobby
8:30 a.m. – 8:50 a.m.	**Welcome Address** Robert Sawyer, MD Gregory Vanden Heuvel, PhD **Keynote Speaker Introduction** Medical student representatives	Auditorium
8:50 a.m. – 9:50 a.m.	**Keynote Address** Saranya P. Wyles, MD, PhD *Transforming Tomorrow: Disruptive Innovation in Regenerative Medicine for Skin Health*	Auditorium
9:50 a.m. – 10:00 a.m.	**Break**	
10:00 a.m. – 12:00 p.m.	**Oral Presentations** Session A Session B Session C	 Auditorium TBL Hall 1 TBL Hall 2
12:00 p.m. – 1:00 p.m.	**Poster Presentations – Session 1** **ODD numbers**	1st & 2nd Floor Lobby
1:00 p.m. – 2:00 p.m.	**Poster Presentations – Session 2** **EVEN numbers**	
2:00 p.m. – 4:00 p.m.	**Oral Presentations** Session D Session E Session F	 Auditorium TBL Hall 1 TBL Hall 2
4:30 p.m. – 5:00 p.m.	**Student Research Awards and Farewell**	Auditorium

Save the Date!

Next WMed Research Day

Thursday April 3, 2025

Thursday April 2, 2026

ORAL PRESENTATIONS SESSIONS

SESSION A	**AUDITORIUM** **Moderator:** Jayce Deleon, MD
10:00 a.m. – 10:30 a.m.	**Faculty Presenter:** Wendy Scott Beane, PhD Therapeutic Potential of Manipulating in vivo ROS Levels to Control Wound Repair and Tissue Regeneration
10:30 a.m. – 11:00 a.m.	**Research Scientist Presenter:** Michael Gutknecht, PhD Reshaping the immunological landscape through immunoglobulin M (IgM) expressed in B cell-derived extracellular vesicles
11:00 a.m. – 11:12 a.m.	Rosemary Vergara, Sarah Webster, Ian Hurley, Nichol Holodick Loss of Estrogen Signaling Alters B-1 Cells in a Model of Polycystic Ovarian Syndrome Abstract no. 52
11:12 a.m. – 11:24 a.m.	Jesse Kooistra, Agata Parsons, Lavet Valerie Bungha Tita, Jerry Bouma, Greg Vanden Heuvel, Erik Larson Molecular model for two hit somatic mutations in Autosomal Dominant Polycystic Kidney Disease Abstract no. 53
11:24 a.m. – 11:36 a.m.	Sashwat Sriram, Jae Beckmeyer, Genevieve Abd, Jennifer Ku, Sheridan Hayes, Harshank Patel, Yong Li Hypoxia-Induced Senescence in Pancreatic Cancer Abstract no. 56
11:36 a.m. – 11:48 a.m.	Talal Al-Assil, Claire Kalina, Madison Laird, Nataly Dawood, Raven Riordan, Neya Suresh Kumar, Ryan Olivier, Saad Shebrain, Cheryl Dickson, Gitonga Munene Does Gender Play a Role in HCV and Cancer Screening Among the Unhoused? Abstract no. 132
11:48 a.m. – 12:00 p.m.	Mohamed Said, Jessica Adamczyk, Roberta Grieger-Nimmo, Patrick Hansma, Prentiss Jones Elevated IL-6, Ferritin, and D-Dimer: Biomarkers of atherosclerotic cardiovascular disease in post-mortem vitreous humor analysis Abstract no. 139

SESSION B	**TBL Hall 1** **Moderator:** Saad Shebrain, MD
10:00 a.m. – 10:30 a.m.	**Faculty Presenter:** Adil Akkouch, PhD Development of Smart Antibacterial Mesh for Abdominal Wall Repair
10:30 a.m. – 11:00 a.m.	**Resident Presenter:** Matthew Sweet, MD Technology-Assisted Hip and Knee Arthroplasty in Orthopaedic Residency Training: A national survey
11:00 a.m. – 11:12 a.m.	Daniel VanZweden, Michael Leinwand Single Incision Laparoscopic Gastrostomy Button Insertion: A straightforward and efficient technique Abstract no. 28
11:12 a.m. – 11:24 a.m.	Maxwell Albiero, Tara Gloystein, Tyler Snoap, Jason Roberts Ulnohumeral bridge plating of unstable elbow fracture-dislocation injuries in high-risk populations Abstract no. 48
11:24 a.m. – 11:36 a.m.	Chi Lee, Mitchell Kenter, Keith Kenter, Adil Akkouch Integration of Poly(Glycerol Sebacate) and Polycaprolactone Scaffolds for Enhanced Tendon Regeneration Abstract no. 57
11:36 a.m. – 11:48 a.m.	Kunal Ranat, Mitchell Kenter, Lydia Williams, Keith Kenter, Adil Akkouch 3D Printed Electrically Conductive Scaffolds to Restore Bone Environment Abstract no. 135
11:48 a.m. – 12:00 p.m.	Richa Gupta, Sumit S. Patel, Raymond H. Bayer, Max Albiero, Mayron Lichterman, David L. Mayor Does That Thumb Trigger Finger Release Have You Feeling “Nerve”-ous Abstract no. 142

SESSION C	**TBL Hall 2** **Moderator:** David Overton, MD
10:00 a.m. – 10:30 a.m.	**Faculty Presenter:** Christopher Jondle, PhD Uncovering the role of IL-17RA signaling during gammaherpesvirus infection
10:30 a.m. – 11:00 a.m.	**Research Scientist Presenter:** Naeem Khan, PhD Human B1-like Cells and Pneumococcal Defense in the Elderly
11:00 a.m. – 11:12 a.m.	Sydney M. Les, Naomi L. Tsuji, Nichol E. Holodick Analysis of the B-1 Cell Repertoire Post-Pneumovax23 Vaccination in a Mouse Model of Sickle Cell Disease Abstract no. 74
11:12 a.m. – 11:24 a.m.	Mikayla Moody, Tjasa Hranjec, Robert Sawyer To Leak or Not to Leak: Is Enterococcus the answer to the question? Abstract no. 105
11:24 a.m. – 11:36 a.m.	Ruth Butters, Amanda Wewer, Fernando Ospina, Ouen Hunter, Vaishali Patil, Nia Evans, Cynthia Bane, Catherine Kothari Cradle Kalamazoo: A review of a decade of community research to reduce black infant mortality in Kalamazoo Abstract no. 147
11:36 a.m. – 11:48 a.m.	Fernando Ospina, Sara Carroll-Muñiz Anti-Bias Data Collection: A model to improve race and ethnicity data collection in service provision Abstract no. 151
11:48 a.m. – 12:00 p.m.	Nicholas Stevens, Alain Elian, Saad Shebrain Gender Variations in 30-day Outcomes Following Cholecystectomy in Patients with Acute Biliary (Gallstone) Pancreatitis Abstract no. 161

SESSION D	**AUDITORIUM** **Moderator:** Greg Vanden Heuvel, PhD
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2:30 p.m. – 3:00 p.m.	**Postdocs Oral Presenter:** Joshua Mitchell, PhD Almost FAIM-ous: dissecting the role of FAIM in protein aggregation diseases
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SESSION E	**TBL Hall 1** **Moderator:** Laurence McCahill, MD
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2:30 p.m. – 3:00 p.m.	**Resident Presenter:** Mikayla Moody, DO Relating Non-surgical Science to Surgery
3:00 p.m. – 3:12 p.m.	Nicholas Kossoff, Richa Gupta, Sumit S. Patel, James R. Jastifer Does Health Insurance Status Affect Time to Surgery for Operative Ankle Fractures? Abstract no. 25
3:12 p.m. – 3:24 p.m.	Colleen Howing, Joshua Mastenbrook, Stephen Godfrey, Michael Trexler, Philip Pazderka Goals of Care Conversations during Prehospital Cardiac Arrest Resuscitation Abstract no. 19
3:24 p.m. – 3:36 p.m.	Mahmoud Ajine, Saad Shebrain, Caitlyn Cookenmaster, Neal Ferrin, Alain Elian, Jennifer Timmons, Gitonga Munene, Robert Sawyer The Plan-Do-Study-Act (PDSA): An iterative approach to optimize residents performance in the American Board of Surgery In-Training Exam (ABSITE) Abstract no. 31
3:36 p.m. – 3:48 p.m.	Sidhvi Nekkanti, Zachary Paquin, Paul Bodenberg, Stacy Brousseau, Sarah Mckenzie, Anji Phillips, William Bettis, Christina Cameron, Mark Kerschner, Maureen McGlinchey Ford Implementation of an Emergency Department (ED) Quality Improvement Program to Improve care for ED Patients with Opioid Use Disorder at four Southwest Michigan Hospitals Abstract no. 61
3:48 p.m. – 4:00 p.m.	Benjamin Root, Paulina Cradeur, Megan Brezka, Cassidy Hinton, Sam Natla, Elizabeth Wang, Nicholas Helmstetter, Sravani Alluri Exploring Street Medicine Programs in the Northern U.S.: Opportunities for interprofessional training and healthcare delivery Abstract no. 109

SESSION F	**TBL Hall 2** **Moderator:** Geetha Dhatreecharan, MD
2:00 p.m. – 2:30 p.m.	**Faculty Presenter:** Andromeda Nauli, PhD Why are men more likely to gain belly fat?
2:30 p.m. – 3:00 p.m.	**Resident Presenter:** Kelsey Sheets, MD Patient Perpetrated Harassment and the Michigan Orthopaedic Surgery Resident
3:00 p.m. – 3:12 p.m.	Marie Freudenburg, Noelle Fukuda, Gillian Erickson, Mallory Ruvina, Rebecca Kusko, Sage Bilsland, Joshua Mastenbrook Prospective Evaluation of the Incidence and Characteristics of Violence Directed at Prehospital Providers Abstract no. 5
3:12 p.m. – 3:24 p.m.	Maria Roche-Dean, Vaishali Patil Examining Stress, Coping and Discrimination in Nursing: A feasibility study Abstract no. 150
3:24 p.m. – 3:36 p.m.	Alice Wei, Nikoli Nickson, Austin Brubaker, Priscilla Woodhams Food Security Screening in Pediatrics: An analysis of implementation, prevalence, and intervention Abstract no. 43
3:36 p.m. – 3:48 p.m.	Faryal Tahir, Lisa Graves Implementation of a longitudinal model for medically managed weight loss in a Family Medicine teaching program Abstract no. 55
3:48 p.m. – 4:00 p.m.	Ibrahim Zahid, Michael Terrio, Ian Crumm, Zafir Khan, Blair Graham, Aidrian Ranjith, Tracey Mersfelder, Kevin Kavanaugh Weight Management: A resource poster for enhancing treatment selection Abstract no. 100

ORAL PRESENTATIONS LIST OF ABSTRACTS

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Prospective Evaluation of the Incidence and Characteristics of Violence Directed at Prehospital Providers

Marie Freudenburg[1], Noelle Fukuda[1], Gillian Erickson[1], Mallory Ruvina[1], Rebecca Kusko[1], Sage Bilsland[1], Joshua Mastenbrook[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Emergency Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Emergency Medical Services (EMS) personnel experience on-the-job violence. We sought to establish a real-time data collection system to reduce recall bias and evaluate the incidence and characteristics of violence faced by our county's primary ambulance agency personnel.

Methods: This 1-year prospective cohort study involved a single advanced life support ambulance agency covering a population of 260,000 and 576 square miles. Here we report on the first 4-months, 8/20/2023-12/17/2023. After each 911 response, the ambulance crew answered a required yes/no question within the electronic record as to whether a verbal or physical violent incident occurred. If "yes," respondents were asked to complete an anonymous REDCap survey to collect additional details, accessible via a QR code in the ambulance and links on agency electronic devices. Descriptive statistics were computed.

Results: Violence was reported in 1% (69/11,713) of 911 responses. Surveys were completed for 31 of these incidents (45%). Of survey respondents, 81% (25/31) endorsed verbal harassment, 65% (20/31) endorsed physical assault or attempted assault, and 3% (1/31) endorsed sexual assault. Patients initiated violence in 87% (27/31) of incidents and 70% (22/31) of recipients were paramedics. On-scene factors most consistently associated with violence were signs of alcohol intoxication and patient altered mental status. Most respondents, 74% (23/31), said that dispatch did not indicate an increased threat of violence, 39% (12/31) did not feel prepared to de-escalate the scene by company training, and of the 22 scenes where police were present, 55% (12/22) of respondents did not feel that police aided in de-escalation.

Conclusion: Violence directed at EMS providers is an ongoing threat, with verbal harassment being the most common. Paramedics appear to be the most likely recipients of violent acts. Scenes with an intoxicated or altered patient may pose an increased risk of violence. Respondents felt more prepared to handle de-escalation by previous training than by police presence. Although our model of real-time data collection appears feasible, the 45% survey-return-rate leaves room for further process improvement and introduces a degree of bias into the descriptive statistics.

IRB Reference: WMed-2023-0989

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Goals of Care Conversations During Prehospital Cardiac Arrest Resuscitation

Colleen Howing, Joshua Mastenbrook, Stephen Godfrey, Michael Trexler, Philip Pazderka
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Goals of care conversations are integral to ensuring healthcare providers deliver patient-focused care. Our institution hosts a three-year Emergency Medicine residency and a one-year Emergency Medical Services fellowship that includes prehospital experiences via a physician response vehicle. The on-duty physician(s) are dispatched to every out-of-hospital cardiac arrest (OHCA) in the county. When family is available, the physician can directly discuss, and electronically document, the patient's goals of care in real-time.

Objectives: This study aimed to measure the occurrence rate and content of goals of care conversations performed by our physicians at OHCAs.

Methods: Following receipt of Institutional Review Board exempt status determination, the documentation database was downloaded as a spreadsheet. Through a retrospective chart review, two authors abstracted data from cardiac arrest encounters dated 9/26/2022 - 4/14/2023. Narrative content was grouped by theme. Descriptive statistics were calculated.

Results: The physicians responded to 149 OHCAs during the study period. A patient advocate was present 86.6% (129/149) of the time, with goals of care conversations occurring at 73.6% (95/129) of arrests. This resulted in cessation of resuscitation for 20% (19/95), with the remaining split between continued full and limited resuscitative efforts. Goals of care conversations were deemed inappropriate to have at three scenes despite having a patient advocate present. Common discussion themes included neurologic outcome, need for mechanical ventilation, and critical care unit admission.

Conclusion: Goals of care conversations were held at a majority of OHCAs, with a substantial number of these changing the course of resuscitation, including termination of resuscitation. Succinct goals of care conversations during OHCAs may result in more goal-concordant patient care and improved utilization of scarce prehospital resources.

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Does Health Insurance Status Affect Time to Surgery for Operative Ankle Fractures?

Nicholas Kossoff[1], Richa Gupta[1], Sumit S. Patel[2], James R. Jastifer[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Ankle fractures are among the most common orthopedic injuries, with bi- and tri-malleolar fractures commonly requiring operative fixation. Healthcare disparities, such as insurance status, may affect time to surgery. The goal of this study was to determine if a patient's insurance status influences time to surgery for operative ankle fractures. Authors hypothesized that patients with no health insurance or public health insurance will have significantly increased time to operative fixation of their fracture compared to those with private health insurance.

Methods: The Nationwide Inpatient Sample Healthcare Cost & Utilization Project database was queried for those patients with both open and closed bi- and tri-malleolar ankle fractures. Patients were stratified based on insurance type into groups 1. Medicare 2. Medicaid 3. Private 4. Self-pay 5. No charge and 6. Other. Data was tested for normality and subgroup analyses were performed to determine differences in time to surgery for patients with open or closed ankle fractures stratified by insurance status.

Results: A total of 113,782 ankle fractures were identified for this study. A statistically significant difference ($p<0.05$) in time to operation was found between groups, with Medicare and Medicaid patients having increased time to surgery compared to those with private insurance or self-paying. When stratified by open versus closed fractures, results suggested there is no difference in time to operation for open fractures, but that a difference does exist for closed fractures (Figure 1).

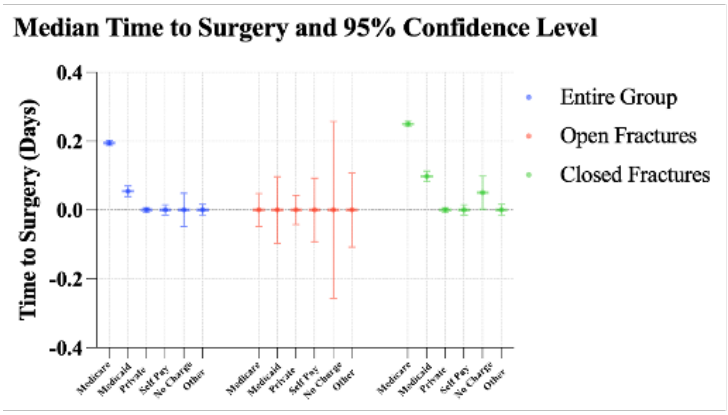

Figure 1: Median Time to Surgery and 95% Confidence Level by Insurance Group for entire study population (Blue), Open Fractures (Red), Closed Fractures (Green)

Conclusion/Clinical significance: The present study contributes valuable insights into insurance status and the timing of surgery for ankle fractures. Social implications including worsened morbidity, decreased quality of life, lost wages, and more may disproportionately impact those with public insurance. Although these results do not identify the direct causes of these delays, it underscores the need for policy reform within the healthcare industry to fix the inefficiencies in the system that lead to disadvantages for some of the most vulnerable populations.

Acknowledgments: Theresa McGoff & Kirsten Hickock for procuring data and performing statistical analysis.

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Single Incision Laparoscopic Gastrostomy Button Insertion: A straightforward and efficient technique

Daniel VanZweden[1], Michael Leinwand[1,2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Bronson Hospital, Kalamazoo, MI

Introduction: Gastric tube placement is a common surgical operation with multiple strategies for insertion. The percutaneous endoscopic gastrostomy (PEG) pull-through technique is commonly used; however, it may not be feasible in small infants. The laparoscopic approach is associated with fewer complications compared to PEG and the open Stamm gastrostomy.(1,2) The laparoscopic technique originally described by Georgeson utilized multiple ports.(3) Ponsky demonstrated the ability to place a gastrostomy button (G-button) via the single incision laparoscopic surgery (SILS) approach.(4) In 2016, we developed a SILS G-button procedure with several modifications which simplified Ponsky's technique.

Methods: SILS G-button operations performed from January 2016 to February 2024 were retrospectively evaluated. Age, gender, weight, operative time, duration of follow-up, and complications were recorded.

Results: There were 71 patients in the cohort. Median age was 4.9 months (mean: 20.9 months; range: 4 days - 13 years). Median weight was 5.4 kg (mean: 8.9 kg; range: 2.2 kg – 27 kg). Median operative time was 20.5 minutes (mean: 26.1 min; range: 14 min - 90 min). The operation was faster in smaller children, with mean operative times of 22.5 minutes in children < 10 kg versus 36.0 minutes in children ≥ 10 kg (p=0.002). Median follow-up was 12.1 months (mean 19.8 months; range: 1 day – 88.6 months). Six patients (8.5%) required an additional trocar. There were no conversions to open. Thirty-one patients (43.7%) had granulation tissue, two of which (2.8%) required operative excision. Thirteen patients (18.3%) had significant leakage.

Conclusion: The SILS G-button technique is simple, effective, and completed in about 30 minutes. There is no wound except for the gastrostomy itself. Aside from granulation tissue and leakage, there were no complications.

IRB Reference: WMed-2024-1100

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The Plan-Do-Study-Act (PDSA): An Iterative approach to optimize residents performance in the American Board of Surgery In-Training Exam (ABSITE)

Mahmoud Ajine, Saad Shebrain, Caitlyn Cookenmaster, Neal Ferrin, Alain Elian, Jennifer Timmons, Gitonga Munene, Robert Sawyer
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: American Board of Surgery (ABS) In-Training Examination (ITE), or ABSITE, preparation requires an effective study approach. In 2014, the ABS announced the alignment of ABSITE to the SCORE® Curriculum. We hypothesized that implementing a Plan-Do-Study-Act (PDSA) approach would help surgery residents improve their performance on the ABSITE.

Method: Over 20 years, in a single institution, residents' ABSITE performance was evaluated over three timeframes: Time A (2004-2013), no specific curriculum; Time B (2014-2019), an annual comprehensive ABSITE-simulated SCORE®-based multiple-choice exam (MCQ) was administered; and Time C (20202023), like Time B with the addition of the PDSA approach for those with less than 60% correct on the ABSITE-simulated SCORE®-based exam. At the beginning of the academic year, in July, all residents are encouraged to (1) initiate a study plan for the upcoming ABSITE using SCORE® guided by the published ABSITE outlines content topics (Plan), (2) take an ABSITE-simulated SCORE®-based exam in October (Do), (3) assess the results/scores (Study), and (4) identify appropriate next steps (Act). Correlational analysis was performed to evaluate the association between ABSITE scores and ABSITE-simulated SCORE®-based exam scores in the three timeframes. The primary outcome was the change in the proportions of ABSITE scores <30th percentile.

Results: A total of 294 ABSITE scores of 94 residents (34 females and 60 males) were analyzed. We found stronger correlation between the correct percentage on ABSITE and ABSITE-simulated SCORE®-based exam scores in Time C (r=0.73, p<.0001) compared to Time B (0.62, p<.0001). The percentage of residents with ABSITE scores lower than 30th percentile dropped significantly from 14.0% to 3.7% (p=0.016).

Conclusion: Implementing the Plan-Do-Study-Act (PDSA) approach using the SCORE® curriculum significantly enhances residents' performance on the ABSITE exam. Surgery residents are encouraged to use this approach and to utilize the SCORE-contents outlined by the ABS in their study plan.

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Food Security Screening in Pediatrics: An analysis of implementation, prevalence, and intervention

Alice Wei BS, Nikoli Nickson BA, Austin Brubaker MS, Priscilla Woodhams MD
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Food insecurity (FI) is defined as limited or uncertain access to adequate food. Prior to the COVID-19 pandemic, the USDA reported that 6.5% of households with children (2.9 million households) experienced FI. As of 2022, that rate increased to 8.8% (3.3 million households). FI is associated with poor growth and worse health outcomes in children. The American Academy of Pediatrics recommends routine screenings using the Hunger Vital Sign, a validated two-question screening tool. Despite this, a 2017 study demonstrated that only 15% of pediatricians screen for FI. This study aims to demonstrate the need for universal screenings and provide a model for providers to connect families with resources.

Methods: This retrospective cohort study uses data from pediatric patients seen at WMed Oakland and Portage clinics between March 1st, 2018, and March 1st, 2023. Demographics and Hunger Vital Sign screening results were analyzed to assess the impact of screenings on the prevalence of food insecurity among pediatric patients.

Results: Patients (n=7461) screened positive for food insecurity at a rate of 17.77% in the first 6 months after implementation. The rate dropped to 12.40% in the first year after implementation, reaching a nadir of 1.57% in year four with an increase to 3.28% in year five (Fig. 1). In total, 81.84% of the study population was screened at least once. In year one, screening was performed for 74.30% of patients at least once, decreasing to 33.81% in the final year (Fig. 2).

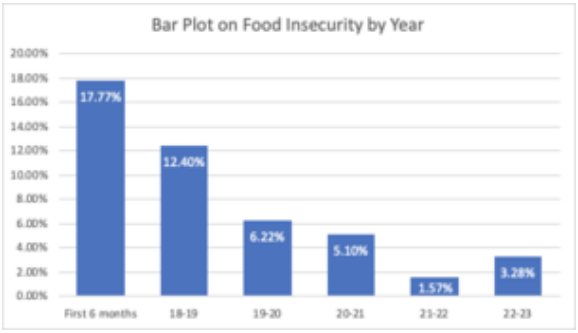

Figure 1. Food insecurity positivity by year. Figure 2. Food insecurity screening frequency by year.

Conclusions: Screening is an effective way to identify social determinants of health that present barriers to optimal health and connect patients with resources to mitigate these barriers. For the first 6 months, our clinics had a relatively high rate of 17.77% positivity as compared to the pre-pandemic national rate of 6.5%. After connecting families with resources, this rate dropped to 3.28%, much lower than our original rates and below the post-pandemic rates of 8.8%. Total patients screened also dropped significantly from 74.30% in year one to 33.81% in year five, demonstrating a value in periodic reeducation of the healthcare team to ensure screening rates remain high.

IRB Reference: WMed-2020-0652.

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Ulnohumeral Bridge Plating of Unstable Elbow Fracture-Dislocation Injuries in High-Risk Populations

Maxwell Albiero, Tara Gloystein, Tyler Snoap, Jason Roberts
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Maintaining stability in complex elbow fracture-dislocations in high-risk individuals, including the obese and high energy trauma populations, remains a difficult challenge. Several surgical options and treatment algorithms exist although there is no current gold standard. We aim to expand upon a minimally published surgical technique introduced by Edelman et al using a 3.5mm LCP ulnohumeral spanning plate to stabilize elbow fracture-dislocations and apply it in these high-risk populations[1]. In this series, we report our institutions experience with the bridge plating technique including postoperative results on nine patients.

Methods: A retrospective review was completed and included nine patients with complex elbow fracture-dislocations who underwent stabilization via this surgical technique performed by two fellowship trained orthopedic trauma surgeons. A posterior triceps splitting approach was utilized and after any required bony and ligamentous repair were completed a 3.5mm LCP plate was contoured and fixed into place along the distal humerus and proximal ulna with minimal prominence. Patients underwent subsequent implant removal and manipulation under anesthesia 7-8 weeks later followed by physical therapy. Post-operative visit documentation was reviewed to gather data on range of motion (ROM), complications, and any repeat instability.

Results: Nine patients averaging 45.6 years in age with an average BMI of 39.3 (range 22-62) underwent this surgical technique. The average elbow flexion-extension at 3 months post-operatively was 32.6-117.8° with 83.5° of pronation and 83.1° of supination. At 6 months, flexion-extension reached 14.0-123.0° with 87.0° of supination and 90.0° of pronation. No patient experienced re-dislocation events or noted varus-valgus instability. One patient underwent an irrigation and debridement of a non-healing incision.

Conclusion/Clinical significance: Through six months of post-operative follow up our data shows encouraging results. The absence of re-dislocation events and the favorable ROM obtained highlight the efficacy of this technique. There are no known published articles with larger case volumes on this novel application, highlighting the clinical significance of this work. This study demonstrates a 3.5 mm LCP ulnohumeral bridge plate in unstable elbow injuries may be a reliable solution and emphasizes its use in the difficult to manage high-risk populations.

References: [1] Edelman et al. (2018) Tech.,22,46

IRB Reference: WMed-2023-1036

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Loss of Estrogen Signaling Alters B-1 Cells in a Model of Polycystic Ovarian Syndrome

Rosemary Vergara[1], Sarah Webster[1], Ian Hurley[2], Nichol Holodick[1]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Kalamazoo College, Kalamazoo, MI

Introduction: Polycystic ovarian syndrome (PCOS) is a multifactorial disease characterized by hyperandrogenism and affects approximately 5 million women of reproductive age (CDC). Women with PCOS were found to be 51% more likely to contract COVID19 than their healthy female counterparts. Furthermore, the CDC indicates more than 50% of women with PCOS develop diabetes by age 40. Diabetes is a risk factor for pneumococcal infection, which is the most common cause of pneumonia. The rate of death due to pneumococcal infection increases 8-fold for those over the age of 65. B cells are essential for our ability to fight infectious disease; yet it is unknown whether PCOS impacts the protective functions of B cells. B-1 cells produce 80-90% of natural antibodies, which are required for immediate protection from bacterial and viral infections. In addition, B-1 cells attenuate insulin resistance. These essential functions are afforded by B-1 cells as a result of their unique development. B-1 cells arise mainly during fetal life and persist throughout adult life by their ability to self-renew. Here, we hypothesized PCOS would lead to alterations of B-1 cells and the natural antibodies they produce.

Methods: We utilized a mouse model of PCOS, estrogen receptor alpha knockout (Esr1KO). B-1a cells were sort purified from young and aged, WT and Esr1KO mice and then used for bulk RT-qPCR or single cell BCR repertoire analysis.

Results: We found (1) a loss of splenic B-1a cells in Esr1KO mice, (2) significant changes to the B-1a cell antibody repertoire away from a protective repertoire in Esr1KO mice, and (3) expression analysis of genes involved in self-renewal show significant changes away from the typical self-renewal mechanism found in WT B-1a cells.

Conclusion/Clinical significance: Our results suggest mice with PCOS have less efficacious B-1 cell derived natural antibodies during aging resulting from a decrease in fetal-derived self-renewing B-1 cells. These results have implications for protection from infection and insulin resistance in aged women with PCOS. Understanding how B cells are affected in PCOS into advanced age will provide new opportunities for improving targeted therapeutics for both young and older women with PCOS.

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Molecular Model for Two Hit Somatic Mutations in Autosomal Dominant Polycystic Kidney Disease

Jesse Kooistra, Agata Parsons, Lavet Valerie Bungha Tita, Jerry Bouma, Greg Vanden Heuvel, Erik Larson
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Most, but not all, tumor suppressors follow a two-hit somatic inactivation pathway, where a block to tumorigenesis is released only when an inherited pathogenic allele is joined by somatic inactivation of the second allele. The mutational mechanisms are unknown, but the fact that some tumor suppressors do not follow the two-hit pathway suggests that the risk of second hit inactivation is an inherent property of the gene. The *PKD1* gene, inactivated in Autosomal Dominant Polycystic Kidney Disease (ADPKD), follows two hit inactivation in humans but not mice, suggesting that the human gene is intrinsically unstable.

Methods: We have tested a mechanistic model for the two-hit pathway in the *PKD1* gene, predicting that DNA structure formation provokes DNA breaks and mutagenesis. We used immunofluorescence microscopy and chromatin immunoprecipitations with antibodies specific for the DNA structure, G-quadruplex (G4), and for a marker of DNA breaks, phosphorylated histone H2AX. We tested for the presence of G4 DNA induced DNA breaks at *PKD1* in human and mouse cells, predicting G4 DNA and break formation in the former but not the latter.

Results: Immunofluorescence microscopy confirms the presence of nuclear G4 DNA and phosphorylated H2AX, confirming their presence throughout the genome. Consistent with bioinformatics, human but not mouse *PKD1* forms G4 DNA structures and shows in increase in phosphorylated H2AX at the locus when cells are incubated with a G4 stabilizing compound.

Conclusion: We find that the human *PKD1* gene encodes and forms G4 DNA structures while the mouse ortholog does not. Since mice do not naturally get ADPKD, the presence of these DNA alterations provide a rationale for second hit mutagenesis, since G4 DNA is well known to inhibit replication. Consistent with that model, we find that a marker for DNA breaks, phosphorylated histone H2AX, is present at human PKD1 when cells are incubated with a G4-stabilizing compound. G4 DNA formation may explain why some tumor suppressors are subject to second hit inactivation while others are not.

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Implementation of a Longitudinal Model for Medically Managed Weight Loss in a Family Medicine Teaching Program

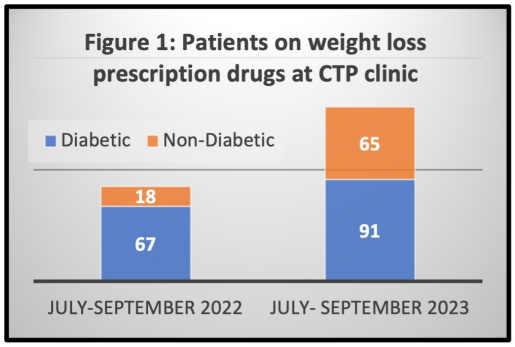
Faryal Tahir, Lisa Graves
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Management of obesity requires a multidisciplinary team approach that integrates lifestyle modification, behavioral therapy, pharmacotherapy and sometimes bariatric surgery. The feasibility of developing medically managed weight loss (MMWL) teaching in a primary care/family medicine residency clinic, which serves the needs of underprivileged patient population, was explored.

Methods: This study demonstrates development of a longitudinal model for MMWL during residency education. This approach involved addition of dedicated faculty, obesity medicine focused didactics, integration of MMWL curriculum and an elective rotation along with curating community partnerships for interprofessional learning with a nutritionist and bariatric surgeon.

As a preliminary analysis, adults aged 18 and above with BMI ≥25 kg/m^2 being prescribed FDA-approved weight loss medications at WMed Family Medicine Crosstown Parkway clinic were reviewed. Data collected over 3-month blocks during the period of July to September 2022 and 2023 were compared.

Results: In the period from July-September 2022, there were 85 patients on FDA-approved weight loss medications meeting age and BMI criteria. Out of this group, only 18 patients (21%) were non-diabetic. In the period from July-September 2023, there were 156 patients on these medications, and of these, 65 (41.6%) of them were non-diabetic (Figure 1).



Clinical Significance: Obesity is a chronic disease that needs long-term partnership between the patient and their provider. Residents need to be educated on the challenges in weight management and learn patient-tailored approaches for treatment. Our study shows a significant increase in the number of patients who are being prescribed medications to assist weight loss. This trend was more significant in the non-diabetic population suggesting increased patient recruitment for MMWL.

The patient population served at Crosstown Parkway has poor access to weight loss programs. Our model shows the feasibility of implementing MMWL curriculum in a population where it has not been a focus in the past. Small changes resulted in dramatic increases in patient uptake of treatment. Prescription drug shortages, understanding long-term adverse effects, limited insurance coverage and availability to underserved communities remain the biggest challenges we need to continue working on.

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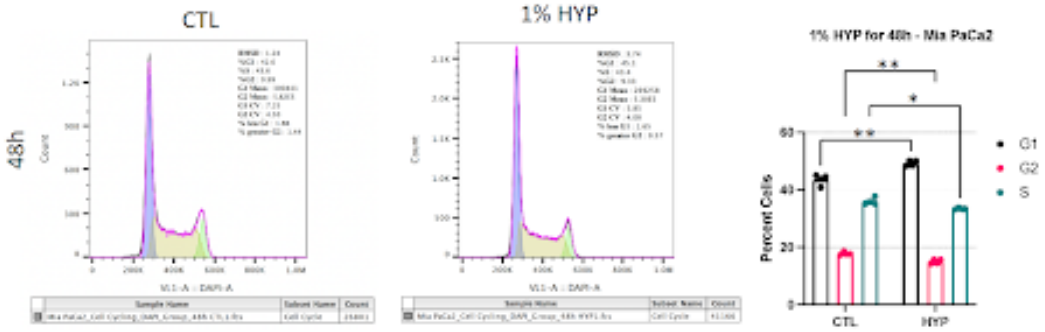
Hypoxia-Induced Senescence in Pancreatic Cancer

Sashwat Sriram[1], Jae Beckmeyer, Genevieve Abd[2], Jennifer Ku[1], Sheridan Hayes[2], Harshank Patel, Yong Li[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Hypoxia is a key regulator that promotes tumorigenesis and imparts stem-like characteristics to cancer cells, contributing to aggressiveness. Hypoxia-inducible factor 1a (HIF-1a) mediates these responses. While cancer cells have the archetypal property of being highly proliferative during malignant transformation, early premalignant lesions have been shown in association with growth arrest. This is associated with a senescence-associated secretory phenotype (SASP), enabling the formation of the tumor microenvironment [1]. We hypothesize that the hypoxic environment is essential in altering cell cycling, metabolism, migration, and proliferation in the pancreatic cancer cell line Mia PaCa-2.

Methods: Pancreatic cell line Mia PaCa-2 was cultured under normoxia and 1% O2 (hypoxia) for 24h, 48h, and 72h. Flow cytometry was performed to assess G1/S phase transitions under normoxia and hypoxia. MTT assay, scratch assay, and cell counts were performed to assess metabolic changes, migration, and proliferation respectively.

Results: Preliminary data showed that under 1% hypoxia, G1 phase was upregulated after 48h ($p < 0.01$) as compared to normoxia cultured Mia PaCa-2 cells indicating cellular senescence. We also detected that proliferation and migration speed were increased under hypoxic conditions.



Conclusion/Clinical significance: The initial aim of this study is to illuminate the intricate interplay between hypoxia and cell behaviors in pancreatic ductal adenocarcinoma progression. The observed upregulation of G1 phase indicates a potential link between cancer stem cell biomarkers, hypoxia-induced senescence, and altered cell cycle dynamics. Our preliminary data indicates that pancreatic cancer is stimulated to become aggressive under hypoxic conditions. We aim to investigate the possibility that hypoxia imparts these stem-like characteristics via reprogramming. Unraveling these mechanisms may unveil novel therapeutic targets, offering a foundation for further exploration.

Acknowledgments: This study was funded by WMed pilot grants.

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Integration of Poly(Glycerol Sebacate) and Polycaprolactone Scaffolds for Enhanced Tendon Regeneration

Chi Lee[1], Mitchell Kenter[2], Keith Kenter[2], Adil Akkouch[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI.

Introduction: Poly(glycerol sebacate) (PGS) and polycaprolactone (PCL) are both clinically and FDA-approved materials known for their biocompatibility and lack of harmful effects. These materials offer stacked properties suitable for tissue engineering applications. Through manipulation of their concentrations and processing conditions, such as printing fidelity influenced by voltages and speed, it is possible to fine-tune the physical properties of scaffolds. These modifications are crucial for promoting cell adhesion, migration, and maturation of tissue, which are essential for tendon repair. This study focuses on the synthesis and characterization of 3D printed scaffolds using PGS and PCL, examining their degradation profiles, surface wettability, mechanical properties, and biological compatibility with fibroblasts.

Methods: The scaffolds were analyzed for degradation in PBS and NaOH (pH 7 and 13), surface wettability through contact angle measurements, and mechanical testing to evaluate their mechanical properties. Biological assessments were conducted with fibroblasts to quantify cell adhesion, proliferation (using Alamar blue assay), and cytotoxicity (using Lactate dehydrogenase as a marker). Cell adhesion was evaluated after 24 hours of seeding 30,000 cells per scaffold, and proliferation was assessed at days 3, 5, and 7. Cytotoxicity was examined after 1 and 3 days of culture. Imaging was performed using DAPI staining and fluorescence microscopy.

Results: The study revealed that there was no significant difference in biological outcomes (cell adhesion, proliferation, and cytotoxicity) between scaffolds. However, variations in scaffold properties such as degradation rates and mechanical strength were observed and could be controlled by adjusting the scaffold composition. These changes suggest the potential to tailor scaffold properties to match the mechanical stretching capabilities of tendons without compromising biological integrity.

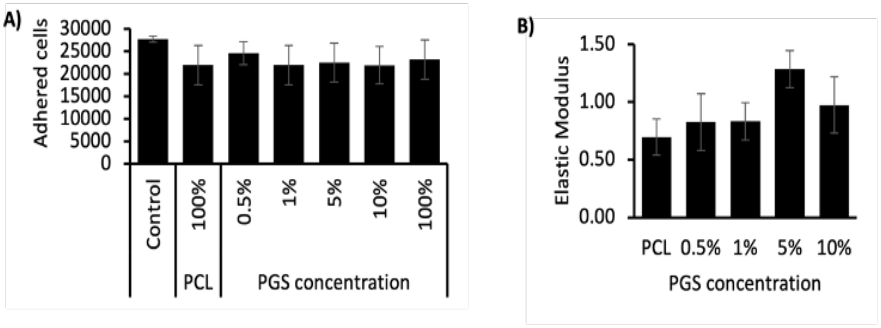

Figure: A) Adhesion of osteoblasts cultured for 16 hours on 3D printed PCL/PGS scaffolds showing no significant difference. B) Elastic modulus of scaffolds showing an increase in scaffolds stiffness with increased concentrations of PGS.

Conclusion/Clinical significance: The combination of PGS and PCL in 3D printed scaffolds improves their mechanical properties, and alongside adjustable parameters such as contact angle and degradation rate, supports their potential use in tendon regeneration. The scaffolds demonstrated compatibility with fibroblast cells, indicating their non-toxic nature and potential for promoting cell alignment and tissue maturation. These findings underscore the scaffolds' malleability and suitability as candidates for tendon repair, paving the way for future research utilizing tenocytes to further understand tissue regeneration processes.

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Implementation of an Emergency Department (ED) Quality Improvement Program to Improve care for ED Patients with Opioid Use Disorder at four Southwest Michigan Hospitals

Sidhvi Nekkanti[1], Zachary Paquin[1], Paul Bodenberg[2], Stacy Brousseau[2], Sarah Mckenzie[2], Anji Phillips[2], William Bettis[2], Christina Cameron[2], Mark Kerschner[1,2], Maureen McGlinchey Ford[1,2]
[1]Department of Emergency Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Bronson Health System, Kalamazoo, MI

Introduction: Opioid use disorder (OUD) causes significant, and still increasing, morbidity and mortality in the United States[1,2]. Opioid overdose remains one of the leading causes of death particularly among younger demographics[3]. 2.5 million Americans have OUD, yet only 1 in 5 (22 %) receive medications to treat it. [4] Patients who receive medication for OUD (MOUD) experience decreased mortality, overdose rates, and ED visits compared to those who do not[4-7].

Methods: In December 2022, the Bronson Health Foundation received a grant from the Michigan Opioid Partnership to develop an ED MOUD Program across Bronson Health System's four Emergency Departments from January 2023-September 2023. Monthly EPIC reports were generated to follow system related metrics including number of opioid related ED visits, EPIC monthly reports were generated to follow system and patient related metrics using 127 opioid related diagnostic codes.

Results: Opioid related ED visits stayed constant during the intervention period, between 25 to 35 visits were seen monthly system wide. Social work consults increased from an average of 50% between January-March to 66% between May-September. Recovery Coach consults increased from 4% in January to a high of 68% in September. Buprenorphine prescriptions increased from 0% to an average of 64% between the months of June-December. Ninety-five patients were started on buprenorphine during the grant period. There were zero episodes of precipitated withdrawal and zero episodes of respiratory depression requiring oxygen.

Discussion: This quality improvement initiative offered ED providers education resources, an ED buprenorphine dosing protocol, order sets with recommended buprenorphine dosing for both ED dosing and discharge prescriptions, and discharge referrals to community partners for follow-up buprenorphine treatment. Over the first nine months of our initiative, we have seen an increase in the quality of care for patients with OUD. Next steps include creating a registry of those identified with OUD for follow-up and analysis; increasing ED and community naloxone distribution; and identifying other ways we can better serve those struggling with OUD.

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Predicting Early Cognitive Dysfunction in Alzheimer's: A glucose uptake framework

Aya Hassouneh[1], Avinash Aravapalli[1], Sri Ram Karthik Bhagavatula[1], Alessander Danna-dos-Santos[2], Saad Shebrain[3], Bradley Bazuin[1], Ikhlas Abdel-Qader[1]
[1]Electrical and Computer Engineering, Western Michigan University, Kalamazoo, MI. [2]Department of Physical Therapy, Western Michigan University, Kalamazoo, MI. [3]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Early and accurate diagnosis is essential for effective management of Alzheimer's disease (AD) to improve treatment outcomes. This study proposes a diagnostic approach using 18F-labeled Fluorodeoxyglucose Positron Emission Tomography (18F-FDG PET) images from the Alzheimer's Disease Neuroimaging Initiative (ADNI). The primary goal is to classify Mild Cognitive Impairment (MCI), Early Mild Cognitive Impairment (EMCI), and Normal Subjects (CN).

Methods and Materials: The methodology involves segmenting the medical images using FMRIB Software Library (FSL) and calculating Standardized Uptake Value Ratios (SUVR) for glucose uptake in key segmented regions, including Grey Matter, White Matter, and Cerebrospinal Fluid (CSF). A support vector machine (SVM) is used for classification, to optimize performance and promote AD analysis. The proposed framework sets the stage for potential progress in diagnosing EMCI, foreseeing upcoming discoveries that could assist in discerning particular cognitive states within Alzheimer's disease. Neuroimaging data were obtained from a single location (ADNI) database. The images were selected from a specific type of imaging modality, 18F-FDG PET, chosen for its ability to facilitate the calculation of SUVR as a measure of glucose uptake. The dataset was designed to achieve balance across cognitive function categories, with 353 individuals with normal cognitive function (CN), 306 with early mild cognitive impairment (EMCI), and 346 with mild cognitive impairment (MCI). The gender distribution included 493 females and 512 males, with ages ranging from 55.3 to 93.8 years.

Results: PET imaging with 18F-FDG in AD consistently shows impaired glucose metabolism in specific brain regions. Without a doubt, amyloid deposition in the neurological pathway occurs before the local decline in brain glucose metabolism in AD. Although the analysis is still in progress, preliminary results reveal distinctions among cognitive groups, particularly between EMCI patients and CN/MCI.

Conclusion: This work's findings could improve our comprehension of AD, especially in its initial phases. The large dataset and innovative techniques used in this study provide a solid foundation for future developments in the recognition and classification of cognitive states in the context of Alzheimer's disease.

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Analysis of the B-1 Cell Repertoire Post-Pneumovax23 Vaccination in a Mouse Model of Sickle Cell Disease

Sydney M. Les, Naomi L. Tsuji, Nichol E. Holodick
Department of Investigative Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Sickle cell disease (SCD) is the most common hemoglobin disorder. Sickle cell patients are 600 times more susceptible to *Streptococcus pneumoniae* infections than the general population. Despite current interventions such as prophylactic antibiotics and vaccination, pneumococcal infection still poses a significant risk to sickle cell patients. Poor infection control in sickle cell patients is mainly due to antibiotic resistance and the emergence of non-vaccine serotypes of *S. pneumoniae*. The sickle cell environment leads to increased virulent strains of *S. pneumoniae* and differences in vaccine efficacy. The study of B-lymphocytes is critical when optimizing vaccination strategies, enhancing passive protection, and developing other treatments for mitigating infection in sickle cell patients. B-1a and B-1b cells are essential for both immediate and long-term protection and survival from *S. pneumoniae* infection, respectively. These B cell subsets produce antibodies recognizing discrete *S. pneumoniae* cell wall determinates such as phosphorylcholine (PC) and pneumococcal polysaccharide type 3 (PPS3).

Methods: We utilized a mouse model of sickle cell disease called the Townes model. Peritoneal and splenic B-1a and B-1b cells were sort purified from WT (healthy) and Townes (sickle cell disease) mice 14 days post-Pneumovax23 vaccination and then used for single-cell BCR repertoire analysis. In addition, we analyzed the amount of total IgM, PC-specific IgM, and PPS3-specific IgM in the serum of WT and Townes mice 0-, 7-, and 14 days post-Pneumovax23 vaccination.

Results: Our results demonstrate differences in the antibody repertoire of B-1a and B-1b cells obtained from WT and Townes mice pre- and post-vaccination. Importantly, we observe a shift in antibody specificity that dominates the B-1 cell response in mice with sickle cell disease. Townes mice also have significantly less PC-specific IgM 7 days post-vaccination but no difference in PPS3-specific IgM.

Conclusions: Our results showing a specific alteration in the B-1 cell antibody response to pneumococcal vaccination suggests a lack of protective response in sickle cell disease. Thus, understanding the response to pneumococcal vaccine in sickle cell disease will help drive the development of therapeutic strategies for antibody defense against *S. pneumoniae* infections and work towards improved outcomes in patients with sickle cell disease.

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Impact of TLR Stimulation on the CD5+ and CD5- B-1 Cell Repertoires with Age

Morgan Helmich, Sarah Webster, Naomi Tsuji, Nichol Holodick
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: CD5+ B-1 and CD5- B-1 cells are essential for immediate and long-term protection from infections, respectively. CD5+ B-1 cells develop primarily during fetal life, requiring self-antigen recognition and strong B Cell Receptor (BCR) signaling. As such, CD5+ B-1 cells display a self-reactive repertoire. Expression of CD5 on B-1 impairs B-1 cells' responsiveness to antigen. However, B-1 cells can respond to BCR signaling with toll-like receptor (TLR) engagement, which downregulates CD5. Therefore, inappropriate activation of B-1 cells leading to autoimmunity is prevented through control of BCR activation by TLR signaling downregulating CD5. TLR activation also facilitates a rapid response of B-1 cells to bacterial infections. The incidence and mortality rate for pneumococcal infection increases dramatically after age 65. Our previously published data demonstrated that natural IgM produced by CD5+ B-1 cells fails to provide protection against pneumococcal infection in aged males. It is unknown why the protective capacity of young male B-1 cells is not retained in aged males. We examined whether there is a difference in the CD5+ and CD5- B-1 cell antibody repertoire that is expanded after CD5+ B-1 cells are stimulated with a TLR ligand in young and aged mice.

Methods: CD5+ B-1 cells were isolated from young (3-month) and aged (23-month) male BALB/c-ByJ mice by sort purification and then cultured with 6 ug/ml of LPS for 48 hours. Afterward, CD5+ and CD5- B-1 cells were single-cell sorted, and then BCR repertoire analysis was performed.

Results: After LPS stimulation, the CD5+ B-1 cells that have down-regulated CD5 display a significant increase in VH11 and VH12 usage and a decrease in VH1 usage. The B-1 cells that remained CD5+ post-LPS stimulation increased VH1 usage. In addition, LPS-stimulated CD5+ B-1 cells from young males retain more CD5+ B-1 cells (46%) than aged males (16%).

Conclusions: These results demonstrate repertoire differences between CD5+ and CD5- B-1 cells post TLR stimulation and a difference in CD5 downregulation between young and aged male B-1 cells. These results suggest differential responsiveness to antigen activation between young and aged males, which has implications for lack of protection from infection into old age.

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Weight Management: A resource poster for enhancing treatment selection

Ibrahim Zahid[1], Michael Terrio[1], Ian Crumm[1], Zafir Khan[1], Blair Graham[1], Aidrian Ranjith[1], Tracey Mersfelder[2], Kevin Kavanaugh[1]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Ferris State University College of Pharmacy, Big Rapids, MI

Introduction: More than two-thirds of the population of the United States is overweight or obese [1]. In addition, a majority of the leading causes of death and disability like diabetes and coronary artery disease are closely linked to obesity. Primary care physicians (PCP) commonly encounter scenarios of weight loss management, and staying up to date with the latest guidelines about the pharmacotherapy is challenging. With this quality improvement project, we aimed to determine physicians' knowledge about weight management pharmacotherapy in addition to their attitude towards using a resource education poster for weight loss management in a PCP clinic.

Methods: A REDCap survey was electronically sent via email to 37 internal medicine and 16 medicine-pediatric residents along with 11 internal medicine and 4 medicine-pediatric, faculty regarding their level of confidence and knowledge of obesity medication therapy. Frequencies and percentages were analyzed for categorical variables. The study was determined to be non-human subject research by the Institutional Review Board.

Results: The survey had a response rate of 53% (n=36). While the majority of the survey population was able to correctly answer the knowledge questions; there were still a good number of physicians who were unsure of some of the correct responses. The correct response rate ranged from 19% to 92% (average 52.8%) depending on the question asked. The participating physicians displayed a positive attitude stating that the use of a poster for weight management medications would decrease the risk of adverse effects in their patients (83%, n=30), would help incorporate medication cost into the treatment selection (83%, n=30), and would help the PCPs be more comfortable in prescribing those medicines (92%, n=33).

Conclusion: The survey results showed a knowledge gap regarding weight loss medications but reflected a positive attitude regarding the use of the poster for pharmacotherapy of weight loss management.

Reference: Health, United States, 2015: National Center for Health Statistics, 2016:461.

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Acute Myocardial Infarction in Pediatric Population

Gabriel Assis de Carlos[1], Asra Usmani[1], Thomas Melgar[1,2], Mahesh Shrestha[1]
[1]Department of Pediatrics, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI.
[2]Department of Internal Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Adult heart attack/myocardial infarction (MI) while well described and intervention guidelines well established, does not translate well to the pediatric population [1]. The etiology of pediatric MI is different than in adults and remains diverse (e.g. congenital malformations, rheumatologic syndromes, infectious, trauma) [2]. Current medical literature lacks epidemiological studies investigating pediatric acute myocardial infarction and associated co-occurrences. In this study, we aim to explore the incidence and risk factors associated with acute myocardial infarction in the pediatric population.

Methods: This population-based study used the Healthcare Utilization Project/Nationwide Inpatient Sample database to characterize the trends of acute myocardial infarction admissions in children aged 21 years or less in the United States from 2016–2020 using ICD-10 diagnostic codes.

Results: Weighted incidence in the US over this 5-year period was 4995 (SE ± 65.89), with a 70% increase in incidence between 2016 to 2020. Median age was 19.04 years (SE ± 0.06), with 67.1% in males (SE ± 1.4), and 45.64% white. The most common associated co-occurrences were cannabis use (19.41% ± 1.26), nutritional deficiencies (7.70% ± 0.83), and cocaine use (7.20% ± 0.81). Case fatality rate was 13% (655 ± 53.25).

Conclusion: This nationwide review suggests a significant increase in the incidence of acute MI in the pediatric population and its associated co-occurrences, with an elevated case fatality rate. It provides critical additional information about patients' demographics and substantiates known risk factors and rarely reported co-occurrences raising pertinent concerns about pediatric cardiac health. Despite its limitation of relying solely on diagnostic codes for hospitalization, the magnitude of the database is a significant strength of this study.

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[1] Thygesen, K., et al (2018) Circulation 138.20: e618-e651. [2] Chalmers, E. A. (2001) Blood reviews 15.4: 181-189.

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The Effects of Hyperglycemia on Osteoblasts Proliferation and Differentiation

Kyra Grove[1], Mitchell Kenter[2], Adil Akkouch[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI.

Introduction: Diabetes mellitus (DM) includes an array of metabolic diseases characterized by chronic hyperglycemia due to either decreased insulin production or decreased insulin sensitivity. DM is a growing pandemic affecting 10% of the world's population and patients with the disease, especially type 1, have an increased fracture risk and decreased bone mineral density. The purpose of this study is to understand the effects of chronic hyperglycemia on osteogenic proliferation and differentiation of osteoblasts.

Methods: Human osteosarcoma cells (SAOS-2 cell line) were cultured in low (0.9 mg/mL), medium (2 mg/mL), or high (28 mg/mL) glucose concentrations in either normal completed growth medium (GM) or osteogenic differentiation medium (DM). The DM contained dexamethasone, ascorbic acid, and β-glycerol-phosphate. AlamarBlue Assay was used to assess cytotoxicity and cellular proliferation. Osteogenic differentiation was assessed via Alkaline Phosphatase Activity (ALP) assay. To evaluate calcium-rich deposits by osteoblasts, Alizarin Red S (ARS) staining was used. The red stain was extracted using cetylpyridinium chloride (CPC) and the optical density was measured at 550 nm. Total RNA was extracted at 3, 7 and 7 days, and gene expression of inflammatory (IL-6), osteogenic (osteocalcin), and adipogenic (PPARγ) markers was analyzed using RT-qPCR.

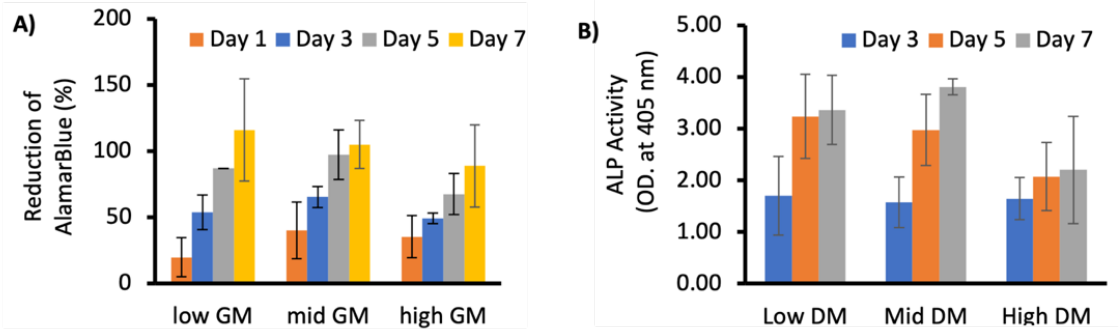

Figure: A) Proliferation of osteoblasts cultured with growth medium (GM) with increased concentrations of glucose showing decrease in proliferation. B) ALP activity of osteoblasts cultured with differentiation medium (DM) with increased concentrations of glucose showing decrease in osteogenic activity with increased glucose concentrations.

Results: AlamarBlue results demonstrated that osteoblasts cultured in high glucose concentrations showed decreased cell proliferation at all time points. Furthermore, decreased osteoblast ALP activity and mineralization was observed in cells cultured in high glucose concentrations when compared to cultured cells on media containing low and medium glucose concentrations. High glucose treatment in growth medium resulted in significant increase in the gene expression of both IL-6 and PPARγ and a decrease in osteocalcin at 7 days.

Conclusions: This data suggests that chronic hyperglycemia is a potential cause of the adverse effects of DM on bone health. Further research is necessary to elucidate the specific mechanism of hyperglycemic effects on osteogenic differentiation and proliferation. In the future, we will study the synergistic effect of anti-diabetic drugs and high glucose levels on the osteogenic potential of osteoblasts.

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To Leak or Not to Leak: Is Enterococcus the answer to the question?

Mikayla Moody, Tjasa Hranjec, Robert Sawyer
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: *Pseudomonas aeruginosa* and *Enterococcus* species have been linked with anastamotic leak. We hypothesized that these bacteria would contribute to anastamotic breakdown following bowel resection in surgical patients as well.

Methods: Between 1997 and 2003, adult patients with intra-abdominal infection after resection of bowel and creation of primary anastomosis were evaluated retrospectively. Univariate analysis evaluated demographic and infection data, while risk factors for anastamotic leak and patient mortality were evaluated via multivariate analysis.

Results: A total of 713 patients with intra-abdominal infections were identified, 267 (37.4%) with an anastamotic leak. Patients with anastamotic leak were likely to be admitted to the intensive care unit and have prolonged hospital stay, despite earlier initiation of antibiotics. The most commonly isolated organisms—Pseudomonas, Enterococcus, and Candida, were not associated with increased risk of anastamotic leak even after adjusting for risk factors. APACHE 2 score, increasing age, and need for transfusion were the most important predictors of mortality. While Candida spp. were associated with a 67% increase in adjusted mortality, Enterococcus and Pseudomonas were not.

Table 1: variables associated with mortality in anastomotic leak ($p<0.05$).

Variable	Wald Chisq	P-value	OR	95% CI
Age (ref. 65-75)	13.49	0.0002	1.034	1.016-1.052
Transfusion	16.97	<0.0001	3.41	1.902-6.111
APACHE2	25.83	<0.0001	1.093	1.056-1.032
Race	4.63	0.0314	0.438	0.207-0.929
Leak versus contamination/perforation	5.56	0.0619	1.046	0.633-1.729
			0.482	0.247-0.941
Candida co-infection	4.54	0.0331	0.630	0.248-1.598
Steroid treatment	4.49	0.0341	2.218	1.062-4.632

Conclusion: Neither *Pseudomonas* nor *Enterococcus* infection was associated with anastamotic leak. The main predictor was treatment with steroids. Further analysis is needed to assess the relationship between enterococci and anastamotic leak.

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Exploring Street Medicine Programs in the Northern U.S.: Opportunities for interprofessional training and healthcare delivery

Benjamin Root[1], Paulina Cradeur[1], Megan Brezka[1], Cassidy Hinton[1], Sam Natla[1], Elizabeth Wang[1], Nicholas Helmstetter[1], Sravani Alluri[1]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI.

Introduction: Street Medicine Programs (SMPs) provide medical care directly to people experiencing unsheltered homelessness and are often housed at medical schools and residency programs. There is increasing recognition that SMPs provide a unique and valuable training environment for medical students, residents, and allied healthcare professionals, but there are no published reports detailing how many SMPs exist, what training and curriculum they offer, and what services they provide to their communities.

This is a first-of-its-kind study surveying the medical education and training opportunities present at SMPs in the northern U.S. Also presented are data concerning the prevalence of SMPs, enumeration of the medical and social services they provide, interprofessional personnel represented, diversity of patient demographics, budgetary requirements, funding sources, and safety data.

Methods: A mixed-methods electronic survey was designed and the WMed IRB declared this "exempt" research. The survey was distributed to SMP Medical Directors in an eight-state area of the northern U.S. between February 2023 and February 2024. Potential respondents were identified via an online directory of SMPs, Google search, personal contacts of the authors, and by referral from existing respondents (snowball method). Respondents were given a $35 Amazon gift card incentive after survey completion. Descriptive data analysis was completed with R software and Microsoft Excel. Theme analysis was undertaken on qualitative data.

Results: 28 SMPs were identified. 18 (64%) SMPs completed the survey. 16 (89%) programs host trainees from medical schools, medical residencies, or allied healthcare programs. 13 (72%) provide Street Medicine related curriculum to trainees including lectures, elective courses, or longitudinal learning tracks. Common services that SMPs provide are wound care, acute care, chronic disease management, and substance use disorder treatment.

Discussion: SMPs are highly prevalent in the northern U.S. and provide an intensely interprofessional environment for healthcare trainees. SMPs provide practical experience with social determinants of health, trauma-informed care, cross-cultural communication, and homeless populations who carry extremely high morbidity and mortality. SMPs must be considered an important emerging environment for medical education and training and further study should be undertaken.

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Does Gender Play a Role in HCV and Cancer Screening Among the Unhoused?

Talal Al-Assil[1], Claire Kalina[1], Madison Laird[1], Nataly Dawood[1], Raven Riordan[1], Neya Suresh Kumar[1], Ryan Olivier[1], Saad Shebrain[1], Cheryl Dickson[1], Gitonga Munene[1,2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]West Michigan Cancer Center, Kalamazoo, MI

Introduction: Cancer rates are notably higher in the unhoused population of the US, yet screening uptake remains low despite Medicaid/Medicare eligibility. This study by medical students aimed to identify barriers to cancer screening among the unhoused in Kalamazoo, MI, to shed light on existing disparities.

Methodology: Surveys were conducted at two homeless shelters, with participants answering 15 questions regarding demographics and risk factors for Hepatitis C virus (HCV) and various cancers. Data on screening rates and barriers were analyzed for each gender and compared via statistical analysis and in graphs.

Results: Out of 143 participants, the majority were male (73%). Women reported a shorter median duration of homelessness compared to men (5 months vs. 18 months). The most cited barriers to screening were lack of access or awareness, transportation issues, and prioritization of other needs. The HCV screening rate stood at 55%, with no gender disparity. However, willingness for HCV screening was higher in women (83%) than in men (49%). Colon cancer screening rates were similar for both genders (around 45%), while lung cancer screening willingness was higher among men. Cervical cancer screening uptake was 77%, but breast cancer screening was only 40%.

Discussion/Conclusion: While the discrepancies between genders may not be immediately apparent, our data shows that developing targeted interventions and tailoring the delivery of adequate cancer screenings to the unhoused require consideration of gender as a key factor. Women's perceived barriers differ slightly from men's, and generally-speaking, they undergo more cancer screenings per year compared with men. The reluctance among male participants to engage in HCV screening has been observed in other studies and as our study demonstrates, it is likely related to informational barriers. These findings warrant exploration to understand the exact causes behind this discrepancy, especially given that HCV is both easily testable and treatable.

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3D Printed Electrically Conductive Scaffolds to Restore Bone Environment

Kunal Ranat[1], Mitchell Kenter[2], Lydia Williams[3], Keith Kenter[2], Adil Akkouch[2]
[1]Western Michigan Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [3]Depauw University, Greencastle, IN

Introduction: Large or poorly healing bone fractures continue to be a growing concern given their susceptibility to lead to delayed unions or nonunions. To enhance bone healing, we have been fabricating electrically conductive scaffolds using melt electrowriting (MEW) to serve as a foundation for bone regeneration. Having successfully printed poly(3,4-ethylenedioxythiophene)-polycaprolactone **(**PEDOT-PCL) composite scaffolds, our objective of this study is to evaluate the cytotoxicity, biocompatibility, and mechanical properties of these scaffolds to determine if they are viable substrates for recapitulating the bone environment.

Methods: PEDOT nanoparticles were synthesized and mixed with PCL to create mixtures of 0%, 0.5%, 1%, and 1.5% PEDOT concentration. Scaffolds were printed with a MEW printer using the composite polymers with an electrical field of 5 kV. A Texture Analyzer was then used for evaluation of their mechanical properties. Next, scaffolds were loaded with osteoblasts and transferred to an empty well plate to account for successful cell adherence. AlamarBlue assay was used to elucidate scaffold cytotoxicity and osteoblast proliferation, and DAPI staining was used to visualize cells on scaffolds. Lastly, statistical analyses were conducted using t-test (significance $p \leq 0.05$).

Results: The average peak force withstood, and average tensile strength of scaffolds significantly increased as PEDOT concentrations increased compared to PCL alone. Each PEDOT-PCL scaffold group exhibited at least a 2-fold increase in these parameters with the 1.5% PEDOT-PCL scaffolds having the greatest peak force and tensile strength out of all groups. No difference was seen in the elastic modulus between groups. The 1.5% PEDOT-PCL group also demonstrated the highest difference in reduction of AlamarBlue compared to all other groups after 7 days. Scaffolds fabricated with 1% PEDOT-PCL and PCL alone were found to have a similar reduction in AlamarBlue and 0.5% PEDOT-PCL scaffolds resulted in the lowest AlamarBlue conversion.

Conclusion: Our study demonstrates that increasing the concentration of PEDOT within the polymer mixture results in scaffolds with the greatest tensile strength. The 1.5% PEDOT-PCL composite demonstrated the greatest tensile strength and peak force endured while also allowing for the highest proliferation and metabolic activity of osteoblasts.

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Combinatory Effect of Niobium and Strontium on Osteogenesis

Suhaib Ellythy[1], Shelby Chaney[1], Mitchell Kenter[2], Adil Akkouch[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Ceramics implants for bone regeneration incorporating strontium and niobium offer promising potential due to their unique properties. Strontium is known to enhance osteogenic activity and inhibit bone resorption, while niobium contributes to improved mechanical strength and biocompatibility. When combined, these elements create a ceramic material that not only promotes bone formation but also provides structural integrity, making it a compelling candidate for applications in bone tissue engineering and regeneration. The primary objective of this study is to investigate the mechanistic underpinnings of Strontium and Niobium, discerning their synergistic actions, and establishing the optimal in-situ dosage for efficacious application in ceramics formulation for bone regeneration and healing.

Methods: Human Osteosarcoma cell line (Saos-2) were treated with concentrations of Nb or Strontium or a mixture of both. The cells were incubated for 2 weeks. AlamarBlue assay was used to evaluate metabolic activity and cellular health. Alkaline Phosphatase activity (ALP) was used was measured using p-nitrophenyl phosphate (pNPP). Total RNA was extracted, and RT-qPCR was used to elucidate gene expression related to osteogenesis and vascularization. The markers targeted were ALP, Interleukin-6 (IL-6), Interleukin-8 (IL-8), RUNX-2, and Osteocalcin (OCN).

Results: Previously we have shown that the optimal concentrations that enhances proliferation and ALP activity of Nb were between 0.025- and 0.05-mM while optimal concentrations of Sr were between 0.5- and 1-mM. We further investigated the gene expression of cells treated for 7 days using these concentrations especially when using regular growth medium without osteogenic supplements. Our results showed that Nb increased the gene expression of ALP, OCN but showed no changes in RUNX-2 and IL-6 expression. Notably, Sr showed the highest increase in the expression of these genes including RUNX-2 and IL-6.

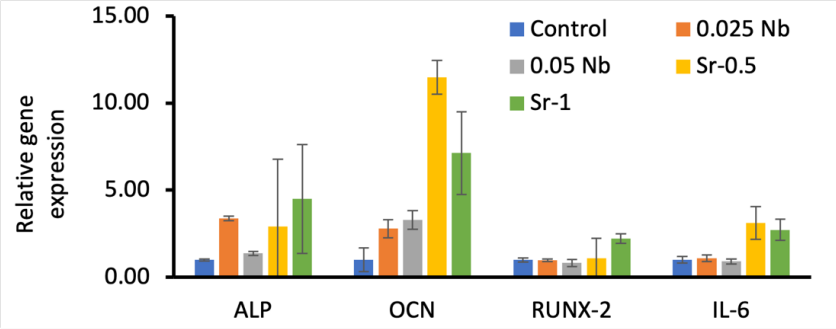

Figure: Gene expression of osteogenic markers of osteoblasts cultured with increased concentrations of Nb and Sr at 7 days using regular growth medium.

Conclusion/Clinical significance: Determining the optimal osteogenic and angiogenic combinations of Nb and Sr will enhance the osteoactivity of ceramics implants used in bone healing and vascularization in vivo.

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Elevated IL-6, Ferritin, and D-Dimer: Biomarkers of atherosclerotic cardiovascular disease in post-mortem vitreous humor analysis

Mohamed Said[1], Jessica Adamczyk[2], Roberta Grieger-Nimmo[3], Patrick Hansma[2], Prentiss Jones[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Pathology, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [3]Randox Laboratories, Randox Laboratories Ltd, Northern Ireland, United Kingdom

Introduction: Vitreous humor has previously been established as a viable measure of immune-related ocular changes in the analysis of diabetic retinopathy. However, the effectiveness of vitreous humor in the analysis of systemic disease has not been examined. This study investigated the levels of inflammatory markers in the vitreous humor of deceased individuals with atherosclerotic cardiovascular disease (ACVD) as the primary cause of death to reveal their peri-mortem inflammatory states.

Methods: The cohort comprised 21 post-mortem specimens with ACVD identified as the primary cause of death. Employing the Evidence MultiSTAT, an automated immunoassay device, we quantified the levels of nine acute phase reactants, namely Interleukin-1 beta (IL-1β), Interleukin-2 (IL-2), Interleukin-6 (IL-6), Interleukin-15 (IL-15), Monocyte Chemoattractant Protein-1 (MCP-1), Tumor necrosis factor-alpha (TNF-α), Interferon-gamma (IFN-γ), Ferritin, and D-Dimer. A case-control methodology was adopted, contrasting these post-mortem findings against findings we generated from gunshot wound decedents as our non-pathological control.

Results: The analysis revealed the ACVD subjects exhibited significantly higher concentrations of IL-6, Ferritin, and D-dimer ($p < 0.05$), establishing a correlation between these markers and cardiovascular mortality.

Conclusion: Currently, cardiovascular disease research underscores a link between inflammation and cardiac ailments, emphasizing the critical role of cytokines. IL-6 is recognized for its dual effects on vascular pathophysiology, including its involvement in atherosclerotic progression. Furthermore, elevated D-dimer levels have been acknowledged as an independent predictor of imminent cardiovascular events, suggesting that cytokines hold substantial promise as biomarkers of ACVD. Ferritin has not been implicated in cardiovascular disease, making our findings a novel contribution.

Our results support the hypothesis that specific cytokines are not only involved in the development of cardiovascular conditions but are also indicative of disease severity and mortality. The significant association of these markers with ACVD mortality suggests their potential utility in clinical settings as prognostic biomarkers for patient assessment and management. This investigation underscores the critical role of inflammation in cardiovascular diseases and highlights IL-6, Ferritin, and D-dimer as significant biomarkers for assessing ACVD risk and its relevance to ocular pathophysiology, using vitreous humor to study post-mortem inflammatory states, beyond its common use for evaluating electrolyte levels.

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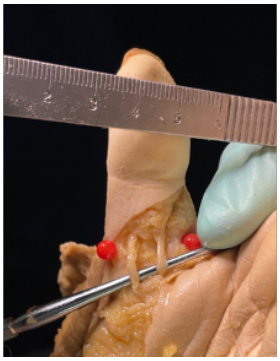
Does That Thumb Trigger Finger Release Have You Feeling “Nerve”-ous

Richa Gupta[1], Sumit S. Patel[2], Raymond H. Bayer[2], Max Albiero[2], Mayron Lichterman[2], David L. Mayor[2]
[1] Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2] Department of Orthopaedics, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: The radial and ulnar digital nerves (RDN and UDN) to the thumb play a vital role in relaying sensory information from the respective divisions of the thumb.[1] Surgical procedures involving the hand require strong understanding of the anatomical pathway of these nerves. In particular, trigger finger release of the thumb requires strong understanding of the RDN pathway to reduce risk of iatrogenic injury of the hand.[2] Thus, the goal of this study was to explore variation in the pathways of RDN and UDNs to the thumb as they cross the proximal thumb flexion crease.

Methods: 21 soft-embalmed, cadaveric hands were dissected by three orthopaedic surgery residents. Each hand was photographed using an iPhone 14 pro 48-megapixel camera (Figure 1). ImageJ software was used to determine the total length of the crease as well as the distance from the radial edge of the flexion crease to both the RDN and UDNs of the thumb.

Results: On average, the UDN crossed at approximately 72% ± 8.2% of the distance between the radial and ulnar edges of the flexion crease, while the RDN crossed at 36.4% ± 9.4%. The UDN crossed at the ulnar third of the crease in 81.0% of patients and in the middle third in 19.0% of patients. The RDN crossed at the radial third of the crease in 43.0% of patients and in the middle third in 57.0% of patients (Figure 2).



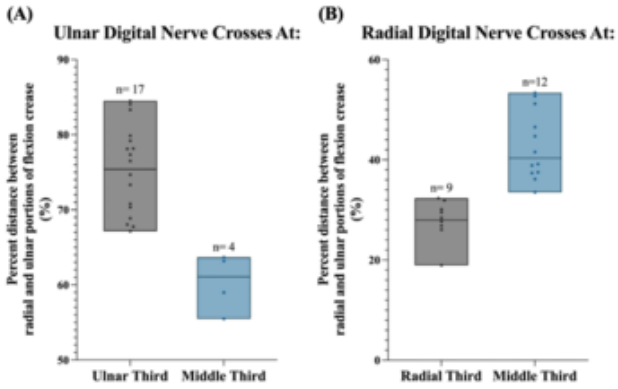


Figure 1 (Left): Photographs of dissected cadaveric specimens with marked proximal flexion crease. **Figure 2 (Right):** Bar graph demonstrating the location the (A) UDN and (B) RDN crosses the flexion crease.

Conclusions: Our investigation suggests the UDN predictably crosses the crease in the ulnar third of the thumb flexion crease. With less consistency, our data also demonstrates the RDN crosses most predictably in the middle third followed by the radial third. This information will support surgeons in performing safe procedures near the thumb, including trigger release of the thumb, with minimization of iatrogenic injury to a digital nerve.

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Cradle Kalamazoo: A Review of a decade of community research to reduce black infant mortality in Kalamazoo

Ruth Butters[1], Amanda Wewer[1], Fernando Ospina[1], Ouen Hunter[2], Vaishali Patil[1], Nia Evans[1], Cynthia Bane[1], Catherine Kothari[1]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]YWCA, Kalamazoo, MI

Introduction: Extending back to the 1990's, a network of organizations and community members has been working to address the distal (structural, political, and economic) factors and proximate (community, organizational, family, and individual) factors that contribute to racial disparities in infant mortality. Research has foundational to this collective impact effort. Collaboration with dozens of community and academic partners has produced a stream of action-oriented research to inform Cradle systems change efforts. This project seeks to outline a Cradle research agenda and demonstrate the types of research arising from long-term community-based-participatory-research efforts to reduce Black infant mortality in Kalamazoo.

Methods: This document review examines a sample of over 35 academic publications, reports, and presentations tied to Kalamazoo community research to reduce Black infant mortality from 2006 to present. Researchers seek to develop themes, a timeline, and identify an overall "research program" research documents, as well as outline future research plans and opportunities to further integrate community research into WMed.

Results: Preliminary findings suggest that early Cradle research was focused on identifying patterns in racial disparities, followed by the integration of the lived experiences of Kalamazoo families through the Mom's Health Experiences survey and the creation of the Community Voice Panel. This research contributed to a focus on examining the factors that influence the effectiveness and quality of home visitation.

Conclusion: Preliminary results of this review show that WMed has played a central role in identifying broad patterns in Kalamazoo Black infant mortality from the start of Cradle efforts. This research has evolved to encompass the lived experiences of birthing families, identification of organizational level patterns in care coordination, and implementation of solutions in collaboration with community stakeholders. Currently, Cradle research appears to be focused on the integration of social determinants of health into healthcare settings. Additional qualitative analysis will provide valuable insights for advancing Cradle's research program to reduce Black infant mortality, informing improvement of overall health outcomes in our community. Future Cradle research seeks to expand to inform policy to improve the integration of social determinants of health to improve health outcomes.

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Examining Stress, Coping and Discrimination in Nursing: A feasibility study

Maria Roche-Dean[1], Vaishali Patil[2]
[1]Western Michigan University, Kalamazoo, MI. [2]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Background: Nurses, like other healthcare professionals, have had to work with critical staffing shortages exacerbated by the COVID-19 pandemic inherently increasing their stress. Staffing shortages and poor working conditions existed before the pandemic; however, more nurses have recently expressed plans to reduce their work hours or leave their positions (Medvec et al., 2023). Increasing recruitment efforts for more people to join the Nursing profession will not adequately resolve the shortage; a multipronged approach including retaining current nurses is needed. Moreover, the Future of Nursing 2020-2030 report emphasizes the need for the nursing profession to mirror the diversity of the United States population (National Academies of Sciences, Engineering, and Medicine, 2021), thus attaining an inclusive healthcare environment requires extending the research agenda to incorporate the experiences and perspectives of diverse groups of nurses.

Objective: This fidelity study was conducted to examine the feasibility of recruiting diverse nurses, into research on perceived stress, anxiety, and coping. Secondly, explore the use of the Everyday discrimination scale in diverse nursing populations.

Study Design: Participant recruitment occurred over 6 months with support from the Muskegon Chapter of the National Black Nurses Association who shared flyers with their members electronically and on social media including Facebook, and LinkedIn. Participants completed an anonymous Qualtrics survey which included items measuring Perceived stress, Generalized anxiety, Brief cope, and Everyday discrimination.

Results: A total of 30 participants completed the survey. Based on the results participants self-identified as: 3% Latino, 77% White, and 20% Black/African American. Furthermore, 93% of participants were born in the US and 7% were US citizens by naturalization. Overall, participants reported experiencing discrimination on all the items on the EDS. Some of the EDS items mean scores indicate that nurses were “called names or insulted” (4.14), were “threatened or harassed (4.68).

Future research should be extended to more nursing and other healthcare professions to explore current everyday discrimination, stress, and coping experiences. Understanding these experiences will inform healthcare and academic leaders for effective recruitment and retention strategies for health disciplines to effectively mirror the US population.

IRB Reference: IRB-2022-175

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Anti-Bias Data Collection: A model to improve race and ethnicity data collection in service provision

Fernando Ospina[1], Sara Carroll-Muñiz[2]
[1]Western Michigan University Homer Styker M.D. School of Medicine, Kalamazoo, MI. [2]ERACCE, Kalamazoo, MI

Introduction: Accurate data on race and ethnicity is essential for identifying disparities in service and outcomes. Many barriers exist to collecting this data including, confusion and misunderstandings about the concepts of race and ethnicity, discomfort and fear of service providers, beliefs that race and ethnicity is a taboo topic, administrative rules and reporting requirements, lack of clear policy, and inadequate data systems. Effective data collection is essential for reducing racial and ethnic disparities. The purpose of this study is to elaborate a race and ethnicity data collection model to improve the quality and utility of race and ethnicity data, informed by a pilot implementation of the model.

Methods: The author, in collaboration antiracism practitioners, child welfare professionals, and early childhood development scholars created and piloted a data collection model for child welfare practitioners. This study uses ethnographic observation, document analysis, and surveys to elaborate the theory underlying the data collection model and assess pilot implementation from February 2022 to November 2023.

Results: The Anti-Bias data collection model uses early childhood education theory and practice to increase skill and comfort with discussing social identity and human difference and implementation practices used in health care settings, translated to a child welfare context. Pilot efforts included the development of implementation teams, drafting of race/ethnicity data collection policy, and data system recommendations. Implementation teams report early patterns of discomfort in collecting and using race/ethnicity data with increased comfort as the pilot proceeds; extending into identification of social supports, cultural practices, and increased trust and rapport with clients. Some practitioners continue to express discomfort collecting data. Data collection was conducted under WMU IRB, exempt.

Conclusion/Clinical significance: The Anti-Bias Data Collection model shows evidence of contributing increased comfort with collecting race and ethnicity and discussing case-relevant cultural practices and social circumstances. This model shows promise as a race/ethnicity data collection practice capable of being translated into multiple practice settings. Improved race/ethnicity data collection and use is essential for reducing racial disparities. This model can benefit from being tested in other settings and more rigorous research methods.

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Gender Variations in 30-day Outcomes Following Cholecystectomy in Patients with Acute Biliary (Gallstone) Pancreatitis

Nicholas Stevens, Alain Elian, Saad Shebrain
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Biliary (gallstone) pancreatitis is a potentially serious complication of gallstone disease and a common cause of pancreatitis in the United States. The more severe forms are associated with increased morbidity and mortality. This study aims to evaluate whether gender is associated with worse 30-day postoperative outcomes following cholecystectomy for acute biliary pancreatitis.

Methods: Patients in the ACS-NSQIP database (2014-2017) with a diagnosis of acute biliary pancreatitis who underwent cholecystectomy were included in this study. Two groups, male and female gender as reported in the database, were compared. Patients' demographic characteristics, perioperative data, and 30-day postoperative outcomes were analyzed and both univariate and multivariable logistic regressions were performed.

Result: Of 4158 patients with acute biliary pancreatitis [ICD-10], 2602 (62.6%) were female. Overall, there were no differences in the majority of demographics and comorbidities between the genders. However, male gender was found to have a significantly higher proportion of open procedures (6.1% vs. 3.3%, p<.001), as well as past medical history notable for diabetes (22.0% vs. 12.7%, p<.001), COPD (4.2% vs. 2.6%, p<.001), hypertension (51.3% vs. 34.2%, p<.001), end stage renal disease on hemodialysis (1.5% vs. 0.8%, p=.041), and bleeding disorders (6.9% vs 3.5%, p<.001). The female group was younger, with a mean age (SD) of 50 (19) vs. 58 (16) years, p<.001. 30-day outcomes demonstrated that the male gender had a significantly higher rate of both serious morbidity (4.9% vs. 2.6%, p<.001) and overall morbidity (7.9% vs. 4.5%, p<.001). On multivariable analysis, male gender was an independent predictor of serious morbidity (OR 1.55, 95% CI [1.10, 2.20], p=0.015). The readmission rate was also higher (6.6% vs. 5.0%, p=0.039) for males, though the median time interval between surgery and readmission was noted to be shorter for the female gender (8 vs. 12 days, p=.002). Of the 240 (5.8%) patients that developed complications post-operatively, 60% (144/240) had serious complications. There were no differences in mortality between the two groups.

Conclusion: Male gender is associated with an increased rate of serious morbidity after cholecystectomy in patients with acute biliary pancreatitis, however there is no difference in mortality between the male and female genders.

POSTER PRESENTATIONS LIST OF ABSTRACTS

1

A Case of Tizanidine and Lisinopril Interaction Causing Hypotension

Kayla M. Setzer[1], Nicholas P. Baldwin[2], Tracey L. Mersfelder[2], Matthew E. Kelly[1]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Ferris State University College of Pharmacy, Big Rapids, MI

Introduction: Tizanidine, a commonly used muscle relaxant, exerts its mechanism as a centrally acting α2-adrenergic receptor agonist by binding to imidazoline receptors with high affinity. Bradycardia and hypotension are adverse effects that are associated with α2-adrenergic receptor agonists in a dose-dependent fashion; however, tizanidine has been reported to exhibit these to a lesser degree than clonidine. We present a case of hypotension caused by a tizanidine and lisinopril drug interaction.

Case Presentation: A 57-year-old male with a past medical history of type 2 diabetes, hypertension, coronary artery disease, and chronic back pain presented with chest pain, epigastric abdominal pain, and severe hypertension. His pertinent medication history consisted of metoprolol tartrate, lisinopril, hydralazine, hydrochlorothiazide, and tizanidine.

On the day of admission, the patient was restarted on lisinopril 20 mg once daily and metoprolol succinate 25 mg twice daily for blood pressure control. The following day, the patient's home dose of tizanidine 8 mg three times daily was resumed upon his request. Following administration of his morning medications of lisinopril, metoprolol, and tizanidine, the patient's blood pressure dropped from 185/83 mmHg to 84/52 mm Hg, during which he remained asymptomatic, a fluid bolus was administered, and blood pressure improved. Further hypotensive events continued that correlated with the dosing of tizanidine and were more pronounced with the concomitant administration of lisinopril. After tizanidine was discontinued, the patient's blood pressure remained in the 150s/50s. The patient was discharged on his home antihypertensive regimen and tizanidine was discontinued.

Discussion: Tizanidine interaction with lisinopril causing hypotension is a rare but potentially life-threatening reaction. Other case reports have been identified describing this adverse effect resulting from the drug interaction. It is believed our patient experienced this reaction with a score of 4 (possible relationship) on both the Naranjo ADR Probability Scale and Drug Interaction Probability Scale (DIPS). Treatment consisted of discontinuing tizanidine and switching to another muscle relaxant with a different mechanism of action. After this intervention, the patient had no further hypotensive episodes. Providers should be aware of this potential adverse reaction from the combination of medications.

References: [1] Kao C. D. et al. (2004) Ann Pharmacother.,38,1840-1843. [2] Publow S. W. and Branam D.L. (2010) Am J Health Syst Pharm,67,1606-1610.

4

Implementation of Crashing Patient Protocol and Its Effect on EMS Provider Witnessed Cardiac Arrest Incidence

Timothy Schiller[1], Stephanie Van Alsten[2], Joshua Mastenbrook[2], Michael Bentley[2], William Fales[2]
[1]Emergency Care Specialists, Grand Rapids, MI. [2]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Emergency Medical Services personnel encounter patients in extremis that continue to deteriorate to the point of cardiac arrest. EMS personnel in Kalamazoo, Michigan encounter approximately 250 cardiac arrests a year, some of which are witnessed by EMS personnel. Crashing patient protocols have been developed in other areas in the country with results showing fewer EMS witnessed cardiac arrests. This retrospective analysis aims to compare witnessed cardiac arrest data from 2021 and 2022, the first year our local crashing patient protocol was put into place.

Methods: We compared Cardiac Arrest Registry to Enhance Survival (CARES) data regarding arrest witnessed by 911 personnel from year of implementation (2022) and prior year (2021). We performed a chi square analysis to compare these data and set the power of the analysis to 0.05 to determine statistical significance.

Results: For the year 2021, the data revealed that 12.95% of cardiac arrest calls were witnessed by EMS responders, compared with 6.77% of cardiac arrest calls in 2022. This decrease in the proportion of cardiac arrests witnessed by EMS 2021 and 2022 yielded a p-value of 0.0181, suggesting a statistically significant difference between the two years.

Conclusion: Our study revealed a statistically significant decrease in the proportion of EMS witnessed cardiac arrests from 2021 to 2022. The Crashing patient protocol was initiated in our EMS System in 2022, suggesting there may be an association with this protocol implementation and a decrease in the number of EMS witnessed cardiac arrests.

6

Diagnosis of Congenital Hyperinsulinism after Escherichia Coli Urosepsis in an Infant

Mohammad Tayliakh[1], Lubaina Ehsan[1], Nourhan Shafeey[1], Lyndsey Reynolds[2]
[1]Department of Pediatric and Adolescent Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Helen DeVos Pediatric Endocrinology, Grand Rapids, MI

Introduction: Congenital hyperinsulinism (CHI) is the most common cause of persistent hypoglycemia in infants and children. The presentation may be vague as it mimics the presentation of other pathologies such as sepsis and metabolic diseases. The association between CHI and a predisposition to severe sepsis has not yet been established. We present a case of an infant with persistent hypoglycemia after *Escherichia Coli (E. Coli)* urosepsis was found to have CHI.

Clinical Presentation: A 3-week-old male ex 35-week infant presented with hypothermia, apnea, and respiratory failure. On arrival at the pediatric intensive care unit, he was on CPAP but was quickly intubated. Blood and urine cultures resulted in a positive for *E. Coli.* Cerebral fluid cultures were negative. Blood glucose was followed, and he continued to have intermittent hypoglycemia even when antibiotics were completed. When venous blood glucose was 50 mg/dL, the critical labs were drawn, C-peptide was low at 0.4 ng/mL, insulin was low at 0.9 uU/mL, and beta-hydroxybutyrate (BHB) was normal at 0.16 mmol/L. A glucagon challenge was done and then glucose was normalized. Although his c-peptide and insulin levels were low at the time of the critical sample, he had a significant response to glucagon. This in conjunction with normal BHB supported diagnosis of CHI. He was started on diazoxide and diuril, which were titrated till the patient had euglycemia pre-feeds. Whole genome sequencing showed a hemizygous pathogenic variant of BRWD3 c.4006-1G>A.

Discussion: Even though CHI has known monogenic mutations, genetic etiology remains unknown in approximately 40–50% children. Currently, the BRWD3 gene is thought to be related to our patient's CHI and is thought to be associated with X-linked intellectual developmental disorder-93, macrocephaly, and potentially overgrowth; our patient had macrocephaly since birth. However, it is worth noting that CHI is common in other overgrowth syndromes, such as Beckwith-Wiedemann syndrome, that can be linked to BRWD3 mutation.

Conclusion: Our case highlights the importance of continued blood glucose monitoring even after events such as sepsis, as illness can mask underlying causes for hypoglycemia, such as CHI. It also provides further phenotypic information for a rarely reported BRWD3 gene mutation.

8

A Quality Improvement Project: Utility of a heart failure medication poster in an Internal Medicine/Medicine-Pediatric/Family Medicine Clinic

Kathryn Garber[1], Tobey Thomas[1], Ron Milbocker[1], Amy Mullikin[1], Tracey Mersfelder[2], Kevin Kavanaugh[1]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Ferris State University College of Pharmacy, Kalamazoo, MI

Introduction: Heart failure (HF) is a common disease state seen in primary care. The available therapies have increased, and HF guideline directed medical therapy has expanded. For physicians working in busy clinics, it can be difficult to stay up to date with the most recent recommendations that provide the most benefit for an individual patient.

The objective of this quality improvement initiative was to develop and implement a HF medication poster to see if it would improve resident and faculty knowledge, comfort, and awareness of those medications in a family medicine clinic. The poster was developed based on costs, classification of medication, classification and stages of heart failure, guideline directed medical therapy, mortality benefit, and contraindications/cautions for use in an internal medicine, medicine pediatrics.

Methods: A pre survey was electronically sent via REDCaps regarding the physician's level of confidence and knowledge of HF medication therapy. A poster was designed and provided for use in the clinics. After the poster was utilized for two months, a post survey was administered. Descriptive analyses was conducted.

Results: Sixty (87%) physicians responded to the pre-survey and 44 (63.8%) to the post survey. Most respondents felt the poster would be helpful in reducing adverse events (86.4%) and cost (81.8%). In addition, 95.5% of respondents felt they would be more comfortable in prescribing medications and in discussing the medications when utilizing the poster. There was a range of 68.2-88.6% indicating correct responses to the knowledge questions. Overall, a positive trend was seen in the adverse events, cost, comfort level, and discussion between the pre and post survey. There were no significant differences in knowledge scores.

Conclusion: The survey results were positive regarding the use of the HF poster. It would be a challenge to find a different tool that is as easy to use as this poster. A poster like the one developed for this project can serve as a quick reference guide for physicians prescribing HF therapy in a busy clinic. Other disease states should be explored for poster development.

9

Management of Symptomatic Cholelithiasis with a Concurrent Pericholecystic Hemangioma

Matthew Welter[1], Michael Chaney[2], Lisa Miller[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Surgery, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Laparoscopic cholecystectomies performed for symptomatic cholelithiasis are typically considered routine. However they may be complicated by atypical factors such as pericholecystic tumors, the most common of which are hemangiomas. While hemangiomas are typically managed conservatively, their vascular nature demands the attention of surgeons operating in their vicinity. Herein, we describe the case of a laparoscopic cholecystectomy complicated by a hepatic hemangioma abutting the cystic plate.

Case Presentation: A 64-year-old-female presented for chronic symptoms consistent with biliary colic. A right upper quadrant ultrasound demonstrated multiple stones within the gallbladder without inflammatory changes in addition to a complex hepatic mass. An MRI demonstrated a 3.8 x 5.2 x 6.0 cm T1 hypointense, T2 hyperintense lesion in the anterior left hepatic lobe consistent with a hemangioma. Due to the patient's lifestyle-limiting chronic symptoms, an elective laparoscopic cholecystectomy was performed. Initially, the liver, gallbladder, and hemangioma were identified (Figures 1A and 1B). A typical bottom-up dissection was started; however, the hemangioma was found to wrap posteriorly to the gallbladder along the cystic plate necessitating the approach to be altered by dissecting the gallbladder off the cystic plate in a dome down fashion. A critical view of safety was obtained. The gallbladder was amputated and sent to pathology which yielded findings consistent with mild chronic cholecystitis with cholelithiasis. The hemangioma was not biopsied nor resected. The patient had no complications or recurrence of their preoperative symptoms.

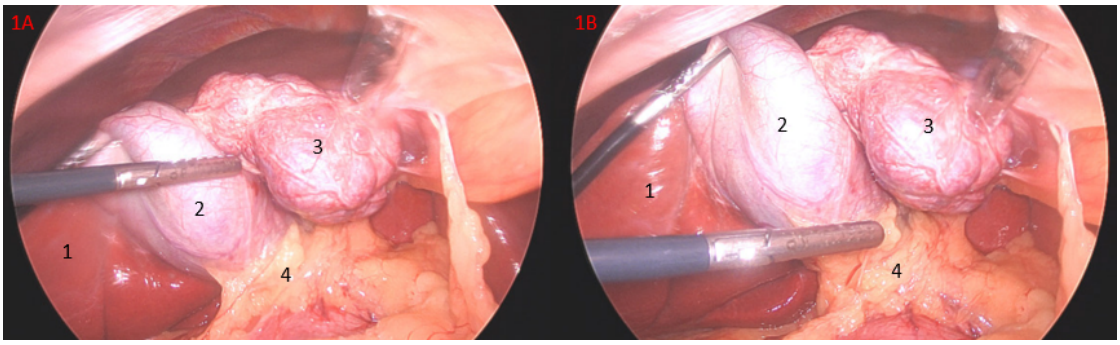


Figure 1A and 1B: Operative view of the (1) liver, (2) gallbladder, (3) hemangioma, and (4) peritoneum surrounding the triangle of calot.

Discussion: Hepatic hemangiomas in close proximity to the gallbladder can complicate the standard bottom-up resection used in laparoscopic cholecystectomies. In such cases, versatility on the surgeon's part to convert to a dome-down approach is safe and effective. Factors to include in surgical decision making include hemangioma size, location, imaging characteristics, growth, and symptomatology. Due to their benign course, neither biopsy nor removal of asymptomatic and size-stable hemangiomas is indicated.

10

Asymptomatic Total Inferior Vena Cava Occlusion in Patient with Rectal Adenocarcinoma

Michael Chaney[1], Matthew Welter[2], Sam Coster[1], Julia Miladore[1], Saad Shebrain[1]
[1]Department of Surgery, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI.
[2]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Hypercoagulability is a known complication of metastatic cancer classically resulting in pathology such as pulmonary embolism and deep vein thrombosis and more rarely, total occlusion of the inferior vena cava. This is more common in disseminated cancer which makes clinical decision-making and operative intervention more complex.

Case Presentation: The patient is a male in his mid-sixties with a history of metastatic rectal adenocarcinoma to the lungs, spine, and liver with a MELD of 22 being treated palliatively with radiation for back pain who presented with failure to thrive and abdominal pain. Physical exam was relatively benign and revealed no signs indicative of phlegmasia or critical limb ischemia. A CT abdomen and pelvis with IV contrast revealed a new, large thrombus extending from both common iliac veins distally into the IVC to the level of the liver and diaphragmatic hiatus (Figure 1). After discussing with the patient his overall poor prognosis and medical fragility, the decision was made to forego mechanical thrombectomy and anticoagulation. The patient was managed symptomatically with pain control and monitored for post-thrombotic syndrome and phlegmasia. He was admitted for pain control and palliative care, then in-home palliative care. Patient passed away shortly.

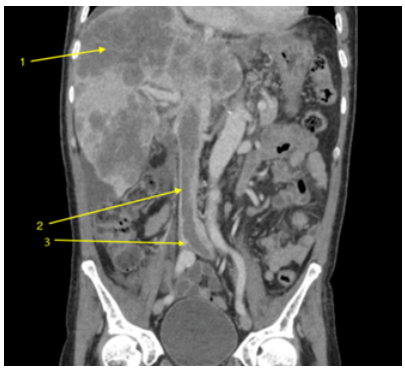


Figure 1: CT showing diffuse metastasis to the liver (1) and thrombus within the IVC from the common iliac veins bilaterally to the liver (2, 3).

Discussion: Vena cava thrombosis is rare, with an incidence of diagnosis as low as 1.7/100,000, 37.5% of such cases are associated with cancer.[1] Mainstay treatment is with full anticoagulation but other modalities such as IVC filters, mechanical thrombectomy or thrombolysis, or open thrombectomy have utility in select situations. The common presence of metastatic and terminal cancer makes clinical decision making in patients with IVC thrombosis more complex. Considerations typically made regarding limb status, bleeding risk, and symptomatology now must be weighed in context of oncologic prognosis. Conservative management with pain control and palliative care can be appropriate in this population.

References: [1] Stein P.D. et al. (2008) Incidence of vena cava thrombosis in the United States. Am J Cardiol; 102(7):927-9.

11

Blood clots: A novel biomaterial for the eradication of Staphylococcal biofilms

Kayla Grooters[1], Jennifer Ku[1], David Richter[1], Genevive Abd[2], Audrey Kim[1], Yong Li[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: A biofilm is a three-dimensional matrix of microscopic organisms which secrete adhesive compounds to adhere to a surface. This extracellular matrix also protects the colony from decussation, environmental hazards, and antimicrobial compounds – making biofilms highly resistant to antibiotics.[1] Biofilm infections are a major cause of morbidity and mortality, particularly those impacting prosthetic joints and valves. Staphylococcal species, including *Staphylococcus epidermidis*, are the most prevalent causative organism.[2] These infections are often refractory to antibiotic treatment and require surgical revision. The annual cost of revision surgery due to biofilm-mediated infections is $7849 m globally.[3]An issue with using antibiotics to treat biofilms is achieving the required minimum inhibitory concentration of drug at the infection site. The MIC for a biofilm can be between 100-800x greater than the MIC for planktonic cells. [4] One idea is to use a biologic delivery system which can adhere to the biofilm itself, facilitating drug penetration. In the past, fibrin clots have been used to model biofilms, indicating that they are an ideal material for biofilm integration. [4]

Methods: In our model, murine blood clots, with and without conjugation to subtherapeutic concentrations of gentamycin, were suspended onto 1- and 7-day old *Staphylococcus epidermidis* biofilms for 24 hours and compared to untreated and gentamycin alone. Changes in biofilm density across conditions were measured through crystal violet assay. This was followed by live/dead staining and confocal microscopy analysis to observe changes in cell viability with and without blood clot exposure.

Results: Our results demonstrate that biofilm density significantly decreases after exposure to both gentamycin conjugated blood clots and blood clots alone. Biofilm density is highest when exposed to gentamycin alone. Confocal analysis revealed that blood clot exposure reduced the number of viable cells present in the biofilm, compared to control. Additionally, comparative histology shows disruption of biofilm architecture and increased planktonic cells after blood clot exposure.

Conclusion: These results indicate that blood clot exposure is effective at degrading staphylococcal biofilms, with and without antibiotic conjugation. This indicates that the blood clot itself possesses biofimcidal properties, warranting further investigation into this mechanism.

12

Overtly Coding Lecture Slides to Learning Objectives in the Genetic and Metabolic Disorders Course: A study measuring student performance and perception

Caroline Hall[1], Erik Larson[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Biomedical Sciences, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Purpose: The Liaison Committee on Medical Education (LCME) standard 6.1 instructs medical schools to ensure that the learning objectives for each required learning experience are made known to all students. In this study, we assessed the value of exceeding this standard by visually aligning learning objectives with lecture slides to establish a closer association with course material. In contrast to previous satisfaction-focused research, our objective was to determine whether this enhanced model correlates with improved outcomes on the Genetics and Metabolic Disorders (GMD) summative exam.

Methods: Seven lectures in the GMD course were modified, resulting in the addition of pertinent learning objectives to the bottom corner of each slide. Additionally, a summary slide linking slide numbers to the learning objectives was included at the conclusion of each lecture. In a prospective cohort study, pre-initiative exam scores for the 2025 and 2026 graduating classes were gathered, followed by post-initiative data for the 2027 class. Test items common to the class of 2027 and either or both classes of 2025 and 2026 were analyzed. The experimental group comprised average class scores on test items linked to the seven modified lectures, whereas the control group consisted of scores on test items from four unaltered lectures. Two 2-sample t-tests compared the difficulty between the treatment and control groups, examining all items and those with a difficulty index > 0.2. An optional, anonymous survey gauged student perception through five Likert-scale questions and a free response section.

Results: T-tests yielded no p-values < 0.05, indicating no statistical difference in test item scores between the groups. The survey demonstrated strong student support for the new method, with positive responses regarding its helpfulness, clarity of test expectations, and stress reduction.

Conclusion: While the test analysis lacked statistical significance, compelling student satisfaction suggests the value of further exploration of this approach.

References: [1] Association of American Medical Colleges, Liaison Committee on Medical Education. Functions and structure of a medical school: standards for accreditation of medical education programs leading to the MD degree. Liaison Committee on Medical Education; November 2023. https://lcme.org/wp-content/uploads/2023/11/2024-25-Functions-and-Structure_2023-11-15.docx

IRB Reference: WMed-2023-1060

13

Characterizing the Relationship Between Thyroid Disease and Adhesive Capsulitis

Hannah Gu, Shamsi Berry
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Adhesive capsulitis is a common musculoskeletal pathology that affects approximately 2-5% of the general population. It is characterized by chronic pain or stiffness, limited active and passive range of motion, and is often unilateral in nature. The pathophysiology is thought to involve inflammation and the deposition of scar tissue around the glenohumeral joint. While hypothyroidism has been determined by multiple studies to be a risk factor in the development of adhesive capsulitis, less research has been conducted on the relationship between hyperthyroidism and adhesive capsulitis. The present study sought to characterize the association between hyperthyroidism and hypothyroidism in the development of adhesive capsulitis.

Methods: This study was conducted via retrospective analysis of aggregate totals from individuals seeking treatment at WMed Health between 2020-2023. Individual medical records were not accessed. A total of 251 patients were diagnosed with adhesive capsulitis, 541 had hyperthyroidism, and 6036 had hypothyroidism. Of these, 1 patient had a diagnosis of adhesive capsulitis following diagnosis with hypothyroidism, and 8 patients had a diagnosis of adhesive capsulitis following diagnosis with hyperthyroidism. These data were evaluated using Chi-square and Fisher's exact test to determine whether a relationship exists.

Results: Chi-square analysis of hypothyroidism in relation to adhesive capsulitis returned a value of 18.43 ($p < 0.0001$). Using Fisher's exact test, the left-sided p-value was determined to be < 0.001, whereas the right-sided p-value was found to be 1.000. The two-sided p-value was determined to be < 0.0001.

Chi-square analysis of hyperthyroidism in relation to adhesive capsulitis returned a value of 23.70 ($p < 0.001$). Fisher's exact test returned a left-sided p-value of 0.9999 and a right-sided probability of 0.0003, whereas the two-sided p-value was determined to be 0.0003.

Conclusion/Clinical significance: Fewer cases of adhesive capsulitis than expected were seen in association with hypothyroidism ($p < 0.0001$), which differs from current literature. Significantly more cases of adhesive capsulitis than expected were seen in association with hyperthyroidism ($p = 0.0003$). Further research should be done to determine the exact mechanism behind thyroid disease and adhesive capsulitis. Investigation as to whether thyroid disease impacts the development of musculoskeletal pathologies beyond adhesive capsulitis is also warranted.

14

Unlocking the Mystery: 5-Oxoprolinuria unveiling a hidden culprit in high anion gap metabolic acidosis

Daniel Wagner, Alana Pinheiro Alves, Susan Bannon
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Normal acid-base homeostasis is essential to human life. High anion gap metabolic acidosis (HAGMA) is commonly seen in emergency settings and often leads to hospital admissions. A less commonly known gamma-glutamyl cycle (GGC) enzyme defect resulting in accumulation of 5-oxoproline [1] can present as HAGMA and may be overlooked. We present a case of HAGMA and 5-oxoprolinuria in a patient with malnutrition and chronic acetaminophen use.

Case Presentation: A female in her mid-thirties with chronic oxycodone/acetaminophen use, chronic pancreatitis, and severe malnutrition presented to the emergency department with dyspnea and abdominal pain after outpatient labs revealed HAGMA. Physical exam showed normal vitals, BMI 17.7, cachexia and PEG tube. Lab analysis revealed metabolic acidosis with bicarbonate of 9, sodium 140, chloride 105, and anion gap of 26. Her AST (68), ALT (79), and alkaline phosphatase (234) were elevated. The rest of her CMP and CBC were within normal limits. Further investigation of the HAGMA revealed normal ketones, osmolar gap and lactate levels. Urinalysis and urine toxicology testing were otherwise unremarkable. Additional workup showed urine D-lactate (0.02) within normal limits, however, 5-oxoproline was markedly elevated (20,911 mmol/mol creatinine) in addition to metabolites of acetaminophen. Acetaminophen was held immediately. She received IV fluids, oral sodium bicarbonate and nutrition replacement. Her metabolic acidosis and overall condition improved gradually over three days and she was discharged home.

Discussion: Our patient was malnourished with a history of chronic acetaminophen use causing 5-oxoprolinuria. Without knowledge of possible causes of HAGMA, unnecessary and excessive workup and healthcare costs can quickly accumulate. We should consider updating current frameworks of thinking when diagnosing metabolic acidosis. The popular mnemonic MUDPILES (Methanol, Uremia, Diabetes, Paraldehyde, Iron, Lactate, Ethylene glycol, and Salicylate) is often used for investigating the cause of HAGMA yet fails to include causes we see as investigative skills improve. Mehta et al. [2] proposed a new HAGMA mnemonic: GOLD MARK – Glycols (ethylene and propylene), Oxoproline, L-lactate, D-lactate, Methanol, Aspirin, Renal failure, and Ketoacidosis. 5-oxoprolinuria is an underdiagnosed cause of HAGMA that we should consider when thinking of traditional pathology.

15

Idiopathic Concomitant Transverse Colon and Small Bowel Volvulus in Healthy 59-year-old Female

Ali Shammout, Michael Chaney, Saad Shebrain
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Transverse colon volvulus (TCV) is a rare condition that causes mechanical large bowel obstruction. Rarer, are TCVs that are idiopathic in nature and arise in the setting of additional small bowel volvulus. The patient is a 59-year-old female with a history of laparoscopic cholecystectomy and abdominal hysterectomy who was transferred from an outside facility for acute onset abdominal pain with nausea and vomiting that resolved upon arrival. She was in stable condition, with a benign abdominal exam and passing flatus.

Methods: CT revealed large bowel dilation to greater than 8cm with transition point in the LUQ and additional mesenteric swirl sign suggestive of internal hernia of small bowel. Initially, the patient was taken to the operating room for diagnostic laparoscopy. Upon entry into the abdomen, there was evidence of volvulized transverse colon with apparent congestion and edema notable in the small bowel and the case was converted to an open laparotomy.

Results: Small bowel twisted on its mesentery was returned to anatomic position and a redundant portion of the transverse colon near the splenic flexure was identified. Partial colectomy with a side-to-side functional end-to-end anastomosis was created and the anastomosis was returned to the abdominal cavity. She was able to be discharged without complication shortly after.

Conclusion: Transverse colonic volvulus is exceptionally rare, making up only 3% of large bowel volvuli, carrying higher mortality due to delayed diagnosis. Undiagnosed cases can progress to ischemia, necrosis, and perforation, with a 16.9% mortality rate reported for large bowel perforation. Our patient's idiopathic nature of her volvulus and benign presentation presented a complex diagnostic challenge. In absence of an acute abdominal exam, vital instability, or lab abnormality imaging and gestalt were utilized to correctly identify this patient's emergent pathology and prevent a potentially mortal outcome.

16

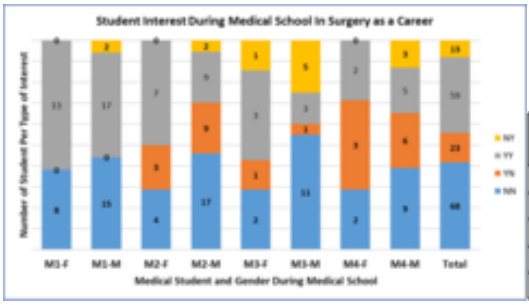
The Future of Women in Surgery: How interested are women medical students in the field of surgery?

Pnina Rokhlin, Raisa Gao, Lisa Miller, Saad Shebrain
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Background: In 2021, women made up 50.5% of the enrolled medical student population and 46.1% of general surgery residents in the United States. Yet, they only make up 22.6% of general surgeons in America as of 2021. This study aims to evaluate the interest in the field of surgery among women medical students during years of medical schools and identify factors influencing decision to persuade a surgical career.

Methods: This is a cross-sectional survey study examining the population of students at a single American medical school made up of 336 of medical students. Voluntary questionnaires were completed by medical students from the graduating classes of 2024-2027 at WMed. Students interest in surgical specialties was categorized into four groups: was interest and is still interested (YY), was not interested and now is interested (NY), was not interested and is still not interested (NN), was interested and now is not interested (YN). Descriptive statistics were calculated using Chi-squared test. Data was analyzed using IBM SPSS Statistics for Windows (Version 28.0).

Results: The survey saw a response rate of 48.5%, with 163 students participating, comprising 114 females (70%) and 49 males (30%). Among the female respondents, 43.9% expressed an initial interest in surgical specialties, with 68% maintaining this interest and 10.5% of female students developed an interest. 45.6% remained uninterested in pursuing a surgical career. In contrast, 65.3% of male students showed interest in surgery, with 78.1% retaining their interest, 2% gaining a interest, and 32.7% of male students remained disinterested. Figure 1. Factors that influenced female and male medical students interest in pursuing a surgical specialty are summarized in Table 1.



Factor	Male N=49	Female N=114	p-value
Work hours/schedule	91.8%	78.9%	**0.046**
Stress levels	49.%	65.8%	**0.0447**
Length of residency	40.8%	43%	0.795
Salary	51%	29.8%	**0.007**
Other:	20.4%	28.1%	0.3043

Conclusion: Female and male students have similar interest in surgery at the beginning of medical school. However, as students progressed, surgical career became more appealing to students who initially showed no interest. Factors promoting and discouraging persuasion of surgical career are slightly different among student's gender.

IRB Reference: WMed-1139

17

Initial Experience with Single-Port Robotic Partial Nephrectomy

Bradley Christensen[1], Yuzhi Wang[2], Mustafa Almajedi[3], Savannah Grandy[3], Adam Matynowski[3], Kangli Chen[4], Mackenzie Gammons[4], Mahin Mirza[4], Sugandh Shetty[5], Mohammed Jafri[5], Conrad Tobert[6], Christopher Brede[6], Craig G. Rogers[2], Brian R. Lane[6,7], Ryan Nelson[8]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Vattikuti Urology Institute, Henry Ford Health, Detroit, MI. [3]Department of Urology, McLaren Macomb, Mt. Clemens, MI. [4]Department of Urology, University of Michigan Medical School, Ann Arbor, MI. [5]Comprehensive Urology, Beaumont Hospital, Royal Oak, MI. [6]Corewell Health Hospital System, Grand Rapids, MI. [7]Michigan State University College of Human Medicine, Grand Rapids, MI. [8]Michigan Institute of Urology, Troy, MI

Introduction: Robotic partial nephrectomy has become standard of care for patients with T1 renal masses amenable to nephron-sparing intervention. Most radical partial nephrectomies use the daVinci Xi (multiport) robot, and urologic surgeons have recently explored the Single Port robot. However, there is limited data comparing patient selection and peri-operative outcomes for Single Port to Xi robotic partial nephrectomy. We evaluated the outcomes of the initial series of patients undergoing robotic partial nephrectomy using the daVinci Single Port compared to the Xi by MUSIC-KIDNEY surgeons.

Methods: MUSIC-KIDNEY is a statewide quality improvement collaborative that maintains a prospective registry of newly diagnosed T1 renal masses. All data regarding patients undergoing robotic partial nephrectomy within a MUSIC-KIDNEY practice between October 2020 and August 2023 were collected. Patient, operative, and post-operative data were compared between patients who received single port and Xi radical partial nephrectomy.

Results: A total of 323 radical partial nephrectomies were completed across 4 MUSIC practices by 6 urologists. Of these, 122 (38%) used the daVinci single port platform. Tumor characteristics (size, complexity) were similar, with more complex cysts in the single port group (24% vs. 12%, p=0.02). When comparing peri-operative outcomes, single port cases had significantly shorter operative time (141 vs. 181 minutes, p<0.001), lower rates of warm ischemia time ≥ 30 minutes (3.4% vs. 13.2%, p=0.01), and lower rates of hospital stay > 2 days (4.9% vs. 14%, p=0.008). Surgeons performing single port radical partial nephrectomy utilized the retroperitoneal approach significantly more than transperitoneal (80% vs. 6.0%, p<0.001). Opioid-free discharge was more common after single port radical partial nephrectomy (66% vs. 17%, p<0.001). At 30 days, the rates of ED visits (10% vs. 13%, p=0.43) and readmission (5.0% vs. 6.6%, p=0.52) were not statistically different.

Conclusions: MUSIC-KIDNEY's initial experience with single port radical nephrectomy demonstrates procedural safety comparable to multi-port and facilitation of retroperitoneal approach. Potential advantages include lower operative time, hospital stay, and opioid prescription after discharge. Limitations include small number of surgeons and cases using single port.

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Targeting Activator of G-protein Signaling 3 (AGS3) Biomolecular Condensates: In silico identification of modulators

Samuel Greenberg[1], Ali Vural[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Biomedical Sciences, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Activator of G-protein signaling 3 protein (AGS3) is a receptor independent activator of G protein signaling with diverse functions of clinical interest including a role in regulating polycystic kidney disease, drug addiction, obesity, and immunity. AGS3 has been observed to undergo phase transition behavior and form biomolecular condensates with exposure to a variety of stresses. The purpose of this study was to use in silico screening techniques to rapidly identify small molecules that bind AGS3 with high affinity, thereby identifying candidates that can affect the phase behavior and activity of AGS3.

Methods: We conducted an in silico molecular docking screen with the Schrodinger Maestro Suite using a diverse library of 2.7 million small, drug-like molecules from the ZINC database and an AlphaFold-derived AGS3 structure focusing on a pocket that includes a structurally conserved domain and an alpha-helix within the intrinsically disordered domain, potentially enabling phase trapping. Small molecules were prepared and docked in the selected pocket with the Glide docking algorithm and top-scoring candidates were selected for subsequent rounds of increasingly stringent docking. Top hits displaying promising predicted affinities and favorable pharmacological profiles were selected for further investigation.

Results: The screen identified several dozen small molecules predicted to bind AGS3 with high affinity, and which adhered to Lipinski's rule of five, indicating that their chemical properties are compatible with an orally active drug. Future work will involve in vitro testing of these hits in a stably transfected HeLa cell line expressing GFP-tagged AGS3. Stress-induced condensate formation will be monitored by fluorescent microscopy to assess the lead compounds' modulation of AGS3 phase transition.

Conclusion: The identification of small molecules that modulate the activity of AGS3 may lead to the discovery of novel drugs that address major clinical diseases including obesity, drug addiction, and polycystic kidney disease. In addition, the development of drugs that affect the phase transition of AGS3 could provide insights into the broader field of protein condensation which includes many proteins and with diverse clinical and basic science implications.

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Neuroplasticity in the Zebrafish Olfactory Bulb after Immune Modulation

Bonnie Ebendick, Susanna Var, Christine Byrd-Jacobs
Department of Biological Sciences, Western Michigan University, Kalamazoo, MI

Introduction: Neuronal damage in humans often results in limited and prolonged recovery. Injury or disease can result in the loss of neurons that may never regenerate in mammals, but zebrafish are renowned for persistent neurogenesis and neuroplasticity. Chemical lesions damage sensory neurons in the olfactory epithelium and disrupt neuronal organization in the olfactory bulb of the brain, but zebrafish recover in about one week. Although the brain's primary immune cells, microglia, are active in pro- and anti-inflammatory functions, their role in injury response is unclear. Modulating microglial populations with immune stimulating (zymosan) or dampening (L-clodronate) drugs illustrates the contribution of these cells to recovery rate. Comparing morphology of three neuronal structures (glomeruli) in the olfactory bulb from treated and untreated fish over recovery time allows characterization of the role of microglia in neuroplasticity.

Methods: Fish were injected with zymosan, L-clodronate, or saline into the brain and then lesioned by applying detergent to the nose. Injections were given 24 hours before (pre-treatment) or concurrently with lesioning. Control fish were lesioned without drugs. Glomerular structures were visualized in whole brains with confocal microscopy using antibodies to label axons and were assessed 1 to 7 days post-lesioning. Recovery rate was measured by evaluation of the level of damage.

Results: The recovery response with zymosan was different from clodronate and saline, and the difference was delivery dependent, with a significant interaction between time, delivery and zymosan. Zymosan pretreatment showed very little damage at 1 dpl, peaked at 4 dpl (later than other groups), and returned to control morphology by 7 dpl. Zymosan concurrent damage peaked at 1 dpl but had a significant decrease in relative damage at 4 dpl and was only moderately recovered by 7 dpl.

Conclusion: The shift in recovery based on drug and delivery method suggests a role for microglia in the timing of inflammatory response. The activity of microglia after damage can be proinflammatory or promote recovery, and the signals that promote that transition are not well characterized. Zebrafish can demonstrate how conserved immune system features promote complete recovery in the nervous system, leading to potential treatments for brain injury and disease in humans.

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A Case of Dysphagia Due to Biphasic Synovial Cell Sarcoma of Mediastinum

Jaspreet Kaur, Samir Mirza, Joanne Baker, Dikshita Poudel, Mohammed Sultan
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Primary mediastinal synovial sarcoma is a rare malignancy with only a few cases reported so far. It is unrelated to synovium and can occur in almost any part of the body. Survival rates of this malignancy have been reported to range between few months and many years. Therapy includes surgical resection, radiation and chemotherapy with various agents having been used. We report a new case of this entity involving thoracic esophagus displacing trachea; thus leading to progressive dysphagia and shortness of breath.

Case Presentation: A man in his 30s presented with a 2-week history of difficulty swallowing food. It was associated with nausea and vomiting, especially after ingestion of the food. It occurred mainly with ingestion of solid foods. He also had difficulty breathing and coughing while swallowing food. Vital signs were stable on initial presentation. CT chest with contrast revealed an 8x5x3.2 cm filling defect in the upper thoracic esophagus causing anterior displacement of trachea. Initial biopsy was non-diagnostic. The patient was started on TPN and got endoscopic non-oncologic resection of the mass with resolution of the dysphagia. Biopsy of the tumor this time came back positive for biphasic synovial sarcoma composed of glandular structures and proliferation of spindle cells. The patient was referred to oncology. A PET-CT scan for the whole body was done which was negative for any residual tumor activity. After discussion with the sarcoma tumor board, the consensus was reached to further investigate for residual disease by EGD/EUS with GI intervention, biopsy, and tattoo if a lesion was identified. The patient underwent a repeat EGD/EUS four months later which was clear of concerning findings. Patient is currently undergoing regular CT chest and PET-CT. Preliminary plan in case of recurrence is to offer peri-operative chemotherapy +/- chemotherapy depending on resectability of tumor.

Discussion: Synovial sarcoma originates in the deep soft tissue and commonly presents as an asymptomatic slow growing mass. Despite its name synovial sarcoma does not represent synovial origin. The differential diagnosis includes various neoplasms of the chest such as localized fibrous tumors of the pleura, malignant mesothelioma, primary and metastatic lung neoplasms, thymoma and other rare primary parenchymal sarcomas.

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A Rare Case of Acute Sinusitis Leading to Epidural Abscess and Superior Sagittal Sinus Thrombosis in a Pediatric Patient

Sophia Yen[1], Hanan Alhyari[1], Yahia Khanfar[1], Jesse Van Heukelom[2]
[1]Department of Pediatric and Adolescent Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Bronson Children's Hospital, Kalamazoo, MI

Introduction: Sinusitis is a common childhood infection which may lead to intracranial complications if not promptly treated. We report a case of acute bacterial sinusitis in a healthy 15-year-old male complicated by a superior sagittal sinus thrombosis along with a frontal epidural abscess.

Case Presentation: 15-year-old male with history of chronic migraines presented with 14 days of worsening headache, neck pain, nausea, vomiting, and left eye swelling. He had left frontotemporal swelling and tenderness which extended to his preauricular area. He endorsed pain with extraocular movement and with neck extension and flexion. MRI brain showed 1.5 cm frontal epidural abscess, myositis of the left temporalis with 2.5 cm intramuscular abscess, osteomyelitis and superior sagittal sinus thrombosis. Pertinent serum labs included: elevated CRP and leukocytes, unremarkable DIC screen, and negative immunodeficiency work-up. Peripheral blood culture grew Streptococcus intermedius. He underwent endoscopic sinus surgery, frontal sinusotomy, ethmoidectomy, sphenoidotomy and drainage. Nasopharyngeal culture grew MSSA and Candida albicans. He was started on Ceftriaxone, Vancomycin, Metronidazole, and low molecular weight heparin for anticoagulation. His symptoms initially improved after sinus surgery; however, after 3 days, he experienced increasing headache, nausea, and vomiting. Repeat MRI brain showed increased left frontotemporal osteomyelitis with increased left parietal extracranial abscess. Neurosurgery then performed stereotactic burr hole evacuation of the epidural abscess and stereotactic needle aspiration of left temporal soft tissue abscess. He demonstrated significant improvement and was discharged with Ceftriaxone, Metronidazole, and Rivaroxaban for anticoagulation.

Discussion: It is important to maintain a high index of suspicion for bacterial sinusitis and its potential complications, especially the less common ones such as epidural abscess and cerebral sinus venous thrombosis (CSVT).

The incidence of CSVT in children is rare, estimated at 0.6/100,000 per year, with 30–50% occurring in newborns. Brain abscesses, meningitis, and sinusitis are the most likely causes of pediatric CSVTs. Our patient developed two rare complications of sinusitis-epidural abscess and sinus thrombosis. Imaging studies and appropriate interventions, such as surgical drainage and anticoagulation therapy, should be considered in patients with persistent or worsening symptoms of acute or chronic sinusitis.

Conclusion: Our case highlights the importance of promptly diagnosing and treating bacterial sinusitis to prevent serious complications like epidural abscess and sinus thrombosis.

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Racial and Ethnic Disparities in Autism Screening in Kalamazoo, Michigan

Jennifer Lee, Christopher Haymaker, Austin Brubaker
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Outcomes in young children diagnosed with Autism Spectrum Disorder (ASD) greatly improve with early intervention services, but there are racial and ethnic disparities in the initial steps of screening and evaluation for ASD in the US [1,2]. We wanted to explore whether the racial and ethnic disparities that are seen nationwide in ASD screenings are seen in the population of Kalamazoo, MI.

Methods: Data regarding patient's race and ethnicity, including those that did not want to disclose, MCHAT completion, and diagnosis of ASD or other developmental disorders were examined retrospectively from 18- and 24-month well-visits at WMed Health between 01/01/2020 to 12/31/2022.

Results: There was not a significant discrepancy found between ASD screenings between race and ethnic categories. We attributed this lack of inequities to decreased well visits during the COVID-19 pandemic, use of other tools to evaluate developmental milestones, and lack of accessibility to the MCHAT questionnaire within the electronic health record.

Conclusion: This finding warrants further exploration into other developmental screenings used from the same time period of visits and a PDSA cycle to increase the use of MCHAT in ASD screenings at 18- and 24-month well-visits.

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MACI Knee Cartilage Repair of Osteochondritis Dissecans: A case report

Richa Gupta[1], Nicholas Kossoff[1], Sumit S. Patel[2], Joshua M Veenstra[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Osteochondritis Dissecans (OCD) is a cartilage disorder common in adolescents where vascular insult results in separation of articular cartilage from underlying bone causing pain, joint instability, catching and locking, and increased risk of osteoarthritis. Based on the severity of symptoms, treatment can range from non-operative management including over-the-counter medication, activity modification and physical therapy, to surgical fixation, debridement, microfracture, or cartilage grafting. Matrix Autologous Chondrocyte Implantation (MACI) has been shown as an effective method of treatment for OCD in patients with larger lesions.

Case Presentation: A 14-year-old male presented with severe pain in his left knee and was found to have a Grade IV chondral defect (20 mm x 15 mm) of the proximal lateral trochlea, Grade III chondromalacia lesion (3 mm x 3 mm) at the lateral patella, and surrounding Grade II chondromalacia lesion (7 mm x 7 mm) (Figure 1). After failing physical therapy, patient was scheduled for MACI implantation and tibial tubercle osteotomy. Intraoperatively, a cut-out guide was used on the trochlear defect and cartilage was removed down to subchondral bone. The same guide was used to size the MACI graft, which was implanted with fibrin glue, followed by sutures for stability (Figure 2). A 45-degree tibial tubercle osteotomy was performed to antero-medialize the tubercle. At 2-week follow up, the patient's incisions were found to be healing without issue and he was neurovascularly intact with passive range of motion from 0-90°.

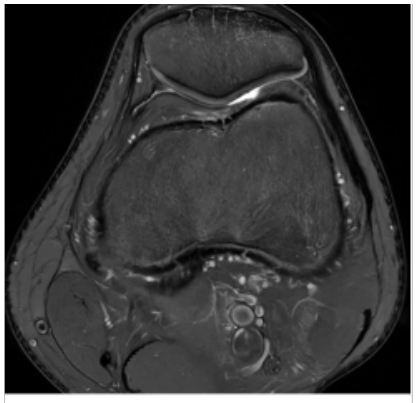

Figure 1: Pre-operative MRI of knee with chondral defects.

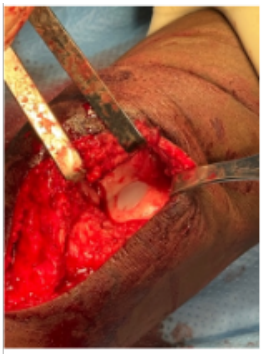

Figure 2: MACI Implant cut out and placed in patient knee to fill chondral defect.

Discussion: MACI has been shown to have successful outcomes in restoring cartilage defects, especially in athletes. Existing studies have shown MACI to provide increased pain relief, better knee function and biomechanics, and decreased complications over a longer duration of time compared to other surgical treatments. Despite promising results, lack of long-term results in literature and high cost makes the use of MACI controversial. This study, while presenting short-term postoperative results, holds unique significance as the first MACI implant performed within our hospital system. This shows that use of MACI is becoming more prevalent throughout the nation, particularly for the pediatric population, marking a notable step in MACI as a viable treatment option for OCD.

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Impact of Peer-Led Cadaveric Demonstrations on Gross Anatomy Education

Autumn Fritz, Morgan Helmich, Jade Woodcock, Sara Allison, Amy Gyorkos
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Undergraduate medical students often encounter challenges when transitioning from theoretical knowledge to practical application in the gross anatomy lab1. Peer-teaching is integral in bridging this gap and is shown to be positively accepted by medical students2. This study aims to incorporate peer-led cadaveric demonstrations into the gross anatomy lab via a dissection elective as a novel educational approach to facilitate a supportive learning environment, foster peer-to-peer knowledge transfer, and enhance students' preparedness.

Methods: In a dissection elective course, students created peer-led videos demonstrating anatomy on cadavers and models. These instructional videos highlighted essential anatomical structures, relationships, and mnemonic devices relevant to the lab objectives. These videos were then incorporated into pre-laboratory modules and disseminated to 89 second-year medical students, asynchronously for lab preparation. To assess effectiveness, video engagement data were gathered through Sproutvideo, and student feedback was collected via a post-course survey using Redcap.

Results: In a study with 55 consenting students, 85% engaged with videos throughout the course and 64% completed a post-course survey. On average, students watched each of the 13 videos at least once, viewing 95% of each video's length. Survey feedback showed high satisfaction: of the students who engaged with the videos, 90% felt more prepared for the practical exam after watching the videos, 90% felt watching the videos increased confidence in answering practical questions, and 86% felt the videos helped identify anatomical structures during gross labs. Furthermore, 97% felt they would have benefitted from having these types of videos in previous anatomy labs.

Conclusions: Peer-led videos significantly enhanced medical students' lab preparedness and confidence, fostering better peer engagement and learning experiences. Utilizing a dissection elective to incorporate peer-led teaching can be beneficial to medical students.

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Novel Use of Faricimab in Polypoidal Choroidal Vasculopathy Recalcitrant to Standard Anti-VEGF Therapy

Rami Madani[1], Dhruthi Reddy[1], Adam Ayoub[1], Ali Haidar[2], Jeffrey Bloom[3], Tarek Alasil[3]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]UCLA David Geffen School of Medicine, Los Angeles, CA. [3]Vitreoretinal Surgery-Acuity Eye Group, Los Angeles, CA

Introduction: Polypoidal choroidal vasculopathy (PCV) is characterized by abnormal vascular networks originating from the inner choroid presenting with recurrent serosanguinous detachments of the Retinal Pigment Epithelium (RPE) and neurosensory retina, leading to progressive central vision loss. Currently the gold standard treatment for PCV, as demonstrated by the EVEREST trial, is ranibizumab. However, alternative therapies are needed for unresponsive pathology. This report describes the only documented case of PCV recalcitrant to ranibizumab but responsive to the novel Faricimab-svoa.

Case Presentation: A 69-year-old Filipino man presented with acute on chronic blurry vision in his left eye. His anterior exam was benign in both eyes, and intraocular pressures were also non-significant. The left eye fundus exam initially demonstrated retinal pigment epithelial detachment with macular edema and exudates. Optical coherence tomography (OCT) was consistent with type 1 choroidal neovascularization in his left eye. Fluorescein and indocyanine green angiography imaging were consistent with PCV in his left eye. He was treated over two years with multiple ranibizumab intravitreal injections followed by a SUSVIMO port delivery system along with rescue ranibizumab intravitreal injections, with no significant response clinically or on imaging. Vision worsened to 20/100 in the left eye. Intravitreal treatment was then switched to Faricimab-svoa injections, with significant improvement on OCT imaging and vision improvement to 20/60 noted after just two injections.

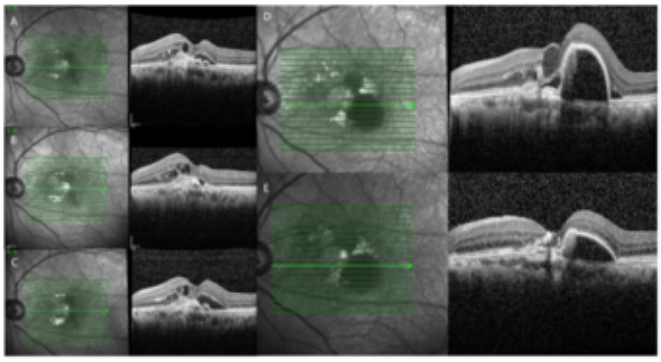

Figure: Serial cross-sectional spectral domain optical coherence tomography (SD-OCT):
Image A-C: Chronological order from A to C
Image D: Pre-Faricimab treatment
Image E: 2 months after Faricimab treatment

Discussion: The case's unique highlight is that PCV did not respond to anti-VEGF therapy (ranibizumab) alone but demonstrated significant gain in vision and anatomical improvement on OCT imaging when treated with Faricimab-svoa (both anti-VEGF and anti-angiopoietin-2 properties). Studies have identified at least two haplotype SNPs in ANGPT2, the gene coding for angiopoietin-2, as susceptibility markers for PCV suggesting a mechanism behind the effectiveness of Faricimab's anti-angiopoietin-2 property. Therefore, Faricimab may provide an alternative to ranibizumab in PCV, particularly in treating resistant patients or patients for whom photodynamic therapy is not an option.

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Gastroparesis, GLP-1 or Idiopathic?

Jessel Ramdass, Syed Hussain, Wamidh Tellow, Steve Pollens
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Gastroparesis is described as delayed or absent emptying of stomach contents in the absence of another mechanical cause. This is usually seen in patients with long standing or uncontrolled diabetes but may be due to other causes as well (surgery, medication, idiopathic). There is prevalence of 2.4 per 100,000 in the United States with women having a higher predilection (around 70%). Some of its pathology is poorly understood and often leads to increased economic burden, clinic, and hospital visits. There is an association with African American patients and increased severity of gastroparesis.

Case Presentation: A 22-year-old female presented to the emergency room with complaints of intractable headache, nausea and vomiting. She has a history of idiopathic intracranial hypertension (IIH) which was thought to be the cause of her symptoms. After appropriate treatment of her IIH, her symptoms did not improve, and the diagnosis was reevaluated, and she no longer had IIH. Alternate etiologies were investigated, and the patient had significant gastroparesis with 99% of stomach contents remaining in the patient's stomach after 1 hour (normal: 30-90%). This patient did not have diabetes, nor did she have any other risk factors for gastroparesis. Other etiologies were investigated, and specialists' input was also attained and after a thorough history, it was noted that this patient was on injectable semaglutide for about a month and had stopped the medication due to side effects. This was the only potential cause. She did not follow the dosing instructions that were given.

Discussion: Gastroparesis can be difficult to treat in the population, especially in diabetic patients and is more difficult if it is idiopathic. With the rise in use of GLP-1 agonists (like semaglutide) for diabetes and weight loss, the side effect profile of these medications should be noted. Gastroparesis is a rare side effect and when it is present, it is difficult to treat. Side effects should be discussed with patients before starting these medications so that patients can make an informed decision. This medication has worked wonders in weight loss and better diabetes control; however, it is not without its risks!

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Hypoxia-Mediated Reprogramming of Injured Muscle Cells is Due to Early Expression of MSX1

Kevin Chen[1], Justin Lee[1], Siobhan West[1], Yong Li[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Msh Homeobox-1 (MSX1) is a homeobox gene known to inhibit precursor cell differentiation. It has also been shown that the ectopic expression of MSX1 is able to induce dedifferentiation of terminally differentiated myocytes. Based on this knowledge, we hypothesized that hypoxia-mediated reprogramming of injured muscle cells is due to early enhanced expression of MSX1. Our goal is to describe the early transcriptional changes triggered by hypoxia in regenerating muscle cells.

Methods: To quantify the amount of MSX1 produced in muscle stem cells (MuSC) under hypoxia, we cultured MuSCs and incubated them in hypoxia (5% O2) and used western blot to measure the amount of MSX1 protein. To assess for changes in gene expression, MuSCs were cultured in hypoxia before RNA extraction. qPCR was performed to measure the expression of the pluripotency markers MSX1, Nanog, OCT3/4, and Sox2. To assess for changes in muscle stem cell behavior in hypoxia, myotube formation was compared between cells cultured in hypoxia and normoxia, with and without MSX1 siRNA.

Results: We found that in MuSC, gene expression of Msx1 and Nanog was significantly increased after 2 hours of hypoxia. By fours of hypoxia, MuSC showed significantly increased Nanog levels but no significant increase in gene expression of MSX1. We also found that the addition of MSX1 siRNA to MuSCs significantly decreased the expression of CXCR4, a marker of pluripotency, and increased the expression of MYOD, a marker of myocyte differentiation. Additionally, our data demonstrated that MuSCs cultured in hypoxia showed a greater decrease in myotube formation when exposed to anti-MSX1 siRNA compared to MuSCs cultured in normoxia.

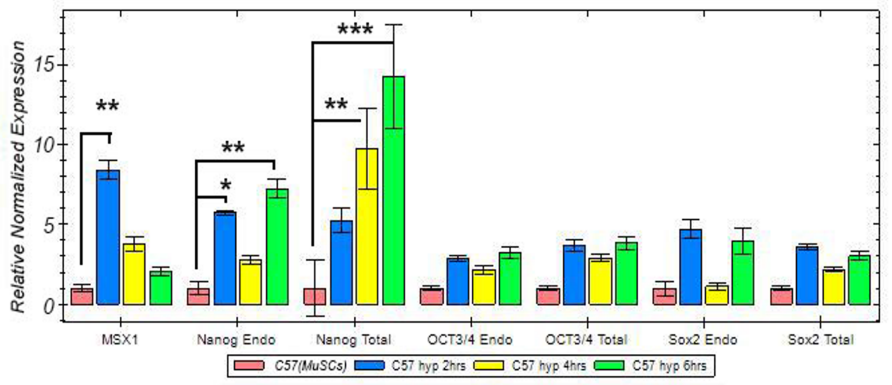

Figure 1. MSX1 has the most significant expression at early moments of hypoxia. We examined the expression of pluripotent and myogenic genes at 2, 4, and 6 hours(hrs) by qPCR. *MSX1* shows significant increase much earlier than the other genes. Data are represented as the mean ±SEM of 4 biological replicates. *P<0.05; **P<0.01; ***P<0.001.

Conclusion: These findings suggest that exposure to hypoxic conditions results in the upregulation of factors that promote pluripotency in MuSC. MSX1 seems to play a key early role in preventing cell differentiation and inducing stem cell-like quality.

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Morbidity of Sentinel lymph Node Biopsy in Melanoma Patients Better Defined

Mason Gonzales[1], Kent Grosh[1], Samuel Coster[2], Theresa McGoff[1], Austin Brubaker[1], Laurence McCahill[1]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI.

Background: Sentinel lymph node biopsy (SLN) is a critical aspect of staging and management for malignant melanoma. However, the procedure poses additional costs and risks. We have established a comprehensive melanoma treatment outcomes registry, aiming to assess the quality of surgical care for melanoma patients. In this study, we sought to assess the quality of outcomes and morbidity specific to the SLN procedure. The study objectives were 1) Identify quality of SLN biopsies at our institution and 2) Identify surgical morbidity specific to SLN.

Methods: Inclusion criteria: Patients identified as having undergone initial surgical treatment for melanoma and detailed assessment of those undergoing SLN. Quality of SLN performance was evaluated by: amount of patients with clinical stage Ib or II offered SLN, node identification rate, SLN pathologic positivity rate, and mean number of nodes excised. Procedure morbidity was evaluated by complications specific to the SLN procedure (infection, seroma, hematoma, lymphedema) and burden of care assessed by post-operative clinic visits.

Results: Of 175 melanoma surgery patients, 103 (58.9%) underwent SLN biopsies, mean age was 65 (range 30-97), and M:F ratio was 57:46. Tumor location was Head/Neck (11.7%); Trunk (41.8%) and Extremity (46.5%). SLN was offered to 90/96 (93.7%) of eligible patients. Nodes were identified in 101/103 (98.1%) of cases. Pathologic positivity was 15.5%, with an average of 1.8 nodes excised. Complications included seromas in 23 (22.3%) 9.7% required aspiration and 3.8% required drainage catheter, infections in 3 (2.91%), lymphedema in 2 (1.97%), and hematoma in 1 (0.97%). Patients undergoing SLN with complications averaged 2.62 clinic visits vs 1.66 in those without complication ($p=0.001$). Wide local excision (WLE)+SLN patients had more post-op visits compared to WLE alone, 2.01 vs 1.22 ($p<0.0001$).

Conclusion: Sentinel lymph node (SLN) biopsy is routinely offered to patients for staging. Nodes are reliably detected intraoperatively. Biopsy positivity rates and the number of nodes removed align with national expectations. Despite the rarity of serious complications, seromas are frequent, increasing burden of care. Although SLN biopsy is vital in melanoma management, it contributes to additional morbidity. Advancing molecular predictors to forecast melanoma outcomes remains a valuable pursuit.

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Incidence of Thrombotic Events in Acute Care Surgery Patients with Incidental COVID-19 Infection

Mikayla Moody, Christine Schmitt, Emma Sand, Mallory Ruvina, Lisa Miller
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Background: The COVID-19 pandemic has presented novel challenges for surgeons in an acute care setting. Early research demonstrated that patients undergoing surgery while infected with COVID-19 may have a higher incidence of thromboembolic events[1]. The investigators aim to answer the question of complication rate in patients with an incidental finding of COVID-19, as this relationship has not been extensively studied. If patients are shown to have minimal complications with an incidentally found COVID-19 infection, this research will further illuminate the decision-making tree for acute care surgeons.

Methods: A retrospective review of the patients from the Bronson Virtual Data Warehouse from June 1, 2020, to December 31, 2021, was performed. The assessed population included patients at least 18 years old who received surgery through the Bronson General Surgery service, which provides urgent surgery to patients not previously established with a Bronson surgeon. We identified patients who incidentally tested positive for COVID-19 and attempted to identify if they had adverse thromboembolic outcomes in the postoperative period.

Results: Data was collected from 560 patients on 593 encounters. Of these surgeries performed, 569 had a negative COVID-19 test just prior to their surgery, while 24 tested positive for COVID-19. No significant differences were found in the following endpoints when comparing patients who were incidentally found to be COVID-19 positive: readmission (p-value=0.77), deep vein thrombosis (p-value=1), cerebrovascular accident or transient ischemic stroke (p-value=1), myocardial infarction (p-value=1), pulmonary embolism (p-value=1), and total mortality within six months of surgery (p-value=1).

Conclusion: Patients who incidentally tested positive for COVID-19 prior to undergoing surgery were not at a higher risk of thromboembolic events in the peri- and post-operative period. These results do not support prior research that demonstrated a higher rate of thromboembolic events. Based on this data from the Bronson General Surgery service, general surgeons are safe to continue to operate on patients with COVID-19 who are asymptomatic or minimally symptomatic.

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IRB Reference: WMed-2022-0977

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Gamifying Tutorials - Using a BINGO Game to Review Medical Physiology

Kelsey Temprine, Hong Phan, Maria Sheakley, Jerry Bouma, Alexandra Bayer, Biren Shah
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: This study introduces a BINGO game as an active learning strategy for pulmonary, renal, and endocrine physiology, aiming to enhance student engagement and the application of physiology knowledge.

Methods: Each BINGO tutorial featured 50-60 questions aligned with prior learning events, utilizing a novel PowerPoint template. Iterative improvements, including revealing correct answers and a polling system, were implemented based on student feedback. Sessions required BINGO materials, prizes, and in one iteration, polling software. Post-session surveys assessed perceptions and engagement using 5-point Likert scale and free-response questions. Thematic analysis of feedback informed iterative improvements and overall themes common between iterations, while t-tests compared responses across sessions.

Results: Students reported high engagement (PUL: 4.34, REN: 4.44, END: 4.29) and perceived effectiveness of time spent (PUL: 4.19, REN: 4.19, END: 3.87) across BINGO games. The games were rated as effective educational tools (PUL: 4.13, REN: 4.44, END: 4.13) and valuable for applying physiology knowledge (PUL: 4.26, REN: 4.56, END: 4.39) on diverse topics (PUL: 4.34, REN: 4.52, END: 4.32). Students expressed a desire for continued BINGO use in future tutorials (PUL: 4.13, REN: 4.44, END: 4.10). Statistical analysis revealed no significant differences among the three BINGO tutorial iterations.

Discussion: Students valued iterative changes based on their feedback, such as revealing correct answers after questions. The PUL survey led to implementing this change in the REN BINGO tutorial, and the REN survey prompted further improvements in the END tutorial, addressing the need for explanation of correct answers. Students appreciated the abundance of practice questions provided, enhancing the learning experience beyond just the BINGO tutorial event.

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Specialized Medical Care via Telehealth for the Underhoused Community: Developmental-behavioral pediatrics as a prototype

Caroline Hall[1], Sophia Haas[2], Sravani Alluri[3], Neelkamal Soares[4], Lisa Graves[3]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Kalamazoo College, Kalamazoo, MI. [3]Department of Family and Community Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [4]Department of Pediatric and Adolescent Medicine, Department of Biomedical Informatics, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Background: Street Medicine Kalamazoo (SMK) is a medical organization established in January 2021 by medical students, resident physicians, and attending physicians from Western Michigan University Homer Stryker M.D. School of Medicine (WMed). SMK serves underhoused individuals whose needs are not typically met by traditional healthcare systems. SMK's work is based on a foundation of trust and mutual respect with the patients they serve. Unhoused youth often face significant developmental and behavioral challenges. Developmental-Behavioral Pediatric (DBP) specialists are trained to diagnose, manage, and treat the functional impairments of a variety of developmental-behavioral and learning conditions through collaboration with an interdisciplinary team. This project expands SMK's services to include DBP via telehealth consultations.

Objective: To develop a DBP telehealth program within SMK that can be effectively delivered to the underhoused population of Kalamazoo.

Methods: Data obtained from the Epic Electronic Health Record were used to determine the number of patients aged 2-21 seen by SMK in the preceding six months. The opinions of community members and SMK physicians were sought to determine the optimal time and location for visits. Workflow analysis was conducted to provide an adapted telehealth service. The technology for telehealth visits was also obtained. Various community organizations, including the Kalamazoo Gospel Mission, Integrated Services of Kalamazoo, and Ministry with Community, have been engaged. The involvement of WMed medical students and undergraduate students from preferred partner institutions has enhanced the project.

Results: A referral/clinical workflow to fit SMK requirements, including digitized behavior assessment and visit intake forms and a method for communicating the SMK calendar to the WMed Health enterprise, has been developed. Additionally, patient educational materials at the fifth-grade literacy level were developed. Two surveys were created – one for SMK staff to assess visit efficiency and another for parents/guardians to gauge SMK patients' access to technology – to determine the feasibility of future telehealth programs.

Conclusion: This project is ongoing and is making significant strides in addressing systemic inequities in healthcare. The model of delivery of care for DBP is a template for the future expansion of telehealth for this SMK population.

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Persistent Bacteremia in Bilateral Septic Cavernous Sinus Thrombosis: A case report

Katelyn Stoker, Ryan Clydesdale, Susan Bannon
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Septic cavernous sinus thrombosis (SCST) is a rare condition with high morbidity and mortality characterized by thrombus formation within the cavernous sinus(es) resulting from contiguous spread of facial, paranasal sinus, or dental infections. Cranial nerve palsies and ophthalmologic findings are hallmarks of SCST, often presenting as eyelid edema, proptosis, chemosis, and ophthalmoplegia. Prompt recognition and treatment are necessary to minimize morbidity, though long-term neurological sequelae are common. Data regarding treatment is limited by the rarity of this condition. This report describes a patient with septic cavernous sinus thrombosis resulting from manipulation of a furuncle within the "danger triangle" of the face requiring surgical intervention for persistent methicillin-resistant Staphylococcus aureus bacteremia.

Case Presentation: A previously healthy middle-aged man presented to the emergency department for evaluation of neck pain and stiffness, fever, photophobia, and bilateral eye swelling for one day. He had a remote history of MRSA skin infection with recent development of furuncles three weeks before presentation, including one above his upper lip which he ruptured. Physical examination revealed bilateral proptosis and eyelid edema, chemosis, and left ophthalmoplegia with a fixed and dilated pupil. CT scan was significant for intraorbital fat stranding and superior ophthalmic vein thrombosis. The patient was placed on a heparin drip, vancomycin, and cefepime; dexamethasone was added due to concern for meningitis. Blood cultures and CSF were positive for MRSA. He developed acute hypoxia and left temporal lobe infarction from septic emboli resulting in right-sided facial and limb weakness. Echocardiography showed no evidence of valvular vegetations, but MRI of the brain revealed complete opacification of the sphenoid sinuses and right mastoid air cells. Despite therapeutic levels of vancomycin and addition of linezolid, bacteremia persisted for five days. Otolaryngology service was consulted, and the patient underwent bilateral total ethmoidectomy and sphenoidotomy, frontal sinusotomy, septoplasty, and ear tube placement. Postoperatively, the patient demonstrated rapid clinical improvement. He was discharged on hospital day twenty-one in stable condition with residual right-sided motor deficits that improved with physical and occupational therapy, and persistent left eye ophthalmoplegia with vision loss.

Discussion: This case demonstrates the importance of rapid recognition of SCST and highlights a potential benefit of otolaryngological intervention in providing source control when treatment is complicated by persistent bacteremia and evidence of sinus infection on imaging.

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EEG-Based Emotion Recognition Using Convolutional Neural Network (CNN) Method

Shokoufeh Davarzani, Abdulrahman Olalekan Yusuf, Simin Masihi, Massood Atashbar
Western Michigan University, Kalamazoo, MI

Introduction: Electroencephalograms (EEGs) are direct reflections of brain activity, which can be used to diagnose both mental and physical states. These signals can be considered an optimal choice for emotion analysis because of direct reflection of the brain electrical activity. Among various EEG-based emotion recognition methods, deep learning methods have demonstrated superior performance compared to the traditional methods, such as linear classifiers, support vector machines (SVMs), and traditional neural networks. While these traditional methods rely heavily on handcrafted features and may struggle to capture the intricate patterns present in EEG data, deep learning methods extract complex features automatically from raw EEG data. This allows for more accurate representation of the patterns associated with different emotional states, and more adoption of diverse data characteristics.

Methods: In this paper, a Convolutional Neural Network (CNN) is developed to classify eight emotional regions from the valence-arousal plane: High Valence High Arousal (HVHA), High Valence Low Arousal (HVLA), Low Valence High Arousal (LVHA), and Low Valence Low Arousal (LVLA). The reason behind selecting this learning algorithm lies in its unique capabilities in capturing the sequential patterns which makes the CNN method ideal for tasks that require the progression of emotional states over time.

Results: As a result of our analysis, it is shown that the CNN model can reach an accuracy of 88.9%, indicating its effectiveness in accurate classification and prediction of the target outcomes in the given task/dataset.

Conclusion: This level of performance indicates the potential practical applicability of the CNN model in various real-world scenarios, particularly those requiring accurate and efficient processing of complex datasets.

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Effects of Different PEEK Fabrication Methods on Surface Wettability and Cellular Response

Lauren C. Brown[1], Mitchell Kenter[2], Aleya Brandon[2], Adil Akkouch[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI.

Introduction: Polyether ether ketone (PEEK) is an organic thermoplastic polymer commonly used in orthopedic devices as an alternative to metallic or ceramic materials. PEEK has favorable outcomes in arthroplasty regarding biocompatibility, material characteristics, and mechanical durability. PEEK is inert, and its hydrophobic surface is problematic for osteointegration because cells cannot adhere and differentiate into bone. Current PEEK modifications for promoting cell adhesion include plasma treatment, laser etching, and surface coating with calcium phosphates, which require sophisticated and specialized equipment. Our goal in this study is to explore the adsorption of serum proteins on the PEEK surface to increase its biological properties while maintaining its physical properties.

Methods: We developed PEEK discs (2-cm diameter) composed of varying sizes of PEEK granules: coarse, fine, and a mixture of both granules. PEEK discs were fabricated using two different sintering temperatures: 380 °C for 10 minutes and 400 °C for 8 minutes. To study the effect of cooling temperature on the surface properties of PEEK, the discs were cooled in an ice bath or at room temperature. Twelve types of PEEK discs with different granule sizes, sintering regiments, and cooling temperatures were produced. We measured wettability using the contact angle of water. Cell adhesion, viability, and proliferation were assayed using AlamarBlue and lactate dehydrogenase tests using osteoblasts.

Results: The wettability of PEEK was influenced by granule size and sintering as well as the cooling temperature, resulting in the lowest contact angle for the fine granules sintered at 400 °C and cooled at room temperature. Osteoblast adhesion was also influenced by the fabrication processes; rapid cooling of fine granules using ice resulted in the lowest cell adhesion. The visual appearance of PEEK disks was also influenced by the rapid cooling, which may result in significant changes in the surface chemistry of the PEEK. Next, we will study the effect of protein adhesion on the twelve fabricated PEEK discs and their effect on stem cell differentiation and bone formation.

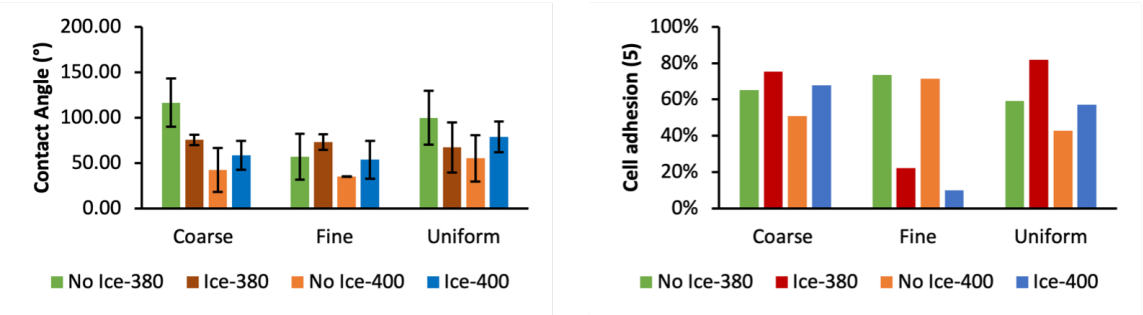

Figure: A) Contact angle of twelve fabricated PEEK disks, B) Osteoblasts adhesion cultured for 16 hours on PEEK discs.

Conclusion/Clinical significance: Enhancing the bioactivity of PEEK by modulating its preparation methods will improve patient outcomes by enhancing the osteointegration of orthopedic devices made by PEEK.

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Potential Sexual Dimorphisms in Mitral Cell Dendritic Structure with Growth, Injury and Recovery in Adult Zebrafish

John Rozofsky[1], Joanna Pozzuto[2], Christine Byrd-Jacobs[1]
[1]Western Michigan University, Kalamazoo, MI. [2]Kalamazoo Valley Community College, Kalamazoo, MI.

Introduction: It is imperative to consider sex as a biological variable in scientific research. While differences between males and females have been found in numerous studies, little is known about sex differences in the recovery of brain structures in adult zebrafish. Olfactory bulb mitral cells (MC) are the primary neurons responsible for transmitting odorant information from the olfactory epithelium to higher-order brain structures. In this study, we examined sex differences in recovery of the MC dendritic arborization in adult zebrafish following loss of sensory input.

Methods: We applied Triton-X 100 detergent to the olfactory epithelium of adult zebrafish once every three days for eight weeks to cause chronic deafferentation of the bulb and allowed other fish to recover for three or eight weeks. We used the left side of the bulb as an internal control. Mitral cells were visualized with fluorescent retrograde tract tracing and imaged with confocal microscopy.

Results: Our hypothesis was that MC dendritic degeneration and regeneration would differ between males and females. We also examined potential sex differences in MCs during growth, as zebrafish continued to grow throughout the course of the study. Control measurements of MC dendritic arbors showed differences in male and female fish, with males possessing fewer numbers of major branches and decreased distribution of fine processes. Our combined data of males and females showed that following eight weeks of repeated damage, MC dendritic morphology significantly decreased in number of tips, total length of dendritic branches, size of dendritic field, and distribution of fine processes. However, when the fish were allowed to recover for three or eight weeks, these significant differences were alleviated, as shown by a return of structures to non-significant levels. Preliminary results indicated that females recovered optical density and number of tips faster than males. Several MC dendritic measures showed effects of fish growth.

Conclusion: Our study shows that timelines for growth and recovery of dendrites differ between the sexes. More work is needed to elucidate further insights into the plasticity of neuronal processes in the zebrafish olfactory system and potential sex differences that may exist between males and females.

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Autologous Blood Clots as a Therapeutic Vehicle for Treatment of Femoral Defects in a Rat Model

David Richter[1], Megan Moore[1], Kristi Bailey[2], Sheridan Hayes[1], Christine Pink[2], Yong Li[1]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Autologous blood clots (ABCs) contain numerous biologically active factors that aid the natural healing process; accordingly, the formation of clots is foundational to the natural healing of bone lesions. Additionally, a growing body of research suggests that mesenchymal stem cells (MSCs) may promote bone healing [1]. Therefore, this study investigated the ability of ABCs loaded with MSCs to promote healing of cortical bone lesions. We hypothesized that defects filled with ABCs and MSCs would achieve complete healing more rapidly than a control fibrin gel.

Methods: All animal procedures were conducted in accordance with protocols approved by WMed's IACUC (IACUC-2023-0027). MSCs were isolated from Sprague Dawley rats, as previously described. Animals were anesthetized with 2.5% isoflurane and provided buprenorphine HCl for analgesia. Approx. 100 µL of blood was obtained from the lateral caudal vein and allowed to clot in the presence and absence of MSCs. The femur was accessed, and, after creation of 1.5 mm drill hole defects, lesions were filled with either a control gel, ABC, or ABC+MSCs. Defects were left to heal for 14, 21, or 28 days, at which point animals were euthanized by CO2 asphyxiation and bones were isolated for histological, radiographic (x-ray, microCT), and molecular analysis.

Results: Defects filled with ABCs exhibited increased opacity on radiography at both 14- and 21-days post-op, indicating superior bone formation. Radiography suggested nearly complete resolution of lesions treated with ABCs by 21-days post-op (Figure 1). These findings were confirmed by histology, with ABC-treated defects exhibiting improved healing at 14- and 21-days post-op. Ongoing experiments involve microCT, immunohistochemistry, and PCR; preliminary data support our x-ray and histological findings.

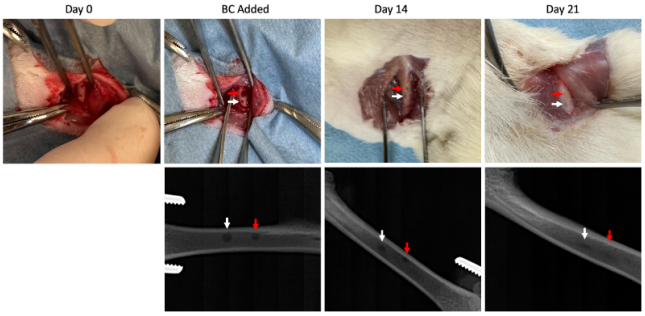

Figure 1. Representative images of 1.5 mm femoral defect on days 0, 14, and 21. On visual and radiographic inspection, defects filled with ABCs (red) appear to have superior healing, relative to control (white).

Conclusion: Application of ABCs resulted in improved healing outcomes of femoral cortical bone defects at 14- and 21-days post-op. Therefore, ABCs may provide an effective vehicle to accelerate local healing following bone injury. Moving forward, we plan to conjugate ABCs with stem cells and pharmaceuticals to further accelerate fracture healing.

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Under-Representation of Diverse Skin Tones in Dermatology, a Case of Gianotti-Crosti Syndrome

Jennifer Vosters, Tiffany Hangse, Asra Usmani, Shekha Nelliadi, Jocelyn Deleon
Department of Pediatrics, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Gianotti-Crosti Syndrome (GCS) also known as papular acrodermatitis of childhood is an acute eruption of pruritic, flat-topped, monomorphic papules in an acral distribution. It is a benign, self-limited rash known to commonly arise after viral infections such as Epstein-Barr virus, cytomegalovirus, and coxsackievirus [1]. It can also appear in recently immunized individuals or those with a history of atopic diseases [2]. However, as this exanthem is diagnosed clinically, it increases the risk of misdiagnosis, incorrect treatments, and unnecessary costs, particularly when providers are not familiar with the appearance of cutaneous findings on darker skinned individuals. Here we present a case of an African American with GCS whose care was misdirected due to misdiagnosis.

Case Presentation: The patient, a generally healthy African American toddler, was initially seen at an outside clinic and treated for atopic dermatitis. Several days later, when topical steroids proved ineffective, he was brought to our clinic. He was noted to have several dark, clustered, papulovesicular non-blanching lesions over his face, bilateral upper and lower extremities. It was demarcated at mid-biceps and proximal thighs bilaterally, involving soles and palms. There was no involvement of trunk or evidence of excoriation. Parents reported fever the day previous but no recent illnesses. The patient was up to date on vaccines. Given the symmetric acral distribution, papulovesicular presentation with preceding fever, the rash was clinically diagnosed as GCS. On follow up 10 days later, lesions are resolving, with no new eruptions.

Discussion: Racial disparities in identification of skin lesions is now a well-recognized concern. Our review of literature revealed little to no cutaneous material illustrating GCS in people of color. This case highlights the need for increased awareness of the presentation of common skin disorders on diverse skin tones, especially as there are variable presentations of GCS. Although GCS typically has no serious health consequences, a delay in diagnosis causes undue distress, increases financial burden, and risks potentially invasive diagnostic workups.

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Application of Artificial Intelligence and Three- Dimensional Modelling in the Planning and Execution of Aortic Aneurysm Repair - A Mini-Review

Harshank Patel[1], Paul Choi[2], Jennifer Ku[1], Rafael Malgor[2], Dhiren Patel[3], Yong Li[3]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Colorado University, Denver, CO. [3]Southern Illinois University, Springfield, IL. [3]Department of Orthopaedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: The accuracy of fenestrations placed in the stent-grafts for the repair of complex aortic aneurysms and dissections can be greatly increased with the help of 3 dimensional (3D) printed phantoms. Moreover, this process can be further standardized by using artificial intelligence (AI) for image pre-processing prior to 3-dimensional (3D) printing. In combination, these two processes can aptly address the fallacies of centerline image analysis and manual image pre-processing, including but not limited to: inaccurate fenestration placement and inter-observer variability. Moreover, with the help of these phantoms, a surgeon can accurately ascertain the interaction between the stent graft and the diseased aorta in vivo. We herein present a comprehensive review of the application of these two technologies for complex aortic aneurysm repair, including the current trends in clinical settings.

Methods: An exhaustive review of the literature was performed using keywords like “3D printing”, “Artificial intelligence”, “Thoracoabdominal aneurysm”, “Abdominal aortic aneurysm”, “Aortic arch aneurysm”, “Endovascular repair”, “Open repair” in PubMed and Google Scholar indexes up to June 2022.

Results: Seven different studies were included in this analysis. Four of these studies dealt with use of 3D printed phantoms for endovascular repair of various aortic pathologies affecting the arch of aorta, thoracoabdominal aorta, and juxtarenal and pararenal aorta. One study dealt with the open repair of thoracoabdominal aneurysm (TAAA) with the help of 3D printed models for graft construction. The last two studies discussed their experience with the use of convolutional neural networks (CNN), an AI based technology, for pre-processing of aortic computed tomography angiography (CTA) images.

Conclusion: Application of 3D printing and AI based image pre-processing in the planning of complex aortic aneurysm can lead to various benefits, like enhanced patient and trainee education, more accurate placement of the fenestrations, decreased surgical time and complications, as well as decreased surgeons’ stress. Thus, the combination of these two technologies has a realistic potential to simplify the planning of complex aortic aneurysm repair.

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Do The Hips Lie? A Rare Osteomyelitis Presentation

Dhruv Srinivasachar, Nital Murthi, Thomas Flynn, Karen Bovid
Department of Orthopaedic Surgery, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI Kalamazoo, MI

Case presentation: A 7-week-old male infant presented with irritability and markedly decreased right hip range of motion for 6 days. The patient was born at 34 weeks via C-section for breech presentation to a mother with group B streptococcus (GBS) unknown status. Infant had a 1-week uncomplicated NICU stay. Regarding other symptoms, no fever, rash, cough, appetite change, constipation, diarrhea, vomiting, oliguria, or decreased activity level were noted. The patient was seen in outpatient clinic for these symptoms, and given his irritability, symptom duration, and unclear mechanism of injury, was sent to the ER and ultimately admitted for further evaluation.

The patient was afebrile, with normal heart rate, respiratory rate, SpO2, and blood pressure. Physical exam was notable for spontaneous bilateral upper extremity and left lower extremity movement. The right lower extremity was flexed and abducted with no spontaneous movement. Passive ROM was reduced secondary to marked irritability, and Barlow and Ortolani maneuvers were unable to be performed due to the same. The cardiovascular, pulmonary, abdominal, and neurologic exams were otherwise normal.

Given the unclear mechanism of injury in a non-ambulating infant, a skeletal survey was performed, with no evidence of new or healing fracture. However, a right femoral neck radiolucency was noted (Fig. 1). Labs including CBC, CRP, and blood culture were unrevealing. MRI revealed right proximal osteomyelitis, which was confirmed on bone biopsy to be Brodie's abscess caused by GBS (Fig. 2, 3). The patient was diagnosed with GBS osteomyelitis, and underwent debridement and a 6 week course of ampicillin with resolution of symptoms. The patient is currently being followed by orthopedics, with no evidence of proximal femoral growth disturbance or femoral head osteonecrosis on short-term follow-up.

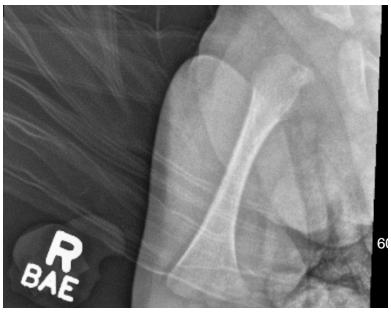
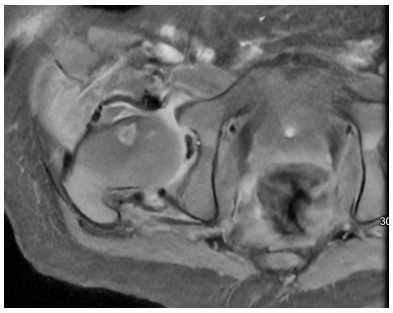


Figure 1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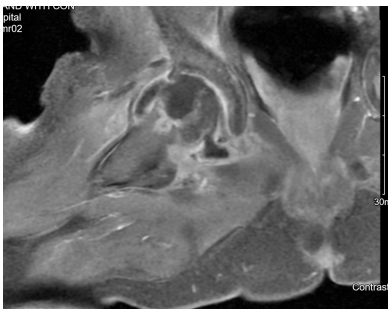
Figure 3

Discussion: Osteomyelitis is an uncommon manifestation of late-late-onset Group B Streptococcus. Patients typically do not have fever and concomitant bacteremia is only present in ~50% of cases. Prematurity, low birth weight, and GBS colonization status of the mother are major risk factors for late and late-late-onset GBS. These cases should be distinguished from non-accidental trauma, which may be evident on skeletal survey with characteristic fractures rather than radiolucency.

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Prostate Cancer with Isolated Peritoneal Metastasis - A Case Report

Harshank Patel, Rohit Mekala, Susan Bannon, Dustin Bivins
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Prostate cancer has varying presentations- from indolent local disease to rapidly progressive metastatic disease. We herein present a case of prostate cancer with isolated peritoneal metastasis three years after undergoing radical prostatectomy.

Case presentation: A male in his mid-sixties presented with haematuria, increased frequency, weak stream, and post-void dribbling. His Prostate specific antigen (PSA) was elevated, and cystoscopy revealed an enlarged median lobe of the prostate. Transrectal USG-guided prostate biopsy revealed invasive prostatic adenocarcinoma; bone scan was negative for any osseous metastasis. He then underwent radical prostatectomy and pelvic lymph node dissection. Post-operative pathology showed adenocarcinoma with Gleason score 4+5 = 9, grade group 5, invading the urinary bladder neck and bilateral seminal vesicles- stage pT3b N0 Mx (Stage III). Post-operative PSA was undetectable, but on serial monitoring, the PSA increased gradually. Thus, salvage radiation therapy and androgen deprivation with leuprolide was initiated. He was then followed-up for a year with repeated PSA's which increased progressively, and two PET scans four months apart, which were consistently negative. But a third PET scan revealed a 2 cm hypermetabolic nodule in the anterior abdomen right to the midline. Since this is an unusual site for metastasis in prostate cancer, a biopsy was done, which revealed adenocarcinoma of unknown origin (no further classification due to insufficient tissue). Hence, he underwent diagnostic laparoscopy with biopsy, which revealed metastatic prostatic adenocarcinoma. Due to the presence of metastatic disease, the tumor stage advanced to Stage IV. Thus, the patient was initiated on an aggressive regimen of leuprolide, docetaxel, and darolutamide, which decreased the PSA in three months.

Discussion: This case enunciates the importance of serial follow-up post prostatectomy in patients with prostate cancer to detect any metastatic disease later in the disease course, that may not be present at the time of resection. Peritoneal metastasis is a very rare site of metastasis in prostate cancer. This patient did not have metastasis at any other site. Such disease is treated in accordance with the National Comprehensive Cancer Network's guidelines for Stage IV prostate cancer. There is also very limited evidence for cytoreductive surgery with hyperthermic intraperitoneal chemotherapy.

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Blood Clots Used as Natural Biomaterials for Antibiotic Delivery

Jennifer Ku[1], Haiying Pan[2], Jessica Pham[1], Ashley Minor[1], Genevieve Abd[2], Robert Sawyer[3], Yong Li[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [3]Department of Surgery, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: The use of blood clots (BC) as natural biomaterials represents an underexplored frontier with promising therapeutic interventions. BC presents with a natural reservoir for growth factors (GF) with a fibrin matrix that enhances its capacity for drug delivery, notably antibiotics. This study investigates autologous BC as a biomaterial for sustained antibiotic delivery and GF release, aiming to evaluate the efficacy of BC composited with antibiotics and mesenchymal stem cells (MSC). Autologous BC offer several advantages, including low risk, cost-effectiveness, and exemption from U.S. Food and Drug Administration constraints. We hypothesize the integration of autologous BC with MSC and antibiotics will yield a versatile delivery vehicle that effectively prevents infection and improves wound healing.

Methods: BC were generated in vitro using blood samples from 2–3-month-old mice and composited with MSC isolated from 4–5-week-old mice. The release of vascular endothelial growth factor (VEGF) was assessed by ELISA for a 7-day period. Moreover, BC were combined with gentamicin (5 µg/ml, 10 µg/ml, 20 µg/ml) and vancomycin (20 mg/ml, 40 mg/ml, 80 mg/ml), concentrations selected based on therapeutic levels. For clotting analysis, hemolytic properties were evaluated at distinct time points: 2 min, 5 min, and 10 min following antibiotic addition.

Results: The study found elevated and sustained VEGF expression in composited BC for 7 days. Additionally, the study revealed a significant impact of gentamicin and vancomycin on the coagulation of BC. BC combined with vancomycin exhibited a nearly instantaneous clotting response observed. Conversely, gentamicin induced a faster clotting response at low concentrations and partial coagulation at higher concentrations. Moreover, sustained release of antibiotics from composited BC were observed over 7 days, underscoring the potential for effective drug delivery.

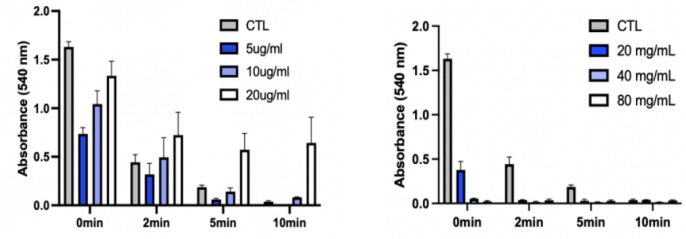

Figure 1. Comparative coagulation response to antibiotic combinations. BC combined with vancomycin demonstrated uniform coagulation throughout all time points, characterized by an immediate clotting response. In contrast, higher concentrations of gentamicin resulted in partial coagulation.

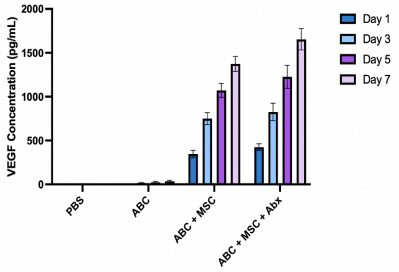

Figure 2: The VEGF from composited BC was assessed by ELISA. Our results suggested that BC compounded with murine MSCs release consistently higher VEGF at a concentration sufficient to promote angiogenesis in wound healing for over more than 7 days in vitro.

Conclusion: The multifaceted role of BC as GF reservoirs, antibiotic carriers, and barriers against infection underscores their capacity to treat diverse injuries in regenerative medicine. Utilizing BC as biomaterials could present a revolutionary treatment shift, providing an innovative and clinically impactful solution for widespread clinical use.

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Avelumab-Induced Rhabdomyolysis: A case report on rare immune-related adverse reaction in urothelial cancer

Rashma Sadasivan[1], Ibrahim Zahid[1], Tracey L Mersfelder[2], Bryce Meck[3]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Ferris State University, College of Pharmacy, Big Rapids, MI. [3]Department of Medicine-Pediatrics, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Avelumab, an immune checkpoint inhibitor (ICI), has gained widespread approval for the treatment of urothelial cancer, renal cell carcinoma, and Merkel cell carcinoma. Its mechanism of action involves acting as a human recombinant monoclonal IgG1 antibody to the programmed cell death ligand-1 (PD-L1). This case report focuses on an uncommon but critical irAE associated with avelumab treatment—rhabdomyolysis. Through this report, we aim to recognize rhabdomyolysis as a side effect of avelumab immunotherapy to enable prompt diagnosis and enhance the effectiveness of treatment interventions.

Case presentation: A male in his 70s with metastatic urothelial carcinoma and a history of right-sided nephrectomy presented with left flank pain, weakness, fatigue for two weeks and darkened urine for two days. His pertinent medication history included daily rosuvastatin and avelumab (800 mg every 2 weeks, last dose 6 weeks prior). Examination revealed stable vitals, left costovertebral angle tenderness, and diffuse abdominal tenderness. Initial laboratory data revealed elevated serum creatinine (6.0 mg/dL), BUN (79 mg/dL), Creatinine Kinase (CK) (35,838 units/L), and liver enzymes. Methylprednisolone and fluid resuscitation led to improvement in CK (17,990 units/L) and liver enzyme recovery, but the serum creatinine continued to increase (6.5 mg/dL). The diagnosis was determined to be acute intrinsic renal failure due to drug-induced rhabdomyolysis with a GFR of 8ml/min/1.73m2, rhabdomyolysis, and immune related hepatotoxicity.

Discussion: Our case unveils a unique instance of avelumab-induced rhabdomyolysis, suggesting a possible causal relationship (Naranjo score 3). This is the first reported case of avelumab induced immune-mediated rhabdomyolysis to the best of our knowledge. Tailored treatment hinges on affected organ and symptom severity. High-dose steroids are prescribed to treat severe adverse events, while discontinuation of the offending agent is advised for grade 4 or recurrent grade 3 irAEs. Providers must stay vigilant for high-grade immune-mediated adverse effects associated with ICIs, acknowledging the potential for multi organ system manifestations. The rarity of this event emphasizes the need for multicenter studies to scrutinize irAE incidence, outcomes, and prevention methods, fostering evidence-based management algorithms. This revelation underscores the delicate balance in utilizing PD-L1 inhibitors, prompting refined approaches to maximize benefits while minimizing rare yet severe risks.

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Onychomadesis Secondary to Streptococcus Pharyngitis: A case report

Asra Usmani, Jocelyn Deleon
Department of Pediatrics, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Onychomadesis is full thickness sulcus caused due to a complete halt in nail plate production. It can be caused by infections, nail bed trauma, systemic diseases, penicillin allergy and medications such as anti-tumoral chemotherapeutics, carbamazepine, lithium salts, retinoids. Of these, viral infections have been reported to be the leading cause of onychomadesis. These include hand foot-mouth disease, COVID-19, influenza, varicella and measles [1]. In this case presentation, we aim to report a unique case of a 4-year-old child who developed onychomadesis following streptococcus pharyngitis. To the best of our knowledge, this is the first reported case of such presentation.

Case Presentation: A 4-year-old healthy boy presented to the clinic with a 2-week history of nail splitting. They were neither bleeding nor painful. He was otherwise asymptomatic. Approximately 6 weeks prior, he was seen for sore throat. He had cervical adenopathy along with a positive streptococcal throat swab. No systemic symptoms, other URI symptoms or rash were noted. At the time, he was treated with Amoxicillin without any complications. On examination, there was horizontal splitting of proximal nails with intact distal nail growth. The splitting was symmetric in both hands and feet bilaterally. There were no signs of fungal infection, subungual hyperkeratosis or psoriatic onycholysis. Parents reported no recent viral illness or any remote infection aside from the streptococcal pharyngitis. The rest of the examination was unremarkable. Upon follow up, the nail changes had self-resolved completely after a month.

Figure 1 Figure 2 Figure 3 Figure 4

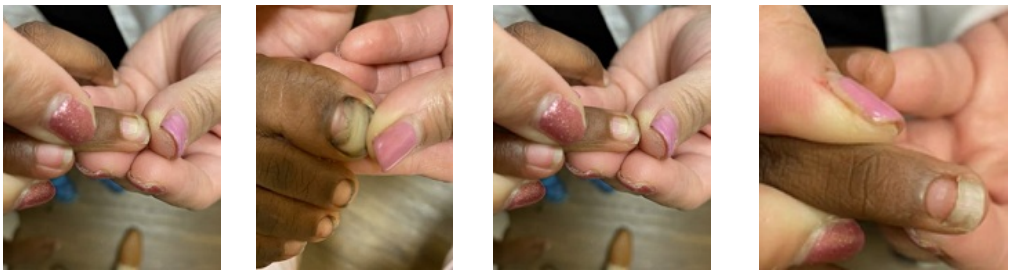

Figure: 1, 2, 3, 4 showing onychomadesis in bilateral hands and feet.

Discussion: Extensively reported, viral infections are now an established risk factor of onychomadesis. Despite no clear consensus, various mechanisms have been hypothesized to explain the nail matrix arrest including fever, inflammation, and viral replication within the nail matrix. Although there have been rare mentions of onychomadesis secondary to scarlet fever, there has been no case reported solely following strep throat. Given the preceding streptococcus pharyngitis in our patient, this case emphasizes the need to consider association of bacterial infections with onychomadesis.

References: [1] Kim, Bo Ri, et al. (2023) Acta Dermato-Venereologica, 103.

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A Case of a Recurrent Schwannoma in the Left Distal Ulnar Nerve

Logan Morrey[1], Sumit Patel[2], Mayron Lichterman[2, 3]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Bronson Methodist Hospital, Kalamazoo, MI

Introduction: While incidence of peripheral nerve schwannomas is relatively low in the general population, multiple, recurring schwannomas, or schwannomatosis is an even rarer phenomenon and can be hard to detect given their ability to mimic other forearm conditions.

Case presentation: We report a case of a 35-year-old male who presented with a mass on his left wrist, a shooting volar pain in his forearm and numbness in his fingers. MRI revealed a 7 cm bilobed heterogenous neural sheath tumor in the distal left ulnar nerve. The tumor was resected through extensive internal neurolysis with tenotomy scissors under a Zeiss operative microscope and post-operative biopsy confirmed the tumor to be an encapsulated schwannoma. The patient was still experiencing similar symptoms 10 months post-op and underwent a repeat MRI which showed a thickening of the ulnar nerve proximal to the area of resection with an 8.5 mm hyperintense nodule. The patient underwent another resection using tenotomy scissors under microscope, and biopsy again confirmed the repeat tumor was a benign non-invasive schwannoma. At 6 weeks post-op, the patient's forearm pain was significantly improved, and his range of motion returned to baseline.

Discussion: Our case demonstrates the importance of post-operative follow-up in schwannomas with appropriate imaging if symptoms persisting, and the importance of considering the possibility of schwannomatosis.

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Wet and Dry Beriberi in a Well-Resourced Community

Gregory Olsen, Sojdeh Saber-Hamishegi , Ramona Wallace
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Beriberi is a disease often associated with developing parts of the world and is easy to miss when working in a well-resourced area. Wernicke-Korsakoff syndrome is the most salient progression of thiamine deficiency in the developed world but given chronicity it has a natural evolution to beriberi. This is a case of a female who developed both wet and dry beriberi in Michigan. Keeping a high index of suspicion in patients with a history of chronic malnutrition, comprehensive physical exam skills, and understanding their social determinants of health can prevent expensive and unnecessary diagnostic studies.

Case Presentation: A black female in her 30s with a past medical history that was significant for coronary artery disease, hyperlipidemia, heart failure with reduced ejection fraction estimated at 40%, pulmonary emboli, and pancreatitis repeatedly presented to an Emergency Department in Michigan with a 3-month history of progressive lower extremity numbness and weakness. She was admitted to the floor due to her inability to ambulate. Imaging, including three X-rays, three CT scans, and three MRIs, showed no clear etiology. A month after admission, electromyography showed metabolic related neuropathy and vitamin testing demonstrated pan-low essential vitamin levels. Correct identification of the patient's condition allowed for remediation with vitamin supplementation and proper nutrition which corrected this patient's symptoms.

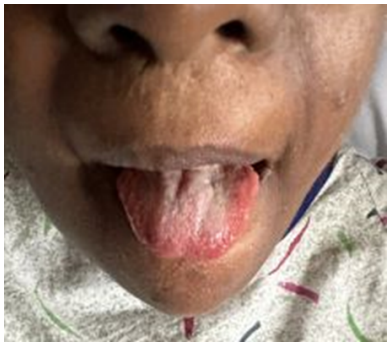

Figure 1:

Discussion: Thiamine deficiency should remain high on one's differential in any patient with risk factors for chronic malnutrition. Hundreds of thousands of dollars of diagnostic effort went into this case when a simple thiamine level, which costs $14, would have given clinicians their answer early on. Comprehensive physical exam skills could also have aided diagnosis, as the patient had a classic vitamin deficiency physical exam finding demonstrated in **Figure 1**. Delays in diagnosis were due to short term thiamine administration in the ED which falsely elevated thiamine levels transiently, low patient familiarity in relation to their social determinants of health, and low clinical suspicion for a chronic micronutrient deficiency in those at risk. Having a comprehensive understanding of a patient's social determinants of health and socioeconomic risk factors can aid diagnoses and reduce unnecessary diagnostic burden.

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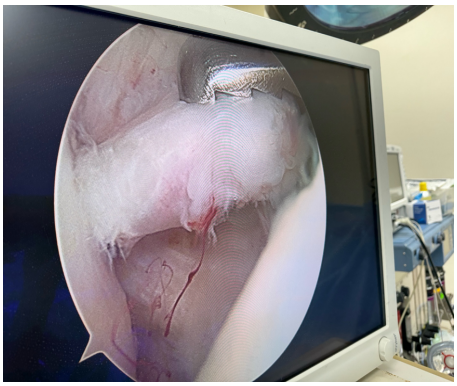
Anterior Cruciate Ligament Reconstruction in Honduras - A Case Study

Nicholas Kossoff[1], Chidambaram Nachiappan[1], Richa Gupta[1], Sumit Patel[1, 2], Joshua Veenstra[1, 2], Mark Veenstra[1, 2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopedic Surgery, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Injuries to the anterior cruciate ligament (ACL) are prevalent among active individuals resulting in both immediate and long-term detriments to knee function if left unaddressed. Effective treatment for ACL injuries include conservative rehabilitation with rest and anti-inflammatory medication or surgical intervention, with the latter being the recommended treatment option for individuals wishing to return to high activity levels. The goal in treating ACL ruptures include restoration of knee functionality and mitigation of subsequent injury risk, ultimately enhancing overall quality of life post injury.

Case Presentation: A 28-year-old male presented 8 months after a left tibial anterior subluxation injury sustained while playing soccer in Honduras. The patient reported complaints of catching and popping in the affected knee. Physical exam revealed a neurovascularly intact left lower extremity with a positive Lachman's and positive pivot shift test. The patient's MRI and X-ray were unable to be accessed due to lack of digital records in Honduras, however, history and physical exam were concerning for an ACL injury with concomitant meniscus injury. The patient underwent a left knee ACL reconstruction (ACLR) with medial meniscectomy. Due to limited resources and dated surgical equipment, transtibial tunnels were utilized with metal interference screws obtained from Pakistan to ensure cost effectiveness.



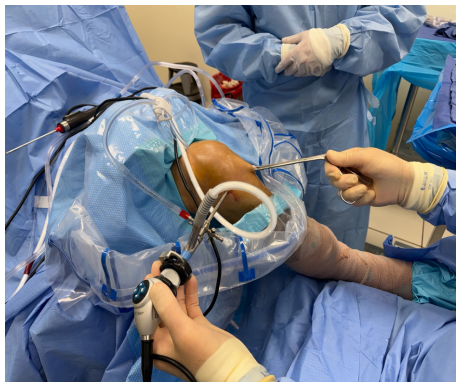


Figure 1: (Left) Intraoperative view of frayed ACL; **Figure 2:** (Right) Intraoperative photo.

Discussion: This case highlights how cost-effective ACLR methods have the potential to extend care to communities with low resources. In places where the latest arthroscopy equipment isn't available, simpler approaches like the transtibial tunnel technique for creating both tibial and femoral tunnels in ACL reconstructions may be more practical. While modern methods like the anteromedial portal and outside-in techniques offer a more anatomic reconstruction that can improve knee stability and function post-surgery, they come with higher costs. Additionally, opting for metal interference screws to secure the ACL graft, instead of bioabsorbable screws of TightRope systems often used in the United States, can save a significant amount of money per operation. This case demonstrates the importance of resource optimization and adaptation of surgical techniques to meet the healthcare needs of low resource communities.

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Impact of Tranexamic Acid Exposure on Osteocytes and Chondrocytes

Audrey Kim[1], Kayla Keckler[1], David Richter[1], Jonathan Wassink[1], Ayooluwa Ayoola[2], Yong Li[2, 3]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, [3]Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Tranexamic acid (TXA) is an antifibrinolytic agent used to control bleeding during surgery and trauma, especially during orthopedic procedures, e.g., joint replacements. However, the long-term impact that TXA has on chondrogenesis and osteogenesis has not yet been fully ascertained. Recently, there have been several publications regarding the toxicity of TXA with a wide variation in results. Given this variance among publications, we sought to explore the current literature in order to summarize the toxic impact of TXA on chondrocytes and osteocytes. This analysis can help guide the formation of clinical guidelines regarding the use of TXA during orthopedic surgeries.

Methods: The known English language publications regarding the impact of TXA on A) chondrocytes, B) osteocytes, C) chondrogenesis, and D) osteogenesis that have been released in the last 15 years were compiled from the PubMed and Google Scholar databases. The data from these publications were organized and sorted based on study type, date of publication, cell type, and toxic dose.

Results: Of the 93 articles compiled, 37 used an *in vitro* design, 12 used an *in vivo* design, 1 used both, and 12 were clinical studies. 23 of the 93 articles included a toxic dose, of which 22 were *in vitro* studies. The most widely recommended threshold for TXA use was 20 mg/mL. Only one *in vivo* experiment included a toxic dose, which was 1 mg/kg in rats. None of the clinical studies listed a toxic dose.

Conclusion and Clinical Significance: There is abundant evidence that the use of TXA above a threshold of 20 mg/mL is toxic to chondrocytes and osteocytes. This threshold is above the average amount of TXA used during many orthopedic procedures. This practice could be placing patients at undue harm. Therefore, many more *in vivo* experiments and clinical investigations should be conducted to form better clinical guidelines regarding TXA use, as well as to weigh the benefits of use against the potential harms.

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Development of an Inexpensive Head Impulse Training Model

Jacob Lenning, Kevin Richardson, Derek Versalle
Department of Emergency Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Collectively, the head impulse test, evaluation of nystagmus, and test of skew can be more sensitive for early stroke detection in acute vestibular syndrome than magnetic resonance imaging.[1] However, accuracy is limited by the difficulty of the head impulse test, which requires head turns between 10-20 degrees at >100 degrees/second.[2,3] Expensive video-oculography devices have been used to teach the motor skills of the head impulse test.[4] The purpose of this study was to correlate head turn velocity measured with a free mobile phone application and a video-oculography device to assess the feasibility of utilizing mobile phones for an inexpensive training model.

Methods: The video-oculography device and the mobile phone, with the free phyphox application to measure angular velocity, were placed on the mannequin head (Figure, Top). The head impulse test was performed with head turns at three different degrees (10, 15, 20 degrees), approximately 30 times each by the investigators. The angular velocity of each individual head turn measured by the video-oculography device in degrees/second and the mobile phone application in radians/second were plotted and linear regression analysis was conducted (Figure, Bottom).

Results: There was a very strong linear correlation between the angular velocity recorded by the mobile phone application and the video-oculography device for each degree of head turn (10 degrees: $R^2 = 0.995$; 15 degrees: $R^2 = 0.994$; 20 degrees: $R^2 = 0.943$). The minimum and maximum radians/second recorded by the phone application associated with an adequate head turn velocity for the head impulse test were 1.9 and 4.6. Additionally, the larger the degree of head turn, the greater the average head turn velocity (ANOVA; $p < 0.001$).

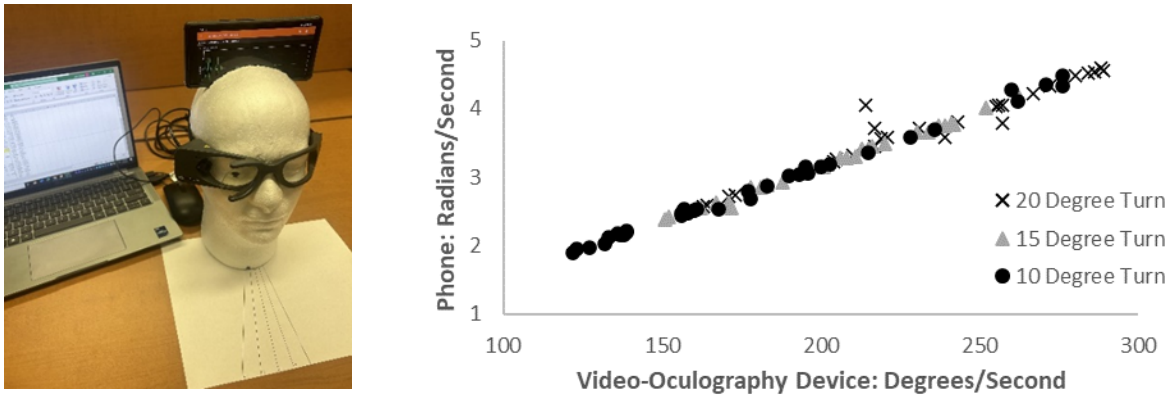

Figure. Test setup (Top). Plot (Bottom) demonstrating the linear correlation of the angular velocities.

Conclusion: Mobile phones can be used to assess the adequacy of head turn velocity for the head impulse test and seem to be a promising tool in the development of a training model. Further steps will be to determine if motor skills for the head impulse test can be taught using mobile phones as part of an inexpensive training model.

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Sex-Specific Differences in Peptidylarginine Deiminase (PAD)2 and Sex Steroid Receptor Expression in the Placenta

Amanda Wewer, Autumn Fritz, Morgan Helmich, Emily Hinners, Gerrit Bouma
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Proper placental development and function is critical for normal pregnancy and postnatal health. Several pregnancy disorders that negatively impact maternal, fetal, and postnatal health are associated with placental dysfunction. Although female (XX) and male (XY) placentas function the same, it is evident that there are sex-specific postnatal health outcomes following placental dysfunction and pregnancy complications. Although underlying causes for these sex differences are unclear, it is postulated that differences in XX and XY placental function are involved due to sex chromosomes and/or sex steroids. Our previous work has shown that the placenta is a source and a target of sex steroids, including androgens and estrogens. Studies in breast and prostate cancer cells demonstrated a role for the citrullination enzyme peptidylarginine deiminase 2 (PAD2) in post-translation regulation of estrogen and androgen receptor signaling. The goal of this study is to determine if PAD2 is present in mouse placentas and if XX versus XY differences exist in the relative level of PAD2.

Methods: Fetuses and placentas were collected from three pregnant female mice (C57BL6) at 14 days gestation. Fetuses associated with each placenta were analyzed using a multiplex PCR genotyping assay that distinguishes XX from XY. Total RNA was isolated from 8 XX and 8 XY placentas; quantity and purity were assessed using a NanoDrop One Spectrophotometer. Total RNA was reverse transcribed into cDNA and used for quantitative real time PCR analysis using the QuantStudio 3 Real Time PCR system and PowerTrack SYBR Green Master Mix. All experimental replicates were assayed and normalized using the geometric mean of actin and 18s rRNA as two endogenous reference genes. Relative PAD2 and androgen receptor (AR) transcript levels were determined using the comparative Ct method.

Results: Real time PCR analysis revealed significant differences in the relative quantities of PAD2 and AR between XX and XY placentas. XY placentas contained ~2-fold higher levels of PAD2 and AR compared to XX placentas. Current experiments are ongoing to determine if PAD2 and AR co-localize and interact with each other directly, and if PAD2-mediated histone citrullination is different between XX and XY placentas.

Conclusions: This study is the first to demonstrate XX and XY differences in PAD2 and AR in the placenta.

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Vitamin C Deficiency: A marker of low socioeconomic status

Taya Smith[1], Rubie Villela[1], Noemi Mangiamele[1], Sophie Numbers[1], Lisa Graves[1, 2], Ramona Wallace[1, 2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Family and Community Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Background: According to the National Health and Nutrition Examination Surveys, vitamin C deficiency remains a public health concern, with 6.1% of the overall population being deficient. Vitamin C is unique in that its physiological roles intersect with factors that make up the measure of socioeconomic status such as education level, income, access to food, and environmental exposure. The persistence of vitamin C deficiency may be a symptom of low socioeconomic status rather than a result of poor nutritional intake.

Methods: Data obtained from a retrospective cohort study included 583 patients who presented to Grace Health in Battle Creek, Michigan between August 2019 - June 2023. Inclusion criteria included patients ages 18 to 99 years at WMed Family Medicine Residency in Battle Creek with inadequate intake of micronutrients as defined by the "Healthy Eating Index." Lab results were used to confirm the presence/absence of micronutrient deficiencies. A combination of chart review and medical record searches were used to associate multiple patient variables with identified deficiencies.

Results: 432 (74%) patients who met the inclusion criteria were shown to have one or more micronutrient deficiencies. Patients with vitamin C deficiency were associated with Medicaid insurance (58.2%, N=99); tobacco use (80%, N=136); unemployment (45.9%, N=78); chronic joint pain (47.6, N=81); mood disorders (65.9%, N=112); and depression (55.3%, N=94).

Conclusion: This observational study suggests that Vitamin C deficiency may be associated with a number of patient factors linked to chronic disease and social determinants of health. Further studies are needed to determine approaches to vitamin C deficiency that include replacement therapy as well as addressing social determinants of health.

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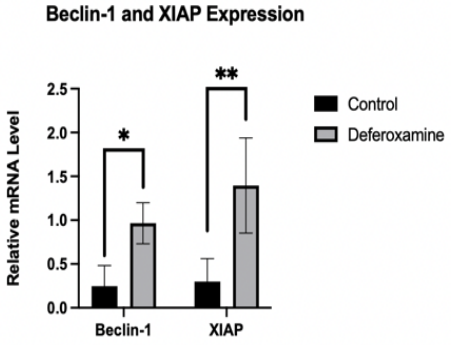
Understanding How Deferoxamine Regulates Autophagic Pathways in Muscle Cells

Megan Moore[1], Sheridan Hayes[2], Yong Li[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, [3]Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Hypoxic preconditioning of muscle cells is a strategy used to improve the survival of transplanted cells, but the mechanism by which hypoxic exposure increases cell survival is not fully understood (1). Previous work from our lab suggests both physiologic hypoxia and hypoxia mimetics like deferoxamine (DFX) increase expression of the protein X-linked inhibitor of apoptosis (XIAP). XIAP plays dual roles in upregulating autophagy by modulating p53 expression via MDM2 as well as activating Beclin-1 (2). We hypothesize that muscle cells treated with DFX should therefore display increased autophagy and greater ability to recycle cellular components under a state of stress. This helps elucidate part of the mechanism of hypoxic preconditioning whereby hypoxic exposure increases cell survival to stress and provides more therapeutic targets for drugs designed to enhance cell transplant survival.

Methods: C2C12 cells were cultured for 6, 12, 24, and 72 hours in either hypoxia (5% oxygen) or in normoxia (21% oxygen) with the hypoxia mimetic DFX. Varied concentrations of DFX (100 µM – 500 µM) were tested to determine optimal concentration. XIAP and Beclin-1 expression were measured via quantitative PCR. Beclin-1 expression levels were confirmed via Western blot.

Results: C2C12 cells showed increased expression of both XIAP and Beclin-1 at 12, 24, and 72 hours as measured by qPCR. All concentrations of DFX above 200 µM showed similar results.



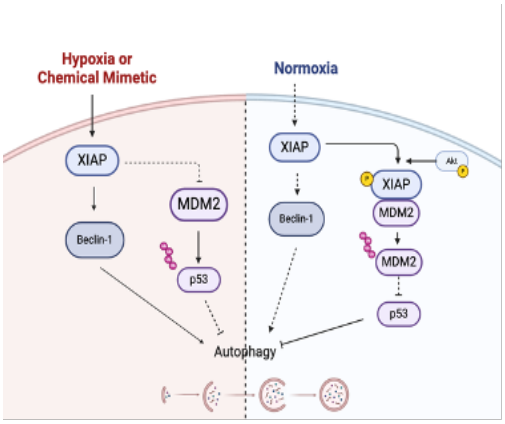


Figure: (Left): Relative expression of mRNA in C2C12 cells cultured for 24 hours with and without DFX. Expression of both Beclin-1 and XIAP increased with DFX. (**Right):** Proposed mechanism.

Conclusion/Clinical significance: Autophagy may play a role in increasing muscle cell survival during hypoxic preconditioning by allowing cells to recycle intracellular components under stress. Linking autophagy to hypoxic preconditioning opens the possibility for more drug targets, which can be used to improve cell transplantation outcomes.

References: [1] Wei Z, et al. Chin Med J (Engl). 2017 Oct 5;130(19):2361–74. [2] Huang X, et al. EMBO J. 2013 Aug 14;32(16):2204–16.

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Assessment of Student Perception of Nutrition Education at a Midwestern Medical School

Emily Valentin, Michelle Zhang, Melissa Olken
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Physicians play an important role in patients' health behaviors. Many chronic diseases in the United States today are related to nutrition. Medical students understand the importance of nutrition in medicine, yet do not feel comfortable in counseling patients [1]. Nutrition in undergraduate medical education is required nationally, with great variability in methods. The quality is difficult to assess across schools. It is unknown how Western Michigan University School of Medicine (WMed) students perceive the quality of their nutrition education and relevance to managing chronic conditions. To evaluate these perspectives, we assessed students' knowledge and confidence in providing nutritional counseling for chronic conditions as they progressed through the curriculum.

Methods: A 32-item survey was created with Likert-scale, Yes/No/NA, and multiple-choice questions. A physician and expert in nutrition science helped write the questions. The voluntary, anonymous REDCap survey was delivered to students enrolled in the 4-year MD degree. Data was analyzed using SAS v9.4 with significance determined at p-value <0.05. IRB granted exempt status (WMed-2023-1016).

Results: There were 68 responses to the survey (32.35% M1s, 14.71% M2s, 23.53% M3s, 29.41% M4s). All students believe that nutrition impacts patient health and that physicians should be knowledgeable about nutrition (100%).

The percentage of students within each class who felt confident in counseling a patient with newly diagnosed type 2 diabetes, hyperlipidemia, obesity, or hypertension regarding dietary changes increased from M1 to M4 year. Associations between class year and confidence were statistically significant for type 2 diabetes (p=.0009), hyperlipidemia (p=.0018), and obesity (p=.0052), but not for hypertension (p=0.112).

Only 22.06% of students reported receiving specific feedback on communicating with patients about dietary changes, with no association between class year and response (p=0.461).

Conclusion: WMed students believe that nutrition impacts patient health. Confidence in counseling patients on nutrition for chronic diseases increases from M1 to M4 year, though few students have received specific feedback on this. A possible area of curriculum improvement is offering more feedback on students' nutritional communication skills.

References: [1] Crowley, J. et al. (2019). Nutrition in medical education: a systematic review. The Lancet. Planetary health, 3(9), e379–e389.

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Evaluating Utilization of Study Strategies and Attitudes Towards Instructional Methods in Medical Education

Peter Awad, Kelsey Temprine
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: A pivotal transition occurs during medical school from the preclinical curriculum to the clinical curriculum where goals and expectations of medical students change. At WMed, a variety of teaching methods are employed to prepare students for this transition, and students engage in diverse study strategies to supplement their learning in preparation to enter the clinical world. The objectives of this study are to assess student attitudes towards different methods of studying and modes of instruction and to examine whether there is a change in prevalence of study strategies utilized during preclinical versus clinical education.

Methods: A REDCap survey consisting of nine questions was designed and sent to all WMed medical students. Students first selected the year of medical school in which they were currently enrolled. Next, Likert-scale questions assessed students' preferred study environments and ratings of the effectiveness of various instructional and study methods. Finally, students were asked to select their primary study strategies and list external resources used during their preclinical and clinical years.

Results: 123 students completed the survey (32 M1, 39 M2, 23 M3, and 29 M4). Data is currently being analyzed to determine similarities and differences across all four classes. Initial findings demonstrate that virtual lectures were the lowest rated instructional method among all classes (2.31/5), whereas simulation was the highest rated (3.76/5). Furthermore, when comparing preclinical versus clinical use of study strategies among current M3 and M4 students, we found that: flashcard use remained consistent (75% preclinical vs. 73.07% clinical), third-party practice question use increased (28.85% preclinical vs. 98.08% clinical), and reading third party textbooks increased (9.62% preclinical vs. 36.54% clinical).

Conclusions: While the data is still being fully analyzed, some clear changes in student learning have been identified. For instance, as students progress into their clinical training, third-party practice questions and textbooks are more frequently used, suggesting a potential shift to self-directed learning. Students also found active learning activities, like simulations, most effective for their learning. Overall, this study aims to provide insight into students' perceptions of the effectiveness of various educational methods with the hopes of informing the improvement of WMed's curriculum.

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Postmortem Neuropathologic Findings in a 47-Year-Old Man with Schizophrenia and Frequent Falls

Alice Wei[1], Amanda Fisher-Hubbard[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Pathology, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Granular cell tumors (GCTs) of the pituitary infundibulum are rare, benign neoplasms that are often incidental findings at autopsy. They are usually asymptomatic due to their slow growth, rarely achieving large enough mass to cause compressive symptoms, but if so, typically not until the fourth or fifth decade of life. Grossly, they appear as nodular, firm, tan-gray, well-demarcated, non-encapsulated masses. The lesions are composed of polygonal cells with bland nuclei and abundant granular eosinophilic cytoplasm. We report a case of the discovery of a GCT of the infundibulum at autopsy in a decedent with a reported history of schizophrenia and frequent falls.

Case Presentation: A 47-year-old man with a history of schizophrenia and frequent falls was found unresponsive at home and pronounced dead at the scene. Autopsy revealed a pink-tan, well-circumscribed mass, 3.6 x 3.6 x 3.6 cm in size, with firm cut surfaces located adjacent to the optic chiasm, appearing to arise from the infundibulum of the pituitary gland; there was associated dilation of the third and lateral ventricles (Figure 1). All other structures otherwise appeared normal. Microscopic examination of the mass showed nests of large polygonal cells with abundant eosinophilic granular cytoplasm, bland nuclei, and inconspicuous mitoses with rare to occasional foci of lymphocytes, golden granular pigment-laden macrophages, and necrosis (Figure 2). The cells were weakly positive for S100 and GFAP at the tumor periphery (Figure 3).

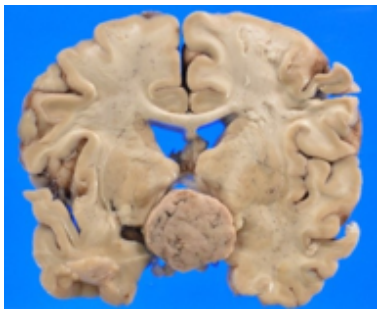
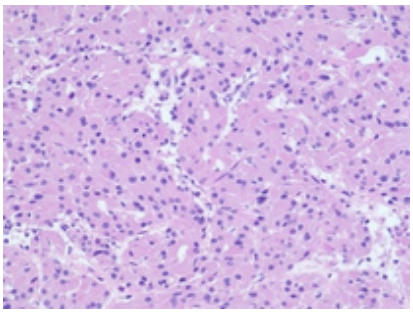
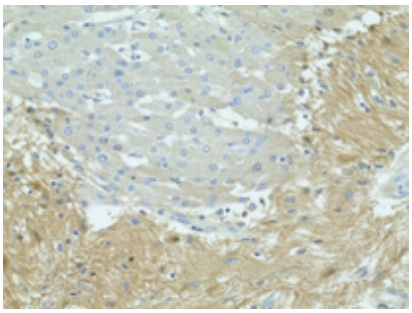

Figure 1. Infundibular mass with associated mild to moderate ventricular dilation | **Figure 2.** GCT of the infundibulum with granular eosinophilic cytoplasm | **Figure 3.** S100 stain of GCT periphery and of adjacent neural tissue.

Discussion: GCTs often go undetected due to their asymptomatic nature, but when suspected, can be difficult to diagnose radiologically due to lack of distinct features. Nevertheless, most GCTs are benign and can be surgically excised before they lead to mass effect. This report highlights a case where postmortem identification of the tumor allowed for diagnosis of hydrocephalus, characterized by urinary incontinence, gait apraxia, and memory impairment, as seen in the decedent.

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Morbidity and Mortality: Laparoscopic vs. Open Approaches in Acute Complications of Peptic Ulcer Disease

Ghazi Saroya[1], Saad Shebrain[1], Taylor Floth[1, 2], Conor Dillon[1], Gitonga Munene[1, 3], Robert Sawyer[1]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]University of Washington Affiliated Hospitals, Seattle, WA. [3]West Michigan Cancer Center, Kalamazoo, MI

Introduction: Peptic Ulcer Disease (PUD) is associated with serious complications such as acute perforation and bleeding. The standard procedure for repair has been surgical laparotomy. With the advancement in minimally invasive surgery, the laparoscopic method has gained favor over the past twenty years. This study aims to compare the 30-day mortality, serious morbidity, and overall morbidity between laparoscopic and open approaches in patients experiencing acute PUD, bleeding, and perforation.

Methods and procedures: The ACS-NSQIP database (2017) was used to identify patients who presented with acute complications of PUD. They were then divided into two groups: laparoscopic group (LG) and open group (OG). The outcomes examined included 30-day morbidity and mortality. Pearson's chi-squared and Fisher's exact tests were used to test group differences of categorical variables. Continuous variables were tested with the Student's t-test, with statistical significance set at a value of $p<0.05$.

Results: The study group comprised of 1206 patients, 138 patients (11.4%) presented with bleeding, and 1068 patients (88.6%) with perforation. The laparoscopic group (LG) included 124 patients (10.3%) and the open group (OG) included 1082 (89.7%). Overall, both groups had similar demographic characteristics. There were no significant differences in 30-day mortality between LG, and OG (4.9 % vs.7.7%, $p=0.253$). However, the LG was associated with lower overall morbidity (49.9% vs. 54%, $p=0.011$), and lower serious morbidity (39.5% vs. 51%, $p = 0.015$).

Conclusion: No differences in 30-day mortality were noted between the LG and OG. However, those who underwent an open approach tended to have higher serious morbidity and overall morbidity. Based on these outcomes, the laparoscopic approach should be attempted in patients with acute complications of PUD unless patient instability requires the most expeditious procedure.

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A Student-Directed Patient Advocacy Program for the Unhoused Population of Kalamazoo County

Neya Suresh Kumar[1], Paulina Cradeur[1], Sherwin Shabdar[1], EricaNoelle Dodde[2], Nicholas Helmstetter[3], Sravani Alluri[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Family Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [3]Department of Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Unhoused patients face many barriers to accessing healthcare, resulting in worse health outcomes. Some potential barriers are negative perceptions or experiences associated with interfacing with the healthcare system, limited ability to access services due to transportation issues, stigmatization or competing interests. Street Medicine Kalamazoo (SMKzoo) is the primary care provider for many unhoused persons in Kalamazoo and utilizes the Street Medicine framework of bringing healthcare to the people. SMKzoo offers full primary care services, including referrals to specialists and diagnostics for complex medical needs. Outpatient referrals require patients to navigate the aforementioned barriers, often resulting in no-shows, late appointments, delayed care, and ultimately worse health outcomes.

Reasoning: Here, we propose a student-run patient advocate service to improve these measures. Patient accompaniment services utilizing community members have proven in the literature to be effective; increase in treatment adherence in teenagers receiving HIV treatment, greater accessibility of healthcare services for indigenous populations, and fewer negative emotions in the months following an abortion. However, there is not currently a well-documented patient advocacy service utilizing medical students, that specifically assists the unhoused.

SMKzoo patients with upcoming outpatient appointments will be identified by the attending team as suitable for the program. The student coordinators will review patient charts, brief the advocates and arrange transportation. The student advocate will meet the patient at their appointment, support them emotionally and help navigate the process, and relay information to the attending team. Quantitative data will be collected in the form of surveys on student perceptions towards working with unhoused patients, patient satisfaction surveys, narrative feedback on impact on preclinical education, patient experience and percentage of referrals that were completed and number of patients enrolled in the program.

Significance: This project will help improve health access and outcomes for unhoused patients in Kalamazoo and supplement medical student education on caring for this population, which is limited in preclinical years. Furthermore, this service is a novel addition to the services offered by Street Medicine programs. If successful, this program can serve as a model for other Street Medicine programs and improve patient care.

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Investigating the Effects of PAPC and OxPAPC on Osteoblastic Cells: Implications for osteoporosis

Aleya Brandon[1], Mitchell Kenter[2], James Springstead[1,3], Adil Akkouch[1,2]
[1]Biomedical Engineering Program, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [3]Chemical and Paper Engineering Department, Western Michigan University, Kalamazoo, MI

Introduction: Osteoporosis and atherosclerosis, prevalent age-related conditions, pose significant global health concerns. Although age-related factors were formerly assumed to be the cause of the correlation between these diseases, more recent research has revealed evidence of some similar pathophysiological mechanisms that point to comorbidity. 1-palmitoyl-2-arachidonoyl-sn-glycero-3-phosphocholine (PAPC) is a major component of cell membranes and is particularly abundant in low-density lipoprotein (LDL) particles, which are known to play a central role in the development of atherosclerosis. Indeed, LDL particles containing PAPC are susceptible to oxidative modification which is associated with increased inflammation and endothelial dysfunction. In our previous work, we showed that oxidized LDL (OxLDL) inhibits the osteogenic potential of osteoblasts. In this study, we propose to study the influence of PAPC and oxidized PAPC (OxPAPC) on osteoblastic cells homeostasis.

Methods: PAPC was converted to OxPAPC using air oxidization technique. Briefly, PAPC was dried under argon gas, exposed to air for 72 h at room temperature for oxidation, and then resuspended in chloroform. The oxidization of OxPAPC was validated using mass spectroscopy, and the concentration of the lipids was determined via the phosphorus assay. Saos-2 cells were then treated with increased concentrations of either PAPC or OxPAPC. Cell cytotoxicity and proliferation were measured at 1, 3, and 5 days. Osteogenic differentiation was assayed using alkaline phosphatase activity and Alizarin Red staining as well as gene expression of RUNX2, osteocalcin and osteopontin.

Results: Low concentrations of 5 µg/mL of PAPC stimulate cell proliferation while high concentrations lead to growth arrest and cytotoxicity. Interestingly, OxPAPC at lower concentrations (≤ 2.5 µg/mL) showed a slight decrease in cells proliferation, however 5 µg/mL showed the highest proliferation over 5 days culture, and higher concentrations (≥ 25 µg/mL) resulted in mild to high toxicity.

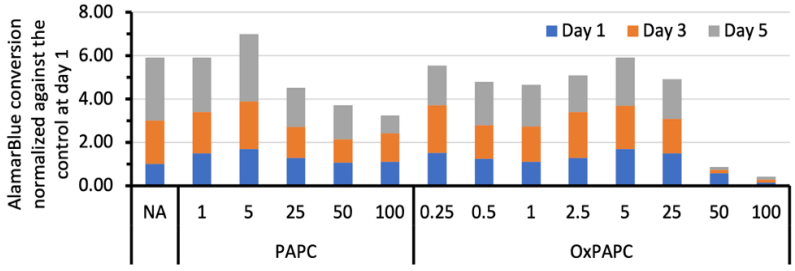

Figure: Proliferation of osteoblasts cultured with increased concentrations of PAPC and OxPAPC showing a dose dependent decrease in cell proliferation at 1, 3 and 5 days.

Conclusion/Clinical significance: Preliminary results suggest that PAPC and OxPAPC influence osteoblasts viability and growth, and high concentrations result in cell death. Addressing the knowledge gap of OxPAPC on osteoblasts allows for more focused examination of the effects of this phospholipid on bone health in ageing population which could pave the way for targeted interventions that enhance bone density and quality.

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PAD2 Protein in XX and XY Mouse Hemochorial Placenta

Morgan Helmich, Emily Hinners, Amanda Wewer, Autumn Fritz, Daryna Hodgson, Gerrit Bouma
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Peptidylarginine deiminase (PAD) 2 is a protein involved in citrullination of histone tails and regulation of gene expression. It has been shown to be present in mammalian placentas. However, the full extent of the role of PAD2 in sex-specific gene expression has not been elucidated. We hypothesize that sex-specific differences in PAD2 protein exist between XX and XY placentas. The goal of this study is to determine if PAD2 protein is present in mouse placentas and if PAD2 amounts differ between XX and XY. This is one part of an overarching study to elucidate the role of PAD2 in sex-specific regulation of steroid receptor signaling in the hemochorial placenta using the mouse model.

Methods: Placental tissue was harvested from four pregnant mice at 14 days gestation. A multiplex genotyping PCR was performed to identify XX and XY placentas. Briefly, genomic DNA from each placental tissue was amplified using primers for the autosomal myogenin gene and a sequence on the Y chromosome. XX and XY placentas were distinguished based on the presence of myogenin (XX and XY) and the Y chromosome (only XY). Once the sex was identified, protein was isolated from frozen tissue and analyzed via Western Blot using a polyclonal antibody raised against PAD2 to determine the level of PAD2 in XX and XY placentas. Cell specific localization within the mouse placenta was determined using immunofluorescence.

Results: The four litters of mice provided 34 placentas. Our genotyping assay revealed 22 XY and 12 XX placentas. Preliminary analysis revealed the presence of a band of the expected size for PAD2 in a subset of XX and XY placentas. Current experiments are in progress to quantify PAD2 in XX and XY placentas, using actin as a reference housekeeping protein. Finally, preliminary immunofluorescence staining revealed PAD2 localization in the labyrinth layer of the placenta.

Conclusions: This study reports for the first time the presence and localization of PAD2 protein in mouse placental tissue. Identification of sex-specific differences in PAD2 protein will provide insight into regulation of sex-specific signaling pathways that may underlie differences in fetal growth and postnatal outcomes.

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Detection of the Zinc Transporter and Membrane Androgen Receptor ZIP9 in the Placenta

Ashley Minor[1], Gerrit Bouma[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Biomedical Sciences, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Pregnancy is associated with increasing secretion of steroid hormones that regulate maternal metabolism, placental function, and fetal growth and development. The placenta is both a source and a target of these steroid hormones. Abnormal androgen secretion and function accompany pregnancy disorders such as gestational diabetes, pre-eclampsia and intrauterine growth restriction. Our previous work demonstrated mammalian placentas contain androgen receptors that play a role in placental angiogenesis. With the recent discovery that membrane receptors exist that mediate rapid and "non-genomic" actions of steroids in addition to classic nuclear steroid receptors, we postulate that membrane receptors for androgens are present and also play a role in placental function. Of particular interest is the discovery that the zinc transporter ZIP9 (SLC39A9) binds to androgens and functions as a membrane androgen receptor. Moreover, studies in ovarian granulosa and prostate cancer cells revealed that testosterone binding to ZIP9 leads to increases in intracellular zinc and activation of G-protein coupled secondary signaling pathways. Considering that zinc is important for placental morphogenesis and hemodynamics, and the complex role of androgens in placental function, we wanted to explore the possibility that ZIP9 is a membrane receptor for androgens in the placenta. The goal of this study was to (1) determine if ZIP9 is present in the placenta, and (2) determine if differences exist in ZIP9 between XX and XY placentas.

Methods: Total RNA was isolated from 8 XX and 8 XY placentas and reverse transcribed into cDNA to be used for quantitative PCR using the QuantStudio 3 Real Time PCR system and PowerTrack SYBR Green Master Mix. All experimental replicates were assayed and normalized using the geometric mean of actin and 18s rRNA as two endogenous reference genes.

Results: QPCR analysis revealed a small (~17%) but significant decrease in ZIP9 ($P<0.05$) in XY compared to XX placentas. Current experiments are ongoing to assay ZIP9 protein levels, as well as cellular localization of ZIP9 in the placenta.

Conclusion: These data are the first to report the presence of ZIP9 in the mouse placenta and suggest a potential difference in the function of zinc in XX and XY placenta.

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Elder Abuse and Neglect in Michigan: An overview of elder death review teams

Bo Collins, Abigail Grande, Christine Pink, Daniel Brauner
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Elder abuse and neglect are underreported. A recent study concluded that about 1 in 10 Americans over the age of 60 have experienced abuse, but only 1 in 24 cases are reported [1]. The growing population of adults over 65 years makes identifying abuse and neglect an essential area of public health research. Funded by the Michigan Department of Health and Human Services, the Medical Examiner's Office at Western Michigan University Homer Stryker M.D. School of Medicine established seven multidisciplinary Elder Death Review Teams to examine deaths of vulnerable adults.

Methods: Using a web-based database of reported deaths, cases are selected by age, manner of death, and circumstances of death, with special attention to injuries sustained in care facilities or suspicious circumstances. Team members include representatives from Adult Protective Services, Licensing and Regulatory Affairs, the Long-Term Care Ombudsman Program, the Medical Examiner's Office and law enforcement. Selected cases are brought to their respective county Elder Death Review Team for discussion. Along with records compiled by the Medical Examiner's Office, each agency provides detailed reports to identify gaps in care.

Results: From October 2021 to September 2023, 5,885 cases were screened and 186 cases were subsequently reviewed by Elder Death Review Teams. The majority of cases reviewed occurred in licensed care facilities, accounting for 17% (n=32), while deaths in homecare settings accounted for 16% (n=31). The remaining cases reviewed were comprised of self-neglect, hoarding, suspicious circumstances, medication theft, etc. Of interest, 567 accidental deaths were caused by or related to a fall. Over 160 of these involved a fall at a care facility.

Conclusion: Elder abuse and neglect are expected to escalate in the United States as the population grows older. This project highlights the benefits of Elder Death Review Teams, including updated policies related to elderly care and/or vulnerable adult populations. Recommendations include care plan evaluations following injuries sustained at care facilities and a requirement for all care facilities to become licensed, as licensed facilities are held to higher standards of care.

References:

[1] *Get the Facts on Elder Abuse.* The National Council on Aging. (2021, February 21). https://www.ncoa.org/article/get-the-facts-on-elder-abuse

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Spontaneous Regression of Common Wart Following Shave Biopsy

Jaspreet Bharaj, Cynthia Lai, Faryal Tahir
Department of Family and Community Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Biopsies of common warts typically show acanthosis, papillomatosis, hyperkeratosis, hypergranulosis, parakeratosis, and cytoplasmic viral-like inclusions without atypia. These benign skin lesions are caused by HPV infection. Treatment for warts depends on patient demographics, preferences, cost, and possible adverse effects. Despite the treatment modality, a host immune response is required to achieve wart eradication.[1] Although there have been many cases of spontaneous regression of warts, we report a case of rapidly regressed cutaneous wart that followed a shave biopsy and did not require any additional treatment.

Case Presentation: A 24-year-old immunocompetent man presented with a 2-year history of a progressively enlarging solitary lesion on his left temple, which developed after his cat scratched the area. The lesion was 3 x 3 cm and was firm, scaly and nonpruritic. A 1cm shave biopsy was taken at the center of the lesion to confirm the diagnosis of verruca vulgaris, or common wart. Within one week of the biopsy, the lesion had rapidly regressed, and it had disappeared entirely when the patient was seen in our clinic for a follow-up visit in three weeks. No further treatment was required.

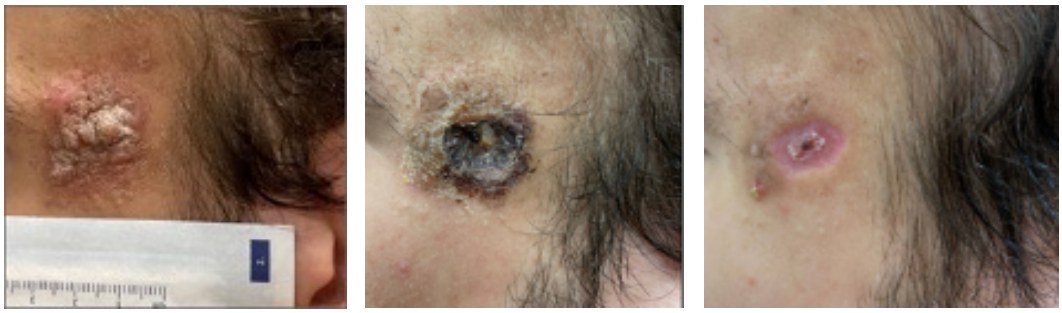

Figure 1: (Left) Initial presentation of skin lesion, (middle)7 days after shave biopsy, (Right) 21 days after shave biopsy.

Discussion: Standard treatment options for common warts are topical salicylic acid and cryotherapy with liquid nitrogen. Intralesional injection with bleomycin, 5-fluorouracil, or cidofovir may be used for recurrent and refractory warts.[2] Immunocompetent individuals with good immune responses typically have complete resolution of warts with treatment, although these lesions may also undergo spontaneous regression. Individuals that can illicit an IgG response do well when it comes to healing.[1] Occasionally, a biopsy of the wart has been shown to initiate the healing process, likely secondary to exposure of viral antigens to the host immune system, which may trigger HPV-specific immunity, leading to rapid regression of the wart.[3,4] Though the role of immunity in HPV infections is not well understood, a cell-mediated response to viral antigens may be required for the resolution of the wart.

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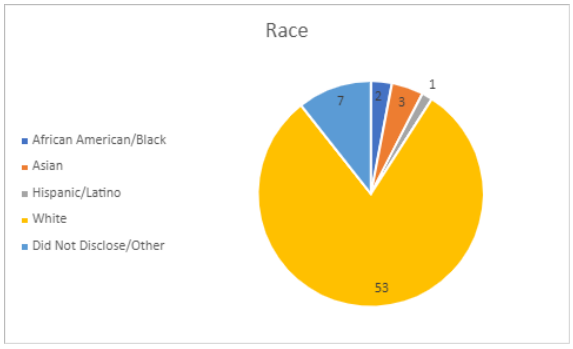
Free Skin Cancer Spot Check: Evaluating prevalence of untreated cutaneous carcinoma in Kalamazoo County

Amanda Hunt, Jess Duong, Cynthia Lai, Daniel Stulberg, Kristi VanDerKolk
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Skin cancers that are detected earlier carry better prognoses and lower costs. Increased rates of late-stage melanoma and mortality are associated with low educational status, Medicaid insurance, uninsured status, and poverty level. These disparities may be explained by a lack of access to dermatology or education regarding risks, thus leading to lower efforts of skin cancer detection. In Kalamazoo County, a medically underserved county located in Michigan, many patients are unable to access timely dermatological care.

Methods: A one-night, free community 'Skin Cancer Spot Check' was held at a family medicine clinic in a centralized location in Kalamazoo. The event was advertised on news outlets, social media, and in print. Participants with skin lesion concerns presented to the clinic, completed a questionnaire regarding the lesion, and received a free evaluation by family medicine physicians. Diagnoses and recommendations were verbally communicated and documented.

Results: 66 patients ranged in age from 16 to 80. Over 80% of participants identified as White. 18.8% identified as African American/Black, Asian, Hispanic/Latino, or other/did not disclose. Most had private insurance. 24.3% reported having Medicaid, Medicare, or no insurance. 72% of lesions had not been previously examined. 28% of lesions were identified as suspicious or cancerous. 22 of 73 (30%) physician recommendations were for removal or biopsy of lesions.



Discussion: Our project aimed to address disparities in skincare by improving dermatological access in underserved residents. We hypothesized that underserved residents would be more likely to attend the free skincare screenings. However, only 18.8% of patients were of racial minorities. This raises the question of free skin screenings further driving inequities in dermatologic care as the majority who took advantage of the event were of racial majority and insured. Nonetheless, over one-quarter of lesions were identified as being suspicious or cancerous and provided opportunity to educate both patients and medical staff on important dermatologic care.

Conclusions: Dermatologic care is difficult to obtain in the Kalamazoo community. Free skincare checks provide educational value to patients, medical students, and residents alike, therefore, improving dermatologic care in Kalamazoo. IRB#: WMed-2023-1022

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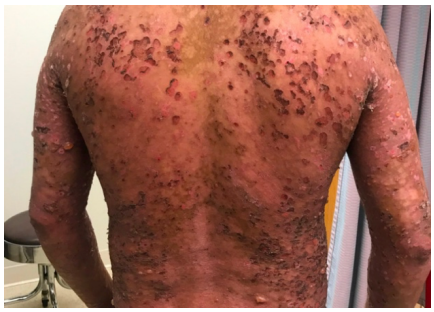
Coexisting Psoriasis and Anti-P200 Pemphigoid: A case report

Amanda Hunt[1], Samantha Hunt[2], Sheryl Hoyer[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Dermatology, University of Illinois, Chicago, IL

Introduction: Anti-p200 pemphigoid is a rare, subepithelial immunobullous disease that may be underdiagnosed. It has been reported to occur in patients who also suffer from psoriasis. We discuss a case of a patient with both psoriasis and anti-p200 pemphigoid to emphasize the importance of considering anti-p200 pemphigoid in the differential diagnosis of patients who have a history of psoriasis and present with a new onset bullous disease.

Case Presentation: A 39-year-old male presented to the dermatology clinic with a few months' history of erythematous, scaling plaques over his face, torso, and upper and lower extremities. He had been seen in the emergency department previously for a similar rash, which was treated as psoriasis. Further review revealed he had previously seen a dermatologist for a generalized bullous disease three years prior. The patient presented with bullae over most of his torso and bilateral upper and lower extremities, as seen in Figure 1. Workup with direct immunofluorescence revealed linear staining of IgG and C3 in the basement membrane zone, as well as IgG reactivity in a dermal pattern on human split skin on indirect immunofluorescence. Pemphigus panel, anti-type VII collagen antibody, IgA pemphigus panel, and anti-nuclear antibody were all negative. Given these findings, a diagnosis of anti-p200 pemphigoid was favored.

Upon presentation three years later, physical exam revealed diffuse, erythematous plaques with scale over his face, chest, back, arms, legs, hands, and feet with no active bullae. Given his history, a biopsy was performed and revealed findings consistent with psoriasis. The diagnosis of coexisting psoriasis and anti-p200 pemphigoid was made.



Discussion: The coexistence of psoriasis and autoimmune bullous diseases has been well-reported in the literature. However, the reasoning for an association between psoriasis and anti-p200 pemphigoid is not well understood. It's hypothesized that the underlying inflammation within psoriatic lesions themselves may trigger antigen exposure and auto-antibody formation leading to bullae formation.[2] Patients with a history of psoriasis and new onset bullous lesions may have anti-p200 pemphigoid and, if so, a treatment regimen consisting of systemic corticosteroids plus an adjuvant therapy is an effective form of therapy.

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Atorvastatin Induced Urticarial Vasculitis

Daaren Bukhari[1], Giselly Silva[1], Cynthia Lai[2], Diana Westgate[1, 3]
[1]Forefront Dermatology, Kalamazoo, MI. [2]Department of Family and Community Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [3]Department of Medical Education, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Urticarial vasculitis is a rare hypersensitivity reaction clinically differentiated from acute urticaria by urticarial plaques lasting greater than 24 hours with associated hyperpigmentation and ecchymoses due to underlying vasculitis. The reaction can be induced by medications, infections, malignancies, and autoimmune diseases. While statin medications have been associated with a number of cutaneous reactions, there is only one reported case of urticarial vasculitis to simvastatin. We report a case of urticarial vasculitis induced by atorvastatin which is chemically similar to simvastatin and should be considered cross-reactive.

Case Presentation: A 69-year-old female presented with a three-month history of a burning rash presenting as polycyclic urticarial plaques resolving with hyperpigmented gray-brown patches on her proximal lower extremities and lower trunk. Atorvastatin 10 mg daily was initiated by the patient's primary care physician six weeks prior to the onset of rash. The patient's medical history and review of systems were otherwise unremarkable. A punch biopsy was performed showing a superficial perivascular inflammatory infiltrate with eosinophils which correlated with the clinical impression of urticarial vasculitis. The patient was treated with topical steroids, oral steroids, and antihistamines with rebounding of her rash. While she achieved control with dapsone, the patient developed dapsone-associated anemia and was subsequently treated with cyclosporine 100mg twice daily with complete resolution.

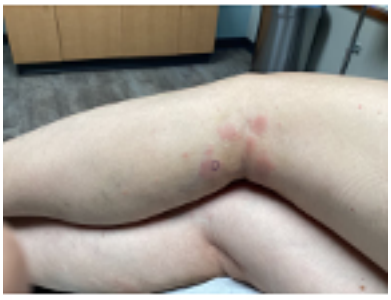

Figure 1: Presentation of Urticarial Vasculitis

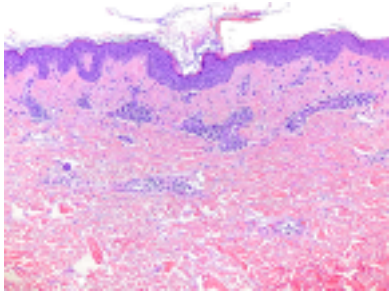

Figure 2: Urticarial Vasculitis Histopathology

Discussion: Statin drugs are a mainstay of treatment for both lipid reduction and the mitigation of cardiovascular risk factors. Numerous cutaneous reactions, both acute and delayed, have been reported with statins. However, urticarial vasculitis is rare with a single reported case to simvastatin. The authors of that report questioned the possibility of switching within the class. Since our patient developed urticarial vasculitis on atorvastatin, clinicians should consider the chemically similar drugs simvastatin and atorvastatin to be cross-reactive. Moreover, a report of lichenoid dermatitis to simvastatin highlighted disease recurrence when the patient was switched to a chemically dissimilar rosuvastatin. Further testing with an oral challenge of rosuvastatin in our patient may help determine if the reaction is a class effect and may inform future drug selection.

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Linking Relapsing-Remitting Multiple Sclerosis with Congenital Arterial Malformations

Anthony Aghajani[1], Cameron Schaecher[1], Emad Wahashi[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Multiple sclerosis (MS) is an autoimmune condition that results in demyelination of the central nervous system. It is most common in women ages 20-50 years old with wide clinical variation. Most patients diagnosed with MS exhibit relapsing-remitting symptoms with partial or complete recovery during periods of remission. Moreover, a link between MS and congenital vascular abnormalities has also arisen as a burgeoning area of research. This case report explores an intricate clinical presentation of newly diagnosed MS in the setting of congenital vertebral artery stenosis.

Clinical course: 21-year-old female patient with no significant PMH presented with vertigo, dizziness, left-sided facial droop, left-sided gaze palsy, and mild dysarthria. Initial concern was raised for stroke/TIA, however imaging was negative for acute cerebrovascular accident. MR imaging was then completed, which exhibited a congenitally diminutive caliber of the right vertebral artery (RVA), an infundibulum of the right posterior communicating artery, and areas of active demyelination consistent with MS (Figure 1, 2). Lesions were identified in the cerebrum, corpus callosum, midbrain, and pons. Neurology was consulted, and a diagnosis of relapsing-remitting MS was made. The patient was then started on a five-day course of methylprednisolone during hospitalization with significant improvement of symptoms. She was scheduled to follow-up with neurology outpatient to discuss initiation of disease modifying therapy. Follow-up MR images did not reveal systemic vascular disease. Of note, family history was significant for a deceased second maternal cousin who was diagnosed with MS. There was unknown vascular involvement in the cousin.

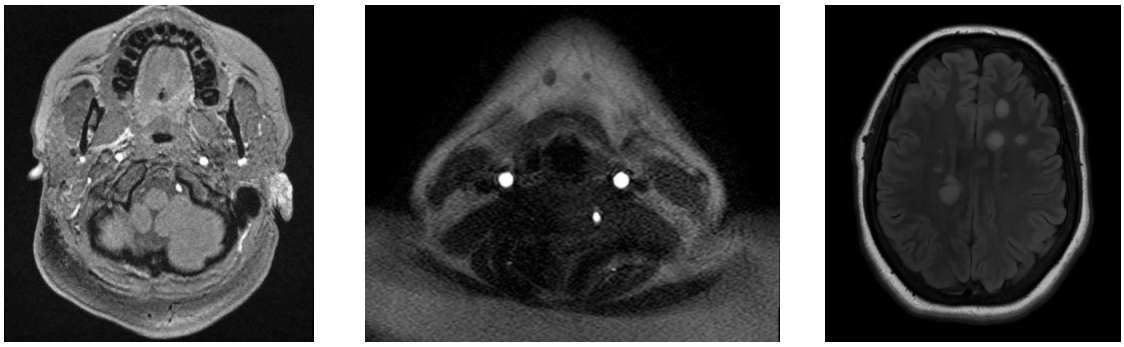

Figure 1: MRA head (left) and MRA neck (middle) demonstrating congenitally diminutive right vertebral artery.
Figure 1: MRI brain (right) showing areas of active demyelination.

Conclusion: MS is a common ailment with unclear initial causes. Vascular abnormalities are frequently linked to neurologic diagnoses, however causality is uncertain. Family history also plays a major role in the determination of pre-diagnosis risk factors. This case demonstrates an area of future research to investigate the possibility of a correlation between congenital arterial malformations and the development of MS in adulthood. A link between these findings carries significant implications and utility for screening vascular imaging and earlier diagnosis with intervention.

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Unveiling Reproductive Health Disparities: A study of contraceptive use, pregnancy rates, and perspectives of unhoused women in Southwest Michigan

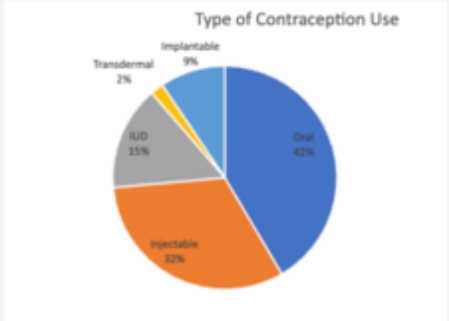
Paulina Cradeur, Noemi Mangiamele, Sreevidya Kurra, Nicholas Helmstetter, Sravani Alluri
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Reproductive healthcare needs and the personal goals of unhoused women remain unmet and understudied, contributing to reproductive health disparities and an unsatisfied delivery of reproductive healthcare.

Methods: This retrospective cohort study included 121 female patients ages 18-45 seen by Street Medicine Kalamazoo from 1/1/2018 to 4/30/2023, meeting the criteria of unhoused in accordance with the Public Health Services Act.

Stage 1 primary objectives examined the number and category of documented contraceptive type, gravity, and parity. Contraceptive categories included implantable, injectable, intrauterine, oral, transdermal, and emergency contraception. Secondary objectives characterized the demographics of the subjects based on age, race, gender, sexual orientation, current health payer status, language, and sterilization. Data were compiled by the Department of Biomedical Informatics through the Epic EHR System. Data were further validated using manual chart review. Stage 2 is currently underway, involving a distributed survey.

Results: The median age at the first Street Medicine visit was 32, with 72.7% Caucasian and 20.7% African American. Out of 121 patients, 43.8% used some form of contraception. Of the 53 patients, 41.5% used oral contraceptives, followed by 32% injectable, 15% progesterone IUD, 9.4% implantable, and 1.9% transdermal. Of the 53 patients, 19% switched contraceptives, the most common being to oral (40%) and to injectable (30%). Of the 121 patients, 67% had a history of pregnancy with a mean gravida of 3.42. The median gravida for those who did not take a contraceptive was 3.00, and for those who did take a contraceptive was 2.00. 19.8% of the sampled patients had undergone a sterilization procedure in the past.



1. Breakdown of contraceptive use percentage by type for unhoused women who are patients of Street Medicine Kalamazoo

Conclusions: Less than half of subjects had a documented form of contraceptive. Based on the mean age, we postulate that women experiencing homelessness may receive contraceptive care later in their lives. In addition, these data showed a statistically smaller use of Long-Acting Reversible Contraception (LARCs) as compared with oral contraceptives. Those who received contraception had lower rates of gravida and parity than those who did not. These results highlight the role of Street Medicine as quality primary care, and identify opportunities for further improving access to reproductive health services within the unhoused population. Finally, these data warrants further investigation into the experiences, preferences, and perceived barriers to care of unhoused women to help inform future initiatives.

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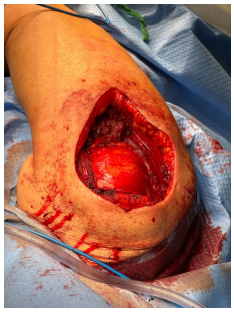
Surgical Resection of Fibromyxoid Sarcoma of the Shoulder: A case report

Jacob Earhart[1], Richa Gupta[1], Nicholas Kossoff[1], Sumit Patel[2], David King[3]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Orthopaedic Surgery, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [3]Department of Orthopedic Surgery, Medical College of Wisconsin, Milwaukee, WI

Introduction: Fibromyxoid sarcoma is a rare soft tissue tumor characterized by a distinct histological appearance and potential for local recurrence and distant metastasis. Emerging predominantly in young to middle-aged adults, fibromyxoid sarcoma typically presents as a painless, slow-growing mass commonly located in the proximal extremities. Surgical resection is the mainstay treatment, aiming for complete excision with negative margins to minimize the risk of local recurrence and optimize long-term outcomes.

Case Presentation: A 65-year-old female presented with a right shoulder mass. Excision of this mass had been previously attempted via a transverse incision but was found to be a high-grade malignancy and resulted in incomplete excision. MRI imaging revealed residual mass deep in the deltoid musculature. 2 cm margins were taken around the previous transverse incision, then a complex ovaloid incision was taken from the acromion and down the lateral aspect of the arm along the fibers of the deltoid. The incision was then continued through the deltoid muscle and the mass was removed. Because of the transverse nature of the previous incision a flap closure of vascularized skin was required. A Vacuum Assisted Closure dressing was applied and one week later a flap was used to close the wound.



Discussion: Large surgical margins have been identified as a key factor for the prognosis of soft tissue sarcoma of the shoulder. To accomplish this while preserving the function of normal tissue, a longitudinal incision is typically performed. A mass of this size and location would typically not require a vascularized skin flap to assist with closure, however in this unique case with a previous unsuccessful transverse incision, extensive margins were taken around the previous incision site and the malignant mass, resulting in increased vascular disruption. The required use of the flap procedure in this case likely caused increased recovery time and is associated with possible complications such as infection, bleeding, flap necrosis, dehiscence, flap deformity, and increased difficulty of subsequent procedures in the area.

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Functions of Intrinsic Muscles of the Foot in Dancers by Active Exercise and Electrical Stimulation

Samantha Dominguez[1], Carolyn Cooper[1], Mark Holling[2], James Jastifer[3, 4]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Armour Physical Therapy, Kalamazoo, MI. [3]Department of Orthopaedic Surgery, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [4]Ascension Borgess Hospital, Kalamazoo, MI

Purpose: The intrinsic muscles of the foot play an important role in foot posture and control during gait. The contribution these muscles make to arch height, foot shape, and the correlation to targeted exercises have not been quantified yet in different athlete populations, including dancers.

Methods: 30 control group volunteers and 36 volunteers who are enrolled in dance class and have at least 1 year of experience underwent testing of the intrinsic muscles of the foot including foot length and arch height measurement. This was followed by activation of the intrinsic muscles (short foot exercise), followed by electrical stimulation (ESTIM), followed by a repeat of the SFE. These measurements were taken using imaging software.

Results: The foot length and height measurements were statistically significantly different between tests (both p less than 0.0001) for the dance group. For the control group there was no difference between short foot exercise and ESTIM for height or length (all p greater than 0.109). For the dance group, there was significant difference between both SFEs that had shorter length and higher MLA height when compared to ESTIM (Both p less than 0.01). There was significant difference for percentage change in all conditions between the dancer group and control group for MLA height (all p less than 0.0001) but not for foot length change (all p greater than 0.1).

Conclusion: This study demonstrates that the intrinsic muscles of the foot contribute to arch height and foot length within the dancer population. Short foot exercise and ESTIM had different effects on foot length and MLA height, showing how dancers can change foot shape more through their own activation of both extrinsic and intrinsic foot muscles when compared to the control group.

Clinical significance: The short foot exercise had a greater effect on foot shape than electrical stimulation and both modalities may be considered by teachers and dancers as a means of improving technique and strengthening after injury or for specific muscle improvement.

Acknowledgement: Thanks to Debby Norton and Kalamazoo Ballet Arts School of Dance for their participation and the YMCA.

IRB Reference: WMed-2022-0934

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Invasive Lobular Breast Cancer Tracking Along a Benign Breast Surgery Scar Mimicking Morphea

Giselly Silva[1], Daaren Bukhari[1], Cynthia Lai[2], Diana Westgate[1, 3]
[1]Forefront Dermatology, Kalamazoo, MI. [2]Department of Family and Community Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [3]Department of Medical Education, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Invasive lobular breast cancer is the second most common type of breast cancer affecting 5-15% of breast cancer patients. This entity is a diagnostic challenge both clinically and radiographically because it typically presents as an area of thickening on the breast often without a palpable mass. In advanced cases, it may rarely present as a dermatitis or cutaneous sore. Reports of breast cancer developing within scar tissue at the site of benign surgical procedures are also exceptionally rare. We present a case of invasive lobular breast cancer mimicking morphea tracking along a surgical scar from a benign breast surgery highlighting the importance of monitoring for skin changes during breast screening examinations.

Case description: A female in her 80s presented for routine full body skin exam due to history of basal cell carcinoma. At the examination, she was found to have an asymptomatic, pink sclerotic appearing plaque tracking along a pre-existing surgical scar from a remote breast reduction. No nipple involvement was noted. No prior treatment was tried. A skin biopsy was performed due to clinical suspicion for morphea. Pathology confirmed invasive lobular breast carcinoma.

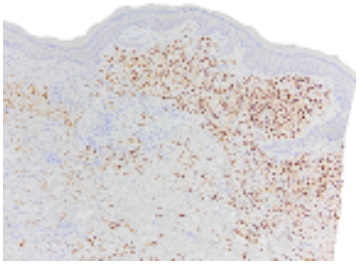

Figure 1: Estrogen Receptor. Staining.

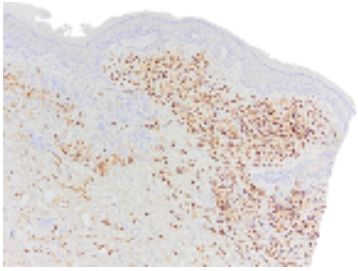

Figure 2: Progesterone Receptor Staining.

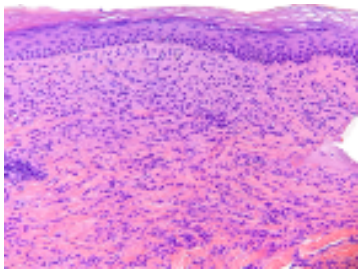

Figure 3: H&E staining.

Discussion: Invasive lobular breast cancer differs from more commonly occurring ductal cancers in its growth pattern. Lobular breast cancer grows microscopically as single filing cells that lead to subtle fibrosis and thickening of breast tissue. This proves diagnostically challenging during clinical breast examinations and routine imaging with mammography or ultrasound. This case depicts an unusual instance of lobular cancer mimicking morphea while coinciding with the scar line of a remote breast reduction surgery. Both the clinical presentation as a sclerotic plaque and the infiltration of a scar are rare entities. While recent literature reported a case of lobular breast cancer presenting as dermatitis and literature from 1968 reported cases of breast cancer developing with scars from benign breast biopsies, our case demonstrates that cutaneous findings within scars on the breast warrant special consideration to avoid delayed diagnosis of breast cancer.

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Tenecteplase vs Alteplase for Acute Ischemic Stroke in the Emergency Department

Josh Goerge, Stacy Brousseau
Bronson Methodist Hospital, Kalamazoo, MI

Introduction: Intravenous thrombolytics are the standard of care for treating patients with acute ischemic stroke within the 4.5-hour window from the time they were last known normal.[1] Alteplase is the tissue plasminogen activator (tPA) recommended in the most recent guidelines and has been the most commonly used agent.[1] Tenecteplase has pharmacokinetic advantages compared to alteplase and has simpler preparation and administration requirements.[2] The aim of this study was to compare the efficacy and safety outcomes of alteplase and tenecteplase in adult acute ischemic stroke in the Emergency Department.

Methods: In this retrospective cohort study, we evaluated patients at Bronson Methodist Hospital treated with intravenous thrombolytics for acute ischemic stroke in the Emergency Department from December 12, 2021 to December 12, 2023. Eligible patients were aged 18 years or older with confirmed or suspected acute ischemic stroke who received alteplase or tenecteplase in the Emergency Department. Patients were excluded if they were a protected patient population (pregnant, aged less than 18 years, incarcerated), did not present to the Emergency Department for acute ischemic stroke, had symptoms resolve while in the Emergency Department, or received a thrombolytic for an indication other than acute ischemic stroke. The primary endpoint was the proportion of patients who received thrombolytics within 15 minutes of completion of non-contrast head computerized tomography (CT) scan. Secondary endpoints included door-to-needle time, change in National Institutes of Health Stroke Scale (NIHSS), and change in Modified Rankin Scale (mRS). Safety outcomes included incidence of intracranial hemorrhage, incidence of major bleeding, and incidence of minor bleeding.

Results/Conclusion: Data analysis with descriptive statistics is currently being performed. Results with be presented at the Kalamazoo Community and Health Sciences Research Day

References: [1] Powers WJ, Rabinstein AA, Ackerson T, et al. *Stroke*. 2019 Dec;50(12):e344-e418. [2] Tanswell P, Modi N, Combs D, et al. *Clin Pharmacokinet*. 2002;41(15):1229-45.

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Optimizing Patient Care: Bridging the gap between micronutrient deficiencies and clinical practice through comprehensive vitamin panels

Noemi Mangiamele, Rubie Villela, Paulina Cradeur, Taya Smith, Sophie Numbers, Ramona Wallace
Western Michigan University Homer Stryker M.D. School Medicine, Kalamazoo, MI

Introduction: The biological importance of micronutrients has been well studied and various pathologies related to micronutrient deficiency have been identified. However, vitamin panels are currently underutilized as a clinical tool for establishing diagnoses and providing patient care. This study highlights the need to incorporate vitamin panels when indicated as a crucial part of patient care in clinics and hospitals.

Methods: This retrospective cohort study included 583 patients who presented to Grace Health in Battle Creek, Michigan between August 2019 -June 2023. Inclusion criteria included all patients ages 18 to 99 at Grace Health with systemic dysfunction and a history of insufficient nutritional intake as defined by the "Healthy Eating Index."

The primary objective of Phase I of this study aimed to identify the prevalence of vitamin deficiencies within Grace Health. IRB approval was obtained, IRB number WMed-2021-0738. Grace Health IT completed data retrieval, which collected data on patients with insufficient nutritional intake and related pathologies. Most recent lab values of Vitamin C, B1, B3, B5, B6, B9, B12, D, A, magnesium, zinc, ferritin, iron, and selenium were obtained. Secondary objectives included identifying associations of vitamin deficiencies with multiple patient variables, such as housing status, education level, BMI, activity level, tobacco use, drug use, and various clinical markers. A manual chart review was then conducted using REDCap. Phase II is currently in the process of expanding the current patient database.

Results: 432 (74%) patients who met the inclusion criteria were shown to have one or more micronutrient deficiencies. Notable observational associations included mood disorders with vitamin B9 (88.2%, N=15), zinc (76.9%, N=40) and B6 (73.9%, N=99) deficiencies; tobacco use with vitamin C (80%, N=136) and B9 (76.5%, N=13); periodontal and oral disease with vitamin B9 (76%, N=13); papular rash with vitamin B6 (73.9%,N=99). This study also showed observational associations between vitamin deficiencies and social factors, such as Medicaid status and sedentary lifestyle.

Conclusion: Many common pathologies are impacted by vitamin and mineral deficiencies; therefore, obtaining appropriate vitamin levels when clinically warranted is critical for comprehensive care. This study warrants further investigation into establishing a vitamin panel protocol for hospitalized patients to decrease readmission rates.

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The Dark Facts of Skin Lightening

Pradnya Joshi[1], Thomas Roberts[2], Madhavi Latha Nagalla[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Psychiatry, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: All around the world, lighter skin complexion is associated with an elite status. In India, Brahmins who are usually fair are considered to be a higher caste and Dalits who are usually dark skinned are labelled as the fifth caste.1 Among African American population, lighter skinned individuals are more advantaged than their darker skinned counterparts in various fields including but not limited to job market and criminal justice systems.2 Some studies show that lighter skinned blacks experience less discrimination. A study in Saudi Arabian women showed that fair skin is associated with beauty and social advantage.3 In pursuit of this elite status people use skin lightening agents which contain steroid agents, hydroquinone, bleach, mercury, and hydrogen peroxide. All these agents can cause serious complications including neuropsychiatric side effects.

Case Presentation: We present a case of a young black male who was admitted to the hospital for psychotic symptoms most likely secondary to the high dose of corticosteroids in the skin lightening creams he prepared. We discuss the psychosocial aspects of his desire for skin lightening. The patient's psychotic symptoms responded to anti-psychotic medications; however, the more holistic long-term treatment should be based on the possible issues related to self-esteem secondary to skin complexion and perceived and/or ingrained societal norms.

Discussion: A literature review using the key words related to psychosis and skin lightening products yielded 11 results. To our knowledge this is the first case to report psychotic symptoms secondary to skin lightening products. This case report adds to the limited literature, educating physicians about the harmful effects of skin lightening products so that they can educate their patients and advocate for their safety.

References: [1] Sankaran S., Sekerdej M., von Hecker U. The role of Indian caste identity and caste inconsistent norms on status representation. Front Psychol. 2017;8:487. [2] Hargrove T. W. (2019). Light Privilege? Skin Tone Stratification in Health among African Americans. Sociology of race and ethnicity (Thousand Oaks, Calif.), 5(3), 370–387. [3] Hamad et. al (2010) Skin-lightening practice among women living in Jordan: prevalence, determinants, and user's awareness.

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An Examination of Orthopedic Implants in the WMed Skeletal Teaching and Research Series: Presenting a resource for medical education and research

Hannah Beehler[1], Christine Pink[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Pathology, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Total hip and knee arthroplasty (THA and TKA) are two of the most common joint arthroplasties performed in the United States, with the prevalence of these procedures anticipated to continue increasing with the aging population. Therefore, medical education programs must expose students to the pathology, mechanisms of surgical intervention, and variance in implant materials for THA and TKA. One of the purposes of the WMed Skeletal Teaching and Research (STaR) Series is to target this educational goal, however, considering whether the collection is representative of the surrounding population is imperative when training medical providers to care for local communities. As few formal skeletal collections exist within the United States, research pertaining to representation of orthopedic surgeries is arguably nonexistent. The WMed STaR Series aims to target this gap in research, comparing representation of THA and TKA from the series to community statistics.

Methods: Donors from the WMed STaR Series were evaluated for the presence of THA and TKA. The type and material of implant, laterality of intervention, donor medical history, and donor demographics were documented. Preliminary data collected from the series will be compared to analogous data from orthopedic patients seen at the WMed Health clinic.

Results: The American College of Rheumatology cites about 1.2 million TKA and THA procedures in the U.S. annually with approximately 36.3% being THA and 63.7% being TKA. Upon evaluation of the STaR series, there were six THA (83% with a metal femoral head and a polymer socket, and the remaining 17% with a ceramic femoral head and a polymer socket) and seven TKA (all with metal tibial and femoral components and plastic spacers). This results in a relative frequency of 46.2% THA and 53.8% TKA in the WMed STaR Series, showing that while WMed has a similar proportion of THA and TKA to the national statistic, the STaR Series shows slightly higher prevalence of THA.

Conclusion/Clinical significance: The development of the WMed STaR Series will provide educators with a reference for orthopedic implants available for medical education, and also will prepare medical trainees to deliver comprehensive care to their communities.

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A Novel Case of Male Neuroendocrine Breast Cancer with Subsequent Spontaneous Regression

Erin Burgmaier[1], Kevin Chen[1], Michael Chaney, MD[1], Daniel Barnas, MD[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Ascension Borgess Hospital, Department of Surgery, Kalamazoo, MI

Introduction: Primary neuroendocrine tumors of the breast are exceedingly rare, representing less than 0.1% of all breast cancers. Male breast cancer is also an uncommon occurrence, making up around 1% of all breast cancer diagnoses. This case report describes a much rarer case, that of 73-year-old male presenting with right breast mass, found to have primary neuroendocrine breast cancer, status-post right total mastectomy with sentinel node biopsy.

Case Description: Patient is a 73-year-old male without personal or family history of breast cancer who presented to his primary care with a palpable lump in his right breast. It had been steadily increasing in size for two months. Fine needle aspiration ruled out abscess. Mammography and ultrasonography showed roughly a 4 cm mass with associated skin thickening. Needle-core biopsy demonstrated high grade dysplasia with features consistent with small cell carcinoma and expression of neuroendocrine markers. PET scan was not able to localize a primary source for the cancer and it was staged T2NxMx. On surgery day the patient reported that the mass was gone. The patient underwent right total mastectomy with sentinel lymph node biopsy without complication. Pathology indicated spontaneous regression of the mass with sclerosed tissue and absence of malignant cells.

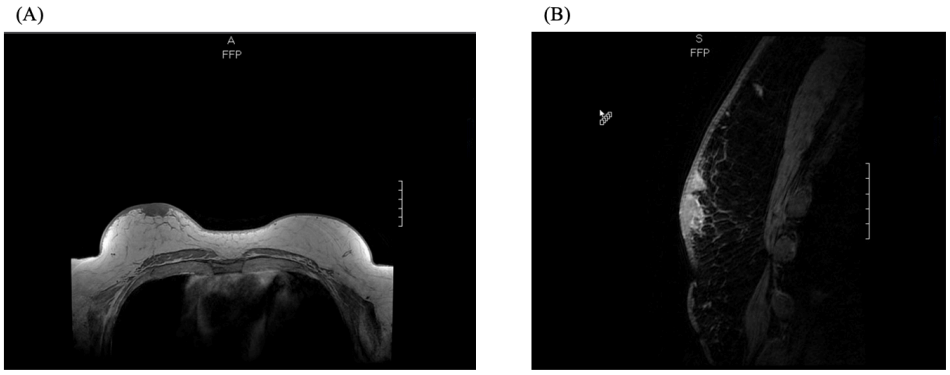

Figure 1: MRI with contrast in axial plane (A) and sagittal plane (B) demonstrating mass in the right breast medially at the 3-4 o'clock axis measuring as 4.3 cm with associated skin thickening.

Discussion: Primary neuroendocrine tumors (PNETs) classically present in the gastrointestinal tract, but can arise in any tissue. This patient presented with nonspecific findings, such as a painless retro-areolar lump and skin changes. He did not have nipple discharge which is present in about half of cases of breast PNET. PNETs of the breast are associated with poor outcomes, as patients typically present at a higher stage and grade compared to other types of breast cancer. Given that the patient was male, his atypical histology and staining, and high grade of dysplasia, total mastectomy was warranted. His total resolution is highly unusual and scantly reported in literature with spontaneous regression of breast cancer occurring in 1 in every 60,000-100,000 cases.

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Resident Nutritional Support Guide

Pradnya Joshi, Kristine Gibson
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Eating disorder (ED) medical stabilization admissions have been on the rise and were accelerated by the COVID-19 pandemic. A literature review found few articles focused on physician-patient-family communication during medical management of ED complications. A thematic analysis from 2019 noted that "navigating uncertainty" with specific language around "communicating with the patient and behavioral management" was particularly stressful to resident and community physicians. Within our own community hospital, we identified a gap in access to decision support material when residents are caring for ED patients. As such we developed a novel educational event and enduring tool for residents.

Methods: A point of care tool including diagnostic criteria, hospital nutrition support protocols, and scripting around common topics was developed with an interprofessional team. Pediatric and Med-Peds residents participated in an educational session during which we reviewed the content of the tool and clarified steps in the protocol. Pre and post surveys were administered. The survey consisted of sixteen questions across three categories: hospital specific protocol, resident confidence in their eating disorder focused communication skills, and underlying medical knowledge needed to manage EDs. Questions were a mix of 5-point Likert scale and True/False.

Results: Despite low baseline average knowledge and confidence scores across all residents, pre- and post-survey analysis showed statistically significant gains (evaluated by a Wilcoxon Signed Rank Test) in all three categories (p-value >0.0001, >0.0137, >0.0001). Questions assessed with a 5-point Likert scale were calculated per case by summing up self-ratings. Mean score was ~6 points higher in each of the three domains. True or false questions focused solely on the protocol, and results were calculated per case (1 for correct answers and 0 for incorrect). Mean score was 1 point higher, which was also statistically significant.

Conclusion/Clinical significance: The educational intervention focused on resident roles during nutritional support admissions was effective in increasing resident knowledge and self-perceived confidence immediately after the event. Our next steps are to study how residents used the tool in the hospital setting.

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The Role of Mitochondrial Disorders in Neurodevelopmental Disorders and Psychiatric/Behavioral Conditions

Daniela Pinto Payares[1], Logan Spooner[1], Jennifer Vosters[1], Samantha Dominguez[1], Lauren Patrick[1], Ann Harris[1], Shibani Kanungo[1, 2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Pediatric and Adolescent Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Background: Mitochondrial diseases are known inborn errors affecting energy metabolism and are as common as chronic diseases such as diabetes, affecting approximately 1 in 5,000 people. The role of mitochondrial diseases/dysfunction has been highlighted in neurodevelopmental disorders like ASD, ADHD, intellectual disability, and speech delay, as well as various psychiatric conditions. Neurodevelopmental disorders are increasingly recognized as having behavioral and psychiatric symptoms. Our study aimed to investigate reports of mitochondrial disorders, noting neurodevelopmental disorders and psychiatric/behavioral conditions.

Methods: We conducted a (systematic) review of literature in PubMed/MEDLINE, Scopus, and Cochrane Library from inception to November 2022. No filters or limiters were applied to ensure relevant literature was captured from inception to November 2022. All references identified from the searches were imported into Mendeley Reference Manager citation management software. Software and manual checks were made to remove duplicate citations. All remaining citations were imported and organized into a Microsoft Excel spreadsheet. Full texts of those citations were downloaded and imported into Mendeley.

Results: Our literature search yielded 277 publications from the above four databases.PubMed returned 168 results, Scopus returned 96 results, ClinicalTrials.gov returned 9 results, and Cochrane Database returned 4 results. Of the 277 total publications, 42duplicate records were removed. This led to 235 publications being screened with 95meeting exclusion criteria and 139 meeting inclusion criteria articles.

Discussion: We examined 139 publications on mitochondrial disease/dysfunction that highlighted the role of mitochondrial disease/dysfunction in NDDs and behavioral/psychiatric conditions. Of the reviewed articles discussing NDDs, 100discussed ASD, 47 on ID, 44 on language disorders, and 29 on ADHD. Articles relating to behavioral/psychiatric conditions included 29 on GAD and personality disorders, 29on schizophrenia, 19 on MDD, 16 on Alzheimer's, 11 on bipolar, 11 on Parkinson's, 7 on OCD, 8 on dementia, and 1 on PTSD. Notably, of the aforementioned articles, 254 of these mentions are in review articles, while only 14 are from clinical trials relating to NDDs. This brings to light the lack of new research studying the relationship between mitochondrial dysfunction and NDDs/psychiatric/behavioral conditions. Additionally, the majority of articles were focused on ASD, leading to the question of whether ASD has a stronger correlation to mitochondrial disease or if it has more research funding.

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A Case of Cervical Avulsion During Vaginal Delivery

Gina Bravata[1], RaMae Harpestad[1], Allyson Schiefer[1], Sara Deatsman[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI., Kalamazoo, MI. [2]Bronson Methodist Hospital, Kalamazoo, MI

Introduction: This case describes the presentation, intrapartum course, operative management, and follow-up of a 28-year-old nulliparous woman who sustained a partial anterior cervical avulsion during delivery. Our aim is to provide information regarding cervical avulsion in the setting of dinoprostone-assisted cervical ripening.

Case Presentation: A 28-year-old G1P0 at 41w0d was admitted for induction of labor for late term gestation using dinoprostone, cervical ripening balloon, and Pitocin. Spontaneous rupture of membranes occurred 27 hours into induction, and 1 hour after starting pitocin. Eleven hours later, she progressed to complete dilation. Spontaneous vaginal delivery occurred after 30 minutes of pushing. After delivery, tissue covered by placental membranes was noted at the introitus. The placenta was delivered intact with gentle cord traction; and, the tissue at the introitus was identified as cervical tissue with significant laceration. The patient was taken to the operating room for an exam under anesthesia and repair. A partial anterior cervical avulsion and posterior cervical laceration were confirmed and urogynecology was consulted intraoperatively to assist with the repair.

The partially avulsed portion of the anterior cervix was initially connected to the cervix by a thin bridge of tissue which completely avulsed during the repair. The laceration was found to extend down the posterior aspect of the cervix and into the posterior vaginal fornix and was approximated in a running fashion. Cystourethroscopy confirmed no injury to the bladder or urethra. No complications were identified at 4-week and 6-week follow-up appointments, and the exam revealed a healing residual cervix. Follow-up is planned at 3 and 6 months, with transvaginal ultrasound at 6 months to assess cervical length.

Discussion: Few cases of partial or complete cervical avulsions have been reported in the literature and standard of care for treatment and follow-up is limited. This case highlights the importance of intraoperative evaluation of complex obstetrical lacerations to obtain adequate repair. Long-term effects of cervical avulsion on future pregnancy are not well established and assessment of cervical length may be beneficial.

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A Rare Case of Amiodarone-Induced Acute Psychosis

Amanda Hunt, Carolyn Cooper, Rohit Mekala, Emad Wahashi
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Amiodarone is a commonly used antiarrhythmic medication. It is famous for having multiple adverse effects, especially toxicity to the pulmonary system. However, acute psychosis secondary to amiodarone use has rarely been noted in the literature. We present a rare case of a 79-year-old Caucasian male with amiodarone induced psychosis after treatment for atrial fibrillation.

Case Presentation: A 79-year-old Caucasian male with past medical history of coronary artery disease, atrial fibrillation, and restless leg syndrome, presented to the emergency department for worsening dyspnea and chest pain. The patient was post-operative day four after a watchman procedure secondary to systolic congestive heart failure. While in the emergency department, the patient was stable with normal vitals. The patient was diagnosed with an NSTEMI and started on heparin and amiodarone per cardiology recommendations. On day three of hospitalization, the patient suddenly grew agitated, experiencing delusions that the hospital staff was trying to hurt him. Of note, the patient witnessed CPR performed on another patient who ultimately expired. He believed that the ER staff murdered this patient and was fearful for his own safety. The patient had no previous psychologic history and received Benadryl and Ativan from ED staff. Psychology was consulted and recommended discontinuing the patients Ropinirole and Loratadine, as these can induce hallucinations in the elderly. Despite adequate time to clear these medications, the patient still experienced hallucinations. Head imaging showed no acute intracranial abnormalities and neurological physical exam was non-contributory, ruling out any medical causes, therefore, it was concluded that our patient was experiencing amiodarone-induced psychosis. Due to this, the amiodarone was stopped, and the patient has since returned to his baseline mentation upon follow-up.

Discussion: This case of acute psychosis secondary to amiodarone helps showcase to physicians the wide array of possible clinical presentations of amiodarone-induced side effects. Although amiodarone has well-studied adverse events, it is also crucial to understand the rarer adverse events when prescribing the medication. We presented this case to help aid clinicians who commonly prescribe amiodarone learn more about the drug and recognize the signs of acute psychosis secondary to amiodarone use.

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Towards New Therapeutics: Modeling non-cognitive NDD symptoms in high-throughput invertebrate systems

Dylan Schafer, Rae Miller, Samantha Hack, Wendy Beane
Department of Biological Sciences, Western Michigan University, Kalamazoo, MI

Introduction: Neurodegenerative disease (NDD) etiology varies greatly between disorders. Consequentially, these diverse physical symptoms make it difficult to uncover mechanistic drivers of disease. While cognition has been widely investigated, neurologic symptoms including impediments in thermal and spatial perception and neuropathy persist. Lack of treatment options thus causes severe quality-of-life burdens for patients. Investigating potential modulators of central nervous system (CNS) morphology and function is the first step to therapeutic development. We apply techniques from the study of neuroethology (the neural basis of behavior), where planarians are an established model of drug susceptibility and addiction. Planarians undergo robust neurogenesis throughout life, where continuous replacement of adult neurons maintains CNS function. NDD-relevant neuronal subtypes (such as GABAergic and dopaminergic neurons) and the behavioral consequences of genetic perturbations are well elucidated. One problem with determining the mechanistic basis of non-cognitive NDD symptoms is correlating intact neural architecture with specific physiological outcomes. Utilizing the planarian CNS regeneration model allows for identifying specific behavioral outputs that are linked to the restoration of specific neural structures.

Methods: To establish planarians as a high-throughput screening tool for behavior and mechanical control in NDDs, we generated a timeline of CNS regrowth (including synapses and axons) following nerve cord transection, where reemergence of neuromuscular behaviors was correlated with the reappearance of CNS structures. Using this as a baseline, we next investigated how disruption of NDD-relevant genes (from the basic helix-loop-helix (bHLH) family) alters structural and behavioral restoration. Following the genetic loss of target genes by RNA interference, we used immunohistochemistry to assess CNS morphology (synapses, axons, and optic nerves) modifications. Thermotaxis (movement towards or away from thermal stimulus) and exploratory behavior assays were used to interrogate thermal responses, spatial awareness, and muscular control.

Results: Our preliminary data suggest inhibition of *Coe*, *MyoD*, and *Atoh* may result in broad changes to brain architecture, concurrent with inhibited optic innervation and reduced exploratory behavior.

Clinical Significance: This study will potentially identify genetic mechanisms regulating non-cognition-associated NDD symptoms, which is a crucial step toward uncovering therapeutic targets and improving patient quality of life.

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Autologous Blood Clots as a Novel Treatment for Post-Traumatic Osteoarthritis

David Richter[1], Sheridan Hayes[3], Megan Moore[1], Kristi Bailey[2], Yong Li[3]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [3]Department of Orthopaedic Surgery, [3]Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Post-traumatic osteoarthritis (OA) is a relatively common form of articular cartilage (AC) damage and is a source of sizable disability [1]. However, clinicians have few viable therapeutic options for treatment of AC injuries and, therefore, novel therapeutics are necessary. Autologous blood clots (ABCs) have received increasing notoriety as a potential therapeutic vehicle in regenerative medicine. This is especially the case in orthopedic lesions, wherein blood clot formation is foundational to the natural healing process. Additionally, a growing body of research suggests that mesenchymal stem cells (MSCs) may promote cartilage repair [2]. Therefore, this study investigated the ability of ABCs loaded with MSCs to promote healing of AC defects.

Methods: All animal procedures were approved by WMed's IACUC (IACUC-2023-0027). After provision of anesthesia, blood was obtained from the lateral caudal vein of Sprague Dawley rats and allowed to clot both in the presence and absence of MSCs. The knee was opened and a 1.5 mm full-thickness defect in the femoral AC was created; defects were filled with either a control gel, ABC, or ABC+MSCs. At 14, 21, and 28 days, animals were euthanized and bones were isolated for histological (H&E, trichrome), microCT, and molecular (PCR) analysis.

Results: H&E and trichrome staining of 21-day samples illuminated superior healing of defects treated with ABCs, relative to control. Additionally, PCR analysis noted significantly increased expression of COL1A1 in ABC+MSC preparations, as compared to both control and ABC alone. Additional histological and microCT analysis is ongoing.

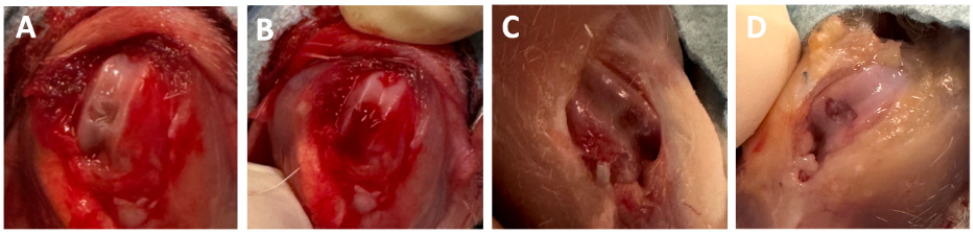

Figure 1. *In vivo* application of BC for treatment of 1.5 mm full-thickness defect in rat femoral articular cartilage. A) lesion + gel, day 0; B) lesion + BC, day 0; C) lesion + gel, day 21; D) lesion + BC, day 21.

Conclusion: ABC and ABC+MSC treatments appear to promote superior healing of full-thickness defects of rat femoral AC. Further, ABC+MSC preparations express significantly greater levels of genes involved in chondrogenesis (e.g., COL1A1). Therefore, these findings suggest that ABCs may serve as an effective therapeutic vehicle for the treatment of post-traumatic OA.

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Novel Surgical Approach to Synovial Sarcoma of the Esophagus

Luke Schultz, Kevin Chen, Corbin Sullivan
Western Michigan Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Synovial Sarcoma (SS) is an uncommon soft tissue malignancy which typically occurs surrounding joints in children and young adults. Rarely, this malignancy may occur in the GI tract, including the esophagus. There have been less than 20 reported cases of primary esophageal SS in the literature to date. Given the rarity of this malignancy, treatment recommendations are limited, however the mainstay of treatment is surgical resection with possible adjuvant radiation and chemotherapy. In all reviewed cases, resection was performed via some variation of esophagectomy. This is an invasive procedure which includes a lengthy hospital stay and risk for significant complications. We present a novel alternative approach for treatment of esophageal SS.

Case presentation: A 30-year-old patient was found to have a large upper esophageal mass after developing symptoms of dysphagia, cough, regurgitation. Otolaryngology was consulted for removal of the mass. CO2 laser was used to remove the pedicled mass from the esophageal wall. Given the size of the mass, it was unable to be removed through the upper esophageal sphincter despite significant effort. The decision was made to allow the mass to pass onward to the stomach to be digested. The patient had an uncomplicated postoperative course with seemingly complete spontaneous digestion of the tumor and no evidence of residual tumor, metastasis, or recurrence. Frozen section pathology confirmed SS of the esophagus.

Discussion: This case represents a novel approach to an extremely rare tumor. To our knowledge, this is the 16th reported SS of the esophagus and the first to be resected via transoral esophagoscopy. This is also the first known case of a tumor being left to be digested in the patient's GI tract, thus preserving the upper esophageal sphincter and hastening recovery. This case suggests that esophagectomy, with associated significant recovery time, functional deficits, and relatively high complication rate, may not be necessary for all cases of esophageal SS. While there has been insufficient surveillance time to draw any definitive conclusions, this case also preliminarily supports active observation over adjuvant chemo/radiation therapy for the management of esophageal SS.

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The Impact of G-Quadruplex DNA on Expression of the Human *PKD1* Gene

Seth Byrne[1], Agata Parsons[2], Gerrit Bouma[2], Greg Vanden Heuvel[2], Erik Larson[2]
[1]Western Michigan University, Kalamazoo, MI. [2]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Autosomal Dominant Polycystic Kidney Disease (ADPKD) is caused by a decrease or loss of the *PKD1* gene product, polycystin 1. The regulators of *PKD1* expression and genetic stability are undefined. We have discovered that the human, but not mouse, *PKD1* gene encodes and forms widespread G-quadruplex (G4) DNA structures: four-stranded conformations that are known to influence gene expression and mutagenesis in the genome.

Methods: G4 DNA formation was investigated to determine its impact on the expression of *PKD1* using a G4-stabilizing ligand in human (HEK293) and mouse (IMCD3) cells. qPCR was used to quantify mRNA for *PKD1* over time in triplicates for both treatment and control (using DMSO) groups. Beta-Actin was used as a housekeeping gene to normalize the expression between cultures of varying growth durations.

Results: Incubation of HEK and IMCD3 cells with the G4-stabilizing ligand PhenDC3 resulted in a decrease in human *PKD1* mRNA compared to loci that do not form G4 structures. *PKD1* in IMCD3 did not show a decrease when treated with the same ligand, consistent with a lack of G4 structures in the mouse ortholog.

Conclusion: The apparent formation of G4 DNA structures in human *PKD1* has a direct impact on expression, resulting in decreased mRNA over time. This may be due to increased mutagenesis at the locus, or because G4 formation reduces the efficiency of transcription. Either way, results here indicate that G4 DNA plays a role in the regulation and potential modulation of *PKD1* expression. Moreover, the data suggests these structures may bring about a decrease in the polycystin 1 gene product and thus contribute to the onset of ADPKD.

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A Comparison of Commercial Hernia Meshes with a New Alternative

Mikayla Moody[1], Mitchell Kenter[2], Robert Sawyer[1], Adil Akkouch[2]
[1]Department of Surgery, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI.
[2]Department of Orthopaedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: In hernia surgery, a mesh infection is a feared complication that can result in longer hospital stays, more antibiotic treatment, and possibly even repeated operations. One proposed mechanism for combatting mesh infections is creating a mesh that elutes agents that can work to fight infection on a microscopic level. Our lab has been working on a mesh using silver graphene oxide and PCL as base materials. We hypothesized that the meshes we had created would be similar to commercial models in tensile strength, contact angle testing, and cellular adherence.

Methods: Meshes were printed using an Axolotl 3D printer in concentrations of 0%, 1%, 2%, and 5% silver graphene oxide. They were then subjected to tensile strength testing compared to commercial Bard and UltraPro meshes. Adherence testing was performed with human dermal fibroblasts, and adherence was assessed at days 1, 3, 5, and 7 using an Alamar Blue reduction test. Contact angle testing was also performed.

Results: Overall, commercial hernia meshes had a higher number of fibroblasts adhered after 16 hours for both intraperitoneal and extraperitoneal portions, as well as higher reduction of Alamar blue on all days, indicating a higher number of cells present. Contact angles between silver graphene oxide meshes remained relatively consistent, while there was substantial variation between two different brands of hernia mesh. Tensile testing is ongoing.

Conclusion: Overall, commercial hernia meshes demonstrated better adherence of human dermal fibroblasts, but contact angle was more variable between commercial brands. More investigation is needed to assess both comparative tensile strength of commercial versus lab-created.

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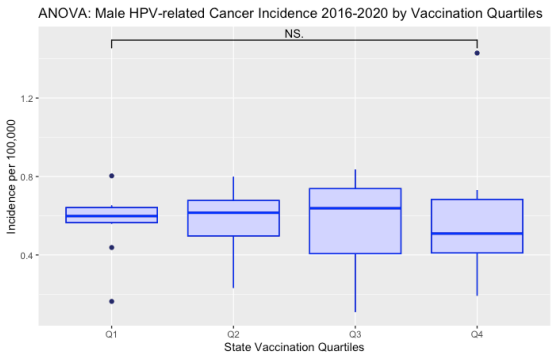
Statewide Association between HPV-Vaccination and Trends in HPV-Related Cancer Incidence

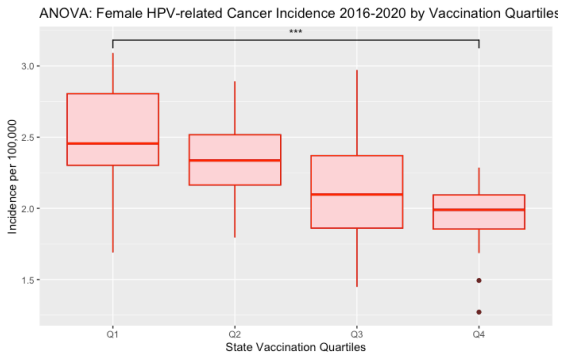
Jefferson DeKloe[1, 2], Luke Schultz[1], Neha Garg[2], Uche Nwagu[2], Joseph Curry[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Thomas Jefferson University Department of Otolaryngology, Philadelphia, PA

Introduction: The Human Papilloma Virus (HPV) Vaccine has shown significant efficacy in preventing HPV infection. In this study, we examine the relationships between state-wide rates of vaccination for HPV and the trends in HPV-related cancer incidence.

Methods: The incidence of cancers of the oropharynx (OPC), cervix, anus/rectum, penis, and vulva/vagina were gathered from the NCDB and SEER databases for patients ages 20-39. Incidence data was stratified by the State of diagnosis and Sex of patients. HPV vaccination rates for teenagers ages 13-17 were obtained from the CDC TeenVaxView survey data from years 2007-2015. Univariate linear regression was performed to determine if there was correlation between statewide vaccination rates and the incidence of HPV-related cancers. The trend in incidence was defined as the difference in incidence from years 2000-2015 to years 2016-2020. States were divided into quartiles based on rates of HPV-vaccination and incidence of HPV-related cancer incidence were examined across quartiles using ANOVA.

Results: Median vaccination rates across all states were significantly lower in males by t-test (32.7±6.85% in males and 52.3±10.2% in females, p<0.0001). From 2000-2015 compared to 2016-2020, incidence of HPV-related cancers dropped significantly in females (mean difference = -0.07 per 100,000, p=0.041) but did not drop significantly in males (mean difference = -0.29, p=0.13). Univariate regression showed that higher rates of vaccination in females were associated with decreased incidence of HPV-related cancers during the period of 2016-2020 (Beta = -0.029, p <0.00024). Higher rates of male vaccination were correlated with a decreasing trend in HPV-related cancers in females (Beta = -0.010, p=0.035). This finding held when examining trends in only OPC (Beta = -0.014, p=0.024). Significantly lower incidence of HPV-related cancers in females were found in the states in the highest quartile of vaccination compared to the lowest quartile (p=0.0045). No variation across quartiles was found for cancers in males (p=0.997) (Fig 1.).





Conclusion: These results add to the growing literature supporting the efficacy of the HPV-vaccine in preventing HPV-related cancers. These results also suggest that vaccination efforts in males have been less successful, with significant room for improvement.

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The Potential Role of Estrogen Receptor in Regulating Carcinoembryonic Antigen-Related Cell Adhesion Molecule 1 (CEACAM1), a Molecule Implicated in the Development of Insulin Resistance

Polina Yagusevich, Tara Subrahmanyan, Berrin Ergun-Longmire, Gerrit J. Bouma
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Background: The liver plays a critical role in insulin clearance as ~60-70% of newly secreted insulin is degraded by hepatocytes through receptor mediated endocytosis. Carcinoembryonic antigen-related cell adhesion molecule 1 (CEACAM1), a transmembrane glycoprotein found in hepatocytes, has been found to increase the rate of insulin clearance from the circulation and suppress lipogenesis. Therefore, we hypothesize that CEACAM1 may play an important role in the development of insulin resistance. Additionally, lack of estrogen receptor 1 (ESR1) in the liver leads to lipid accumulation, and Ceacam1 expression is positively correlated with ESR1 in breast cancer tissue (Wang JL, Sun SZ, Qu X, Liu WJ, Wang YY, Lv CX, Sun JZ, Ma R. Clinicopathological significance of CEACAM1 gene expression in breast cancer. Chin J Physiol. 2011 Oct 31;54(5):332-8. PMID: 22135912). Taken together, we are interested in examining the potential role of estrogen receptors in insulin clearance via CEACAM1. The objective of this study is to determine if ESR1 regulates Ceacam1 expression in the liver.

Methods: Livers have been collected from male and female wildtype (WT) and ESR1 knockout (KO) mice. RNA will be reverse transcribed into cDNA which will then be used for qPCR. All experimental replicates will be assayed and normalized using the geometric mean of actin and 18s rRNA as two endogenous reference genes. Furthermore, genomic DNA is isolated from WT livers and cross-linked in 1% formaldehyde, and chromatin will be sheared through sonication. Purified DNA fragments are captured by a chromatin immunoprecipitation (ChiP) validated ESR1 antibody and analyzed using PCR using Ceacam1 primers designed around an estrogen response element in the promoter region.

Results: *RT*-PCR analysis to test newly developed primers for Ceacam1 revealed expression of Ceacam1 in liver, as well as mouse placentas.

Conclusion: The potential regulation of Ceacam1 by ESR1 in the liver will provide critical new information on the role and mechanism of ESR1 in development of hyperinsulinemia as observed in metabolic disease. Future experiments will examine the role of Ceacam1 related insulin resistance in PCOS as well as its role in the placenta and pregnancy.

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Novel Treatment of a Dural Venous Sinus Thrombosis using the Penumbra Lightning System and Indigo 7 Mechanical Thrombectomy Aspiration Catheter: A case report

Marah Ranger[1], Kenneth Kreitel[1,2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Ascension Borgess Neurointerventional Surgery, Kalamazoo, MI

Dural Venous Sinus Thrombosis (DVST) is a rare cause of stroke, estimated to occur with an incidence of ~5,000 cases/year in the US population1. These thrombi block drainage of cerebral venous structures and the subsequent alterations in pressure can lead to ischemia of regional brain tissue, intracranial hemorrhage, or both simultaneously. As such, they often present with a wide variety of clinical symptoms ranging from asymptomatic cases to severe focal neurological deficits, headache, seizures, coma, or death2. Because of this variability, DVSTs can be difficult to diagnose and manage. Currently, there are no standardized guidelines directing treatment of DVST; however, it is generally accepted that systemic anticoagulation, along with supportive care, is typically first line therapy– even in the setting of intracranial hemorrhage. In severe cases where the patient's life may be at risk or if there is failure of conservative management, endovascular treatments to remove the offending thrombotic obstruction have been performed with varying degrees of success. We report a novel case of successful and efficient endovascular thrombectomy in a 60-year-old male with life-threatening DVST using a large bore aspiration catheter and flow modulation system designed for the peripheral vasculature. To the best of our knowledge this is only the second reported use of this system in the dural venous sinuses.

Citations: [1] Adelman E, McDermott M, eds. Cerebral vein and cerebral venous sinus thrombosis. University of Michigan Health System - Comprehensive Stroke Center. July 2016. Accessed February 9, 2024. https://www.med.umich.edu/1libr/Stroke/SinusVeinThrombosis.pdf. [2] Gala NB, Agarwal N, Barrese J, Gandhi CD, Prestigiacomo CJ. Journal of NeuroInterventional Surgery. 2011;5(1):28-34.

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Case Report: Pseudohypothyroidism with possible Fahr's Syndrome in a pediatric patient

Venkat Atluri, Nahal Massoudi
Department of Emergency Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Hypocalcemia poses unique challenges in the pediatric population. In this article we will present a case of a pediatric patient found to have hypocalcemia along with a possible diagnosis of Fahr's disease. Fahr's disease, also known as familial idiopathic basal ganglia calcification, is a rare neurological disorder characterized by abnormal accumulation of calcium deposits in the basal ganglia and other areas of the brain.

Case presentation: A 15-year-old male with no PMH presented to the ED due to 2 episodes of seizure-like activity. During both, the patient was playing basketball and initially noticed facial twitching, repetitive abnormal tongue movement, and visual disturbances. The patient was unresponsive during these episodes and confused after, answering questions inappropriately. He returned back to baseline after an hour. No urinary incontinence, tongue biting, or tonic-clonic activity during these. He presented at baseline to the ED with no deficits on exam other than positive Chvostek sign (ipsilateral facial twitching in response to stimulation over facial nerve). Labs demonstrated hypocalcemia, hyperphosphatemia, and elevated parathyroid hormone (PTH). The CT brain demonstrated abnormal mineralization in the deep gray nuclei and subcortical white matter of the frontal lobes. He was admitted and started on calcium infusion. No further episodes were observed and calcium maintained stable with oral supplementation. He was discharged with outpatient follow-up with endocrinology and repeat CT.

Discussion: This pediatric patient presented with multiple episodes of transient neurocognitive deficits but no findings on exam other than Chvostek sign, typically associated with hypocalcemia. His labs were consistent with pseudohypoparathyroidism. Given his presentation and imaging, this patient can possibly be diagnosed with Fahr's disease. This rare disorder is characterized by abnormal accumulation of calcium deposits in the basal ganglia and other areas of the brain, often associated with calcium metabolization disorders. Although he presented with transient neurocognitive impairment, no movement disorders or psychiatric symptoms were observed, which can also be expected with Fahr's. If it is Fahr's disease, then the prognosis is poor as there is no cure. He is likely early in symptomatic progression. Genetic testing would be needed for definite diagnosis. Management will be supportive with the goal of alleviating symptoms.

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Investigating Cannabis Use and Association With Chronic Diseases: A Pilot autopsy study

Rami Madani[1], Yoshiya Yamikawa[1], Mahmoud Ajine[1], Mohamed Said[1], Christine Pink[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Western Michigan University Homer Stryker M.D. School of Medicine, Department of Pathology, Kalamazoo, MI

Introduction: Cannabinoids are under the limelight of translational research, however their potential to attenuate or exacerbate certain diseases, has not been fully elucidated. Cannabinoids have potential pharmacotherapeutic effects in anxiolysis, anti-emesis, and management of inflammatory bowel disease through impacts in the gut-brain-axis. Cannabis smoking also has a more deleterious effect on lung function as compared with smoking tobacco. To clarify the range of effects of cannabinoids, this pilot study analyzed autopsy reports to highlight potential relationships between a history of cannabis use (HCU) and chronic health conditions.

Methods: The autopsy reports of 79 decedents presenting with a history of drug, alcohol, nicotine, or cannabis use were reviewed and those without a clear HCU (positive or negative) were excluded. The final sample includes 42 decedents autopsied between December 2022 and February 2023 at the WMed Department of Pathology and Office of the Medical Examiner (OME). Data pertaining to the presence or absence of chronic conditions were documented by the pertinent body system or non-organ system. Musculoskeletal (MSK), Endocrine (END), and Cardiovascular (CVS) conditions are the focus of this presentation.

Results: The average age of decedents with an HCU was 43.8 years. Data were interpreted using Fisher's exact test. There was a significant relationship of HCU to MSK conditions ($p=0.0353$). END and CVS conditions were not correlated to HCU ($p=0.0592$ and 0.1249, respectively). The associations between HCU and MSK are consistent with the literature and larger patterns among the WMed OME decedent population.

Discussion/Conclusion: Study results align with recent literature indicating a therapeutic effect of cannabis use for chronic MSK conditions like osteoporosis via endocannabinoid ligands and CB2 receptor activation. Although not significant, this preliminary work revealed patterns between HCU and chronic END and CVS diseases. Future research will address demographic variables, existing comorbidities, mode of cannabis exposure, other substance misuse history, and clinical correlations of cannabis use and MSK, END, and the CVS pathologies.

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Undescended and Unnoticed: Addressing Cryptorchidism in pediatric care

Rami Madani[1], Mahmoud Ajine[1], Yaqub Ahmedfiqi[1], Grainne Caughey[1], Patrick Hansma[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Pathology, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Cryptorchidism is defined as the lack of one or both testes in the scrotum. It affects about 3% of full-term and 30% of premature male infants. True incidence is approximately 1% after the first year of life. Early intervention plays a significant role in minimizing long-term morbidities associated with cryptorchidism, including increased risk of testicular germ tumors, inguinal hernias, torsion, and psychological impairments; therefore, it is crucial for physicians to detect cryptorchidism early. Treatment is typically orchiopexy and continuous monitoring. Given the serious ramifications of undiagnosed cryptorchidism, this retrospective study examines and calls to attention the incidence of cryptorchidism in pediatric autopsies, focusing on discrepancies between reported and actual testicular descent in medical histories.

Methods: We systematically examined a forensic pathologist's pediatric (<18 years old) autopsy records performed between 2010 and 2022. We identified 186 pediatric cases and among these, we identified a total of 113 males. Of these 113 male pediatric cases, we further identified 5 cases of undescended testes. The primary objective was to determine the incidence of unreported cryptorchidism in pediatric autopsies with histories of normal testicular descent (NTD).

Results: The incidence of cryptorchidism was 4.4% (5/113). In all cases, medical records documented NTD. The average age at autopsy of these 5 decedents was 3.0 years.

Discussion/Conclusion: Due to the previously discussed risk of UDT (undescended testes), the rate of clinically undiagnosed cryptorchidism in the studied population is concerning. Protocol detailed by the American Urological Association, currently recommends palpation of testes for position at each recommended well-child visit and referral to a surgical specialist for timely evaluation if UDT persists beyond 6 months of age. Currently, methods of diagnosis include physical exam, ultrasound, and surgical exploration. Literature on improved diagnostics is scarce; studies suggest the use of diffusion-weighted imaging (DWI) with conventional MRI to increase the accuracy of identifying UDT.

This study reinforces the importance of performing routine screening for UDT. Further research should investigate high-sensitivity methods to evaluate UDT. Additionally, larger retrospective studies could investigate potential correlations between cryptorchidism and factors such as SES and race.

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Cholecystectomy and Hematological Disorders: Implications for hereditary Elliptocytosis and Gilbert Syndrome

Mussa Ibrahim[1], Rami Madani[1], Talal Al-Assil[1], Steven Stone[1, 2], Mohammad Omaira[1, 2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Hematology & Medical Oncology, Bronson Cancer Center, Kalamazoo, MI

Introduction: Hereditary Elliptocytosis (HE) is a rare genetic disorder characterized by mutations in the alpha spectrin gene (SPTA1), resulting in structural abnormalities and compromised membrane stability of red blood cells (RBCs). Gilbert Syndrome (GS) is an autosomal recessive condition defined by reduced activity of uridine diphosphate-glucuronyl transferase-1A1 (UGT1A1), leading to elevated levels of unconjugated bilirubin (UCB). Although both conditions are typically asymptomatic, their coexistence, especially in conjunction with other comorbidities like chronic kidney disease (CKD), is not well-documented. This report presents a unique case of concurrent HE and GS in a patient with CKD and examines the implications of cholecystectomy in the management of these conditions.

Case Presentation: Our case involves an African American female in her early 60s with a medical history including stage 3B CKD, congestive heart failure, hypertension, and a previous cholecystectomy. She presented for the management of chronic normocytic anemia with a hemoglobin level of 8.5 g/dL. A blood smear examination identified the presence of elliptocytes, and subsequent genetic testing revealed a mutation in the SPTA1 gene, leading to a diagnosis of HE. A pathogenic mutation in the UGT1A1 gene led to an additional diagnosis of GS. Interestingly, the patient had no history of jaundice or hyperbilirubinemia following her cholecystectomy, which was performed 22 years before her presentation.

Discussion/Conclusion: HE leads to premature destruction of RBCs, while GS impairs the liver's ability to conjugate bilirubin. These coexisting conditions can elevate levels of unconjugated bilirubin and increase the risk of bilirubin gallstone formation. A study involving a pediatric patient with GS and a hemolytic disorder suggested a synergistic effect in elevating the risk of bilirubin gallstones and hyperbilirubinemia. Post-cholecystectomy, the patient in the study showed significantly reduced bilirubin levels and no recurrence of gallstones. Our patient's experience aligns with these findings; she did not encounter any hyperbilirubinemia episodes following her cholecystectomy. This outcome may be attributable to the bypass of bile storage in the gallbladder, precluding the accumulation of unconjugated bilirubin in the bloodstream. We propose that cholecystectomy may be a valuable intervention in managing these conditions effectively for patients diagnosed with both GS and HE.

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CLL to Hodgkin's: A tale of unwanted upgrades and fungal side quests

Delour Haj[1], Mohamed Said[1], Talal Al-Assil[1], Steven Stone[2], Mohammad Omaira[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Bronson Cancer Center, Kalamazoo, MI

Introduction: Richter Transformation (RT) involves the progression of chronic lymphocytic leukemia/small lymphocytic lymphoma (CLL/SLL) into more aggressive lymphomas, including Hodgkin's or Non-Hodgkin's lymphoma. RT from CLL to Hodgkin's lymphoma is found in 0.2-0.8% of cases. Positron Emission Tomography and Computed Tomography (PET-CT), utilizing standardized uptake values (SUV), are crucial to assess disease severity and predict outcomes.
CLL patients are susceptible to opportunistic infections like histoplasmosis, which can occasionally mimic CLL recurrence.

Case Presentation: A male in his mid-60s with CLL/SLL initially treated with Fludarabine, Cytoxan, Rituximab (FCR), and Rituximab, Cyclophosphamide, Doxorubicin, Vincristine, Prednisone (R-CHOP), had multiple relapses of CLL and disseminated histoplasmosis. Four years after initial histoplasmosis infection, he developed recurrent disseminated histoplasmosis, severe hypercalcemia, and progressive chronic kidney disease (CKD). PET/CT scans revealed an enlarged left cervical lymph node with heightened SUV. Despite histoplasmosis treatment, evidenced by reduced lymphadenopathy and decreased FDG uptake, he exhibited a severe hypercalcemia relapse two years later- without evidence of infection. Investigation revealed the patient's progression to classic Hodgkin lymphoma (HL), two decades post-CLL diagnosis.

Discussion: The patient's hypercalcemic episodes, initially linked to histoplasmosis and later HL, indicate a complex interplay between infection, malignancy, and metabolic disturbances. Severe calcium levels reaching 15.5 mg/dL (normal range: 8.6-10.3 mg/dL), suggest additional factors beyond CKD. Although recent hypercalcemia raised suspicion for recurrent histoplasmosis, no signs of fungal infection were observed.
This case prompts speculation about fungal infections influencing CLL's evolution into classic HL, and underscores a need to consider infectious and malignant factors in CLL patients with unexplained hypercalcemia. This demonstrates PET/CT's utility in monitoring histoplasmosis recurrence and detecting HL transformation. Ongoing research regarding how chronic histoplasmosis and hypercalcemia influence transitions to classic HL is needed, highlighting the necessity of diligent monitoring and comprehensive evaluation.

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Double Trouble: Unraveling the enigma of Mixed Histiocytosis

Mahmoud Ajine[1], Adam Ayoub[1], Talal Al-Assil[1], Steven Stone[2], Muhammad Usman[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Bronson Cancer Center, Kalamazoo, MI

Introduction: Langerhans cell histiocytosis (LCH), characterized by granulomatous lesions primarily composed of langerin-positive (CD207+) histiocytes, can affect diverse organ systems. In contrast, Erdheim-Chester disease (ECD) features the excessive accumulation of foamy histiocytes, predominantly affecting the long bones, cardiovascular, retroperitoneal, endocrine, and orbital systems. This case report presents a rare coexistence of LCH and ECD, also known as Mixed Histiocytosis (MH) in a middle-aged female.

Case Presentation: A female in her 40s with a history of LCH presenting with abdominal pain, particularly in the upper abdomen and periumbilical region. Notably, she experienced a visible mass protruding from her umbilicus upon coughing, with subsequent migration of pain to the right lower quadrant. Initial diagnostic evaluation through computed tomography (CT) imaging revealed lung abnormalities, symmetric and bilateral peri- and pararenal soft tissue infiltration, extensive vascular infiltration, and hepatosplenomegaly. A CT-guided peri-nephric tissue biopsy confirmed the diagnosis, displaying ECD morphology and immunohistochemistry positive for CD163, Cyclin D1, Factor 13a, and the BRAF-V600E mutation.

Discussion: The coexistence of LCH and ECD in the same patient is rare but linked to the BRAF V600E mutation. Diagnosis of mixed histiocytosis, including both LCH and ECD, is challenging and relies on biopsy. Treatment has evolved from IFN-a-based regimens to more targeted therapies like BRAF and MEK inhibitors, with vemurafenib showing promise for patients with the BRAF V600E mutation. In our patient's case, multiple lesions were found in multiple systems including cardiac, pulmonary, facial, orbital, CNS, and in the retroperitoneal cavity. It is imperative that extensive imaging is obtained at time of diagnosis in order to evaluate for systemic spread and lesion activity. Modalities such as PET and MRI of the brain and heart are commonly used to monitor progression. Treatment of mixed histiocytosis is a multi-specialty effort due to systemic involvement and thus follow ups not limited to neurology, endocrinology, and oncology are essential.

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From Protection to Peril: The migration of IVC filter fragments to heart and lung

Delour Haj[1], Aseal Liqa[1], Talal Al-Assil[1], Steve Stone[1, 2], Muhammad Usman[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Bronson Cancer Center, Kalamazoo, MI

Introduction: Puerperal ovarian vein thrombosis (POVT) is an uncommon yet significant form of deep vein thrombosis that primarily affects the right ovarian vein in the postpartum period. The deployment of Inferior Vena Cava (IVC) filters, which serve as a prophylactic intervention against pulmonary embolism in patients for whom anticoagulation therapy is contraindicated or ineffective, has been scrutinized due to possibility of specific adverse events.

Case Presentation: This clinical picture presentation explores the intricate management and long-term outcomes following the placement of an IVC filter in a woman in her late 20s status-post POVT shortly after a non-spontaneous vaginal delivery. The implantation ultimately resulted in the filter fracturing and its fragments migrating to the right ventricle and left lower lobe of her lung. As a result, she presented to clinic experiencing intermittent abdominal pain, chest pain, palpitations, and exertional shortness of breath. Remarkably, her abdominal symptoms resolved upon the successful retrieval of the filter, attributing such pain to the presence of the remaining filter, its fracture, and tilting. Despite the successful removal of the filter, her chest pain and breathlessness persisted, unexplained by extensive cardiac evaluations, suggesting an interplay of factors related to the mechanical presence of the fragments.

Discussion: This outcome underscores the critical risks associated with prolonged indwelling of IVC filters, including fragmentation, migration, IVC perforation, and post-thrombotic syndrome. It advocates for prompt filter retrieval and transitioning to anticoagulant therapy as soon as feasible, to mitigate the dual risks of IVC filter complications and venous thromboembolism (VTE). Additionally, this report enriches the literature with longitudinal clinical imagery spanning 18 years, documenting this rare case from filter insertion to fragmentation and eventual retrieval, offering invaluable insights into the potential long-term sequelae of IVC filter placement.

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Unraveling the Complexity of Nager Syndrome with VPS45 Mutation: A rare case of genetic intersection and hematological anomaly

Yaqub Ahmedfiqi[1], Mohamed Said[1], Talal Al-Assil[1], Steve Stone[1, 2], Mohammad Omaira[1, 2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Bronson Cancer Center, Kalamazoo, MI

Background: Nager Syndrome is a rare congenital disorder caused by a mutation in the SF3B4 gene, marked by distinctive craniofacial and limb abnormalities, with an occurrence rate of 3 in 1,000,000. VPS45 mutations are associated with a distinct clinical presentation, primarily characterized by severe congenital neutropenia and bone marrow fibrosis. Given the rarity of both conditions, our unusual case of Nager Syndrome with VPS45 mutation aims to expand the clinical understanding of this mutation, particularly with respect to its function in hematological regulation.

Case Presentation: The patient is a teenage male, diagnosed with Nager Syndrome at birth presents to clinic for work up of pancytopenia. His bone marrow biopsy indicated hypocellularity with otherwise normal findings. Genetic testing revealed microdeletion of chromosome 1q22 affecting both SF3B4 and VPS45 genes associated with Nager Syndrome and congenital neutropenia respectively.

Discussion: The clinical journey of our patient, diagnosed with Nager Syndrome and later developing sporadic thrombocytopenia progressing to pancytopenia, presents a unique and significant case. Initially presenting with features consistent with Nager Syndrome, the onset of thrombocytopenia, evolving into pancytopenia, diverges from the known malignancy profiles. This anomaly suggests an underlying genetic influence, likely stemming from the VPS45 deletion. Traditionally, VPS45 mutations are linked to severe neutropenia manifesting early in life, often necessitating hematopoietic stem cell transplantation (HSCT) for survival. Our patient's clinical course, devoid of typical VPS45 mutation physiologies, challenges this narrative.

Simultaneous presentation of Nager Syndrome and a VPS45 gene deletion in our patient may be attributed to the proximity of the SF3B4 and VPS45 genes, both located on the locus 1q21.2. Although asymptomatic, patients with pancytopenia must be continuously monitored as they are at risk of death secondary to severe bleeding and/or sepsis.

Our recommendation for its diagnosis involves a combination of hematological assessments, clinical evaluations, and genetic testing to confirm the presence of the VPS45 gene mutation. The rarity of both conditions and its unusual asymptomatic presentation has not been reported in the literature to date.

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Platelet Plunge: Navigating the Oxaliplatin Odyssey in stage IV colorectal conquest

Sultan Elhaj[1], Ali Shammout[1], Talal Al-Assil[1], Steve Stone[1,2], Sunil Nagpal[1, 2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Bronson Cancer Center, Kalamazoo, MI

Introduction: Oxaliplatin, a cornerstone in cancer chemotherapy, is lauded for its efficacy as a third-generation platinum-based alkylating agent. However, its clinical use is marred by adverse effects, notably severe thrombocytopenia. We present a critical instance of oxaliplatin-induced thrombocytopenia in a patient undergoing treatment for stage IV colorectal carcinoma, illustrating the clinical challenges and management complexities involved.

Case Presentation: A male in his early 60s with stage IV rectal adenocarcinoma experienced thrombocytopenia following treatment with the FOLFOX regimen for liver metastases. Despite the regimen's initial success, the patient's condition deteriorated during the 11th cycle, marked by acute rectal bleeding and atrial fibrillation, necessitating emergency intervention. An alarming drop in platelet count from 175,000 to 3,000 cells/µL was observed within hours post-infusion. The diagnosis was immune thrombocytopenic purpura (ITP) secondary to oxaliplatin. Management included intravenous immunoglobulin (IVIG), platelet transfusions, and dexamethasone, leading to clinical improvement.

Discussion: Oxaliplatin-induced thrombocytopenia, manifesting as ITP, presents a significant therapeutic dilemma, often necessitating the discontinuation of oxaliplatin, alongside corticosteroid and IVIG administration. Literature reveals instances of hemolysis and bleeding requiring intensive intervention, including platelet transfusions. Despite desensitization efforts, the re-emergence of ITP advises against the reintroduction of oxaliplatin, highlighting the critical need for meticulous monitoring and individualized treatment approaches. This case emphasizes the delicate balance in leveraging oxaliplatin's anticancer efficacy against its potential for inducing severe, life-threatening side effects. Vigilance and a strategic, tailored approach are paramount in navigating oxaliplatin therapy, ensuring optimal patient safety while maximizing therapeutic outcomes.

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Mortality and Morbidity Outcomes in Acute Appendicitis and Generalized Peritonitis: A comparative study of laparoscopic and open appendectomy outcomes

Rami Madani[1], Bradley Christensen[1], Rebecca Rice[2], Gordon Liu[2], Sarah Khalil[2], Alain Elian[2], Gitonga Munene[2, 3], Robert Sawyer[2], Saad Shebrain[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Surgery, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [3]West Michigan Cancer, Kalamazoo, MI

Introduction: Peritonitis is a surgical emergency that is traditionally approached through laparotomy. The laparoscopic approach has gained popularity over the last two decades as minimally invasive surgery evolves. This study aims to evaluate the 30-day outcomes of laparoscopic and open appendectomy in patients who presented with acute appendicitis and generalized peritonitis (AAGP).

Methods and procedures: Using the ACS-NSQIP database (2015-2017), patients who presented with AAGP were identified and divided into two groups: laparoscopic (LA) and open appendectomy (OA). To create similar groups and minimize the influence of treatment selection bias, regression models including Inverse propensity treatment weighting (IPTW) were used. Outcomes examined included 30-day mortality and morbidity. Pearson's chi-squared and Fisher's exact tests were used to test group differences of categorical variables. Continuous variables were tested with the student t-test. Balanced diagnostic tests including standardized differences were used to compare both groups before and after weighting. Statistical significance set at a value of $p<0.05$.

Results: Of a total of 129,368 patients with appendicitis, 13,686 (10.4%) had acute appendicitis and generalized peritonitis (AAGP). We divided the AAGP patients into two groups. Laparoscopic appendectomy (LA) included 11,764 patients (85.9%), and open appendectomy (OA), included 1,934 (14.1%). Demographic characteristics of patients before and after IPTW were obtained. Both groups were similar. Post-operative outcome was worse in OA compared to LA, including increased odds of higher 30-day mortality [(4.15, 99.8% CI (1.18, 14.59), $p<.0001$), higher serious morbidity [1.44, 99.8% CI (1.20, 1.72), $p<0.0001$), and overall morbidity (1.67, 99.8% (1.41, 1.99), $p<0.0001$).

Conclusion: Patients presented with AAGP who underwent an open approach had worse 30-day outcomes, including higher mortality, serious morbidity, and overall morbidity. Laparoscopic approach should be considered in all patients presenting with AAGP.

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Outwitting Colorectal Cancer with Cutting-Edge Surgery and Immuno-Shenanigans

Talal Al-Assil[1], Tucker Morris[1], Madison Laird[1], Saad Shebrain[1], Gitonga Munene[1, 2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]West Michigan Cancer Center, Kalamazoo, MI

Introduction: Immune checkpoint inhibitors (ICI) can result in a durable response in patients with deficient DNA mismatch repair colorectal cancer (dMMR). Oligoprogressive disease is increasingly becoming a clinical dilemma encountered by surgical oncologists and it is unclear if there is a role for resection**.**

Methods: We retrospectively report a series of patients with metastatic colorectal cancer and dMMR treated with ICI who developed oligoprogression and underwent resection. We evaluated clinical factors, radiographic findings, patient outcomes, and change in circulating tumor DNA (ctDNA) post resection.

Results: Four female patients, with a median age of 67.5 years underwent resection of oligoprogressive disease. All of the patients received a median of 8 cycles of oxaliplatin-based adjuvant therapy. Following initial resection, patients developed metastatic disease at a median of 8 months from initial diagnosis. Median time to development of oligoprogression after ICI initiation was 4-5 months. A positron emission tomography (PET) scan in three patients demonstrated PET avid oligoprogressive disease and non-avid, non-progressive residual disease. Surgical intervention included abdominal wall resections in two patients and multi-visceral resections in the other two patients. All patients had viable disease on pathological evaluation. Three patients had a negative ctDNA following resection.

Conclusion: In well-selected patients resection of oligoprogressive disease in dMMR colorectal cancer patients treated with ICI can result in durable disease control. Postoperative ctDNA levels suggest that in some patients oligoprogression represents local failure. Preoperative PET/CT scan should be considered in all patients to assess tumor viability.

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Mimicking the Prion: Hashimoto's Encephalopathy presenting with Creutzfeldt-Jakob Disease-like symptoms

Talal Al-Assil[1], Garret Weaver[1], Lindsay Bliss[1, 2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Bronson Neuroscience Center, Kalamazoo, MI

Introduction: Hashimoto's encephalopathy is an uncommon autoimmune condition, first delineated in 1966, exhibiting a higher incidence in females with a prevalence rate of 2.1 per 100,000 individuals. This disorder can manifest through a spectrum of symptoms, notably altered mental status, cognitive impairment, tremors, myoclonus, seizures, gait disturbances or ataxia, and stroke-like episodes, particularly in patients presenting with elevated anti-thyroid antibodies after excluding other etiologies of encephalitis.

Case Presentation: We report the case of a male in his early 70s with a notable medical history of deep vein thrombosis managed with Eliquis, obstructive sleep apnea, and uveitis, who was admitted to the emergency department exhibiting rapid cognitive decline over a month. Initially discharged with a provisional diagnosis of viral meningitis following a camping trip, his condition deteriorated, prompting re-admission due to escalating encephalopathy, tremors, auditory and visual hallucinations, agitation, urinary incontinence, and neurological examination revealing hyperreflexia with clonus. An exhaustive investigation affirmed the presence of elevated anti-thyroid peroxidase antibodies, culminating in the diagnosis of Hashimoto’s Encephalopathy.

Discussion: The clinical trajectory of the patient, underscored by non-specific findings on complete blood counts, comprehensive metabolic panels, thyroid-stimulating hormone levels, vitamin B12 levels, meningoencephalitis and paraneoplastic panels, coupled with an initial normal anti-thyroid peroxidase and lack of responsiveness to steroids, pivoted the differential diagnosis towards Creutzfeldt-Jakob Disease (CJD). Awaiting results from RT-QuIC/14-3-3 protein assays of the cerebrospinal fluid, a provisional 5-day corticosteroid regimen yielded marginal benefits. Subsequently, negative RT-QuIC/14-3-3 results and elevated anti-thyroid peroxidase and anti-thyroglobulin levels with preserved thyroid function led to the reconsideration of autoimmune encephalitis, particularly Hashimoto's encephalopathy, as the diagnosis. An augmented steroid regimen facilitated significant clinical recovery, enabling the patient’s discharge shortly thereafter. This case underscores the importance of considering Hashimoto's encephalopathy in the differential diagnosis of rapid cognitive decline, particularly when initial investigations do not point towards a definitive diagnosis and highlights the potential for clinical improvement with appropriate steroid therapy.

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Persistent Severe Fatigue, Anxiety, and Insomnia: A case report highlighting the interplay of genetic variants, obstetric complications, cardiac concerns, and psychiatric symptoms

Leilani Nguyen, Sodjeh Saber-Hameshigi, Ramona Wallace
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: This case depicts a genetic variant, MTHFR C677T, that contributes to this patient's unique history and multisystemic presentation involving Sheehan's syndrome, dysmenorrhea, POTS, anxiety, and insomnia. Despite a variety of interventions, aspects of her presentation persisted or worsened. This case emphasizes the significance of a multidisciplinary approach given the broad differential diagnosis. It also highlights the limitations of a purely symptom-based approach to patient care, and the importance of a thorough understanding of patients' history, genetics, and environmental factors.

Case Presentation: 40 yo female with PMH of dysmenorrhea, POTS, Sheehan's syndrome presenting with worsening fatigue and anxiety. Her functional capacity has declined significantly to the point of being primarily bedridden. She has trialed numerous psychiatric medications with little to no improvement. Abnormal findings on her physical exam were persistent tachycardia and decreased lower extremity deep tendon reflexes. Genetic testing indicated the MTHFR C677T variant, which impacts the synthesis and breakdown of various compounds, such as purines, homocysteine, and catecholamines. Her treatment consisted of methylated folate and B12 supplementation leading to significant improvement to her functional capacity.

Discussion: The patient's conditions and worsening symptoms showed no resolution even after numerous interventions. Subsequential testing elucidated that her presentation was due to a MTHFR C677T variant. MTHFR is an essential enzyme in the folate synthesis cycle, converting 5,10-methylenetetrahydrofolate into 5-methyltetrahydrofolate and remethylating homocysteine to methionine. MTHFR is also a modulator of catecholamine metabolism via the production of S-Adenosylmethionine, which donates a methyl group to Catechol-O-methyltransferase. This case depicts the multisystemic effects of MTHFR dysregulation and the simple, yet impactful necessary treatment.

This case exemplifies the significance behind a multidisciplinary approach to complex patient presentations, as well as the challenges behind diagnosing and managing chronic conditions. The patient's acute and chronic conditions had severely diminished her functional capacity. Through careful evaluation, the identification of her genetic disposition helped illuminate multiple aspects of her presentation, with consequential treatment allowing return to her functional baseline. By employing interventions based on individual characteristics, such as genetic variants and lifestyle factors, this case identifies the ability to attain positive outcomes and the significance of patient-centered care.

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When Platelets Play Ping-Pong: Decoding the mystery of Cyclic Thrombocytopenia

Suhaib Ellythy[1], Talal Al-Assil[1], Mohammed Omaira[1,2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Bronson Cancer Center of Kalamazoo, Kalamazoo, MI

Introduction: Cyclic thrombocytopenia (CTP) is a rare hematological disorder marked by fluctuating platelet counts, leading to phases of thrombocytopenia and potential clotting risk. Distinguishing from Immune Thrombocytopenia (ITP), CTP exclusively impacts platelet lines, posing diagnostic challenges. This report discusses a nearly decade-long management of a CTP case, emphasizing the diagnostic and treatment challenges associated with this uncommon hematological disorder, characterized by its unique impact on platelets, unlike other cyclic hematological conditions affecting multiple blood cell lines.

Case Presentation: A female patient in her 50s initially diagnosed with immune thrombocytopenia (ITP) in her mid-40s presented with persistent severe thrombocytopenia, unresponsive to standard therapies: corticosteroids, intravenous immunoglobulin, and thrombopoietin (TPO) mimetics. Further investigation revealed fluctuating platelet counts, ranging from <5,000 to >1,000,000 × 10^9/L every 4-6 weeks leading to the subsequent diagnosis of idiopathic cyclic thrombocytopenia (CTP). Despite unsuccessful treatments, including rituximab, immunosuppressive medications, and splenectomy, the patient has avoided bleeding or thrombotic complications. The sole effective management has been platelet transfusion support for counts below 10,000 × 10^9/L with weekly platelet count checks.

Discussion: Clinical evidence demonstrates that the etiology of CTP is complex, with potential associations to TPO expression, megakaryocyte dysfunction, unstable peripheral control mechanisms, hormonal imbalances, infections, or autoimmune factors. This disorder exclusively affects platelet counts, differentiating it from other cyclic hematological disorders. The rarity and elusive nature of CTP contributes to frequent misdiagnoses, complicating efforts to accurately determine its incidence and prevalence. Our case, unresponsive to conventional ITP treatments, highlights the importance of vigilant platelet level monitoring in unexplained thrombocytopenia to distinguish CTP from ITP. Precise diagnosis allows CTP patients to avoid unwarranted therapies, such as immunosuppressants, hormonal mimetics, and/or splenectomy, and their associated side effects. The case presented here underscores the diagnostic and management complexities associated with CTP, emphasizing the need for research to unravel CTP's etiology and develop more effective treatment strategies. Lastly, we advise providers to be on the lookout for recurrent, immunosuppressant-resistant, episodes of thrombocytosis, followed by rebound thrombocytosis, especially in the female patient population.

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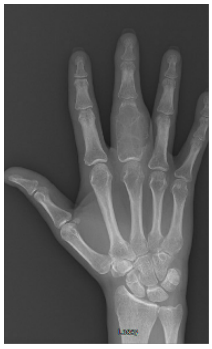
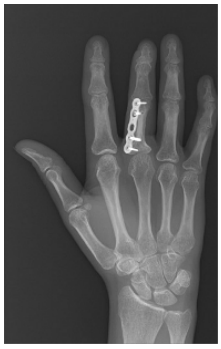
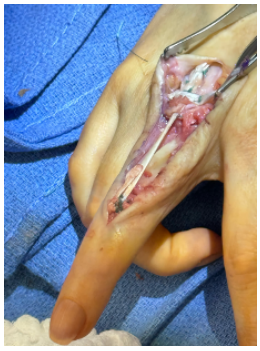
Use of the Palmaris Longus Muscle Tendon as a Graft for Extensor Tendon Reconstruction

Kunal Ranat[1], Richa Gupta[1], Sumit Patel[1], Jessica Hanley[2], David King[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Medical College of Wisconsin, Milwaukee, WI

Introduction: The palmaris longus (PL) works with the long flexors of the forearm to allow for flexion at the wrist joint and small joints of the hand. However, given its absence has not demonstrated a loss of grip and pinch strength, its function appears insignificant and is thus considered an accessory muscle [1]. Nevertheless, the PL is easy to harvest and has a long flat tendon (PLT) that allows good revascularization, encouraging its wide utilization as a tendon graft [2]. We present a case of extensor tendon reconstruction with use of the PLT to restore active motion to a previously ineffective joint.

Case Presentation: CGS is a 40-year-old female with history of extensive aneurysmal bone cyst within the right third digit proximal phalanx causing significant bone loss (Figure 1). Attempts at reconstruction were associated with multiple complications, resulting in extensive damage to her extensor tendon mechanism. An allograft was plated into the defect leaving minimal motion in her PIP joint and some motion in her MCP joint (Figure 2). To regain motion and extensor function, CGS underwent extensor tendon reconstruction using the PLT as graft.

A dorsal incision was made to visualize and remove the aforementioned plate. The underlying bone was inspected and found to have residual allograft that had not yet revascularized but appeared healthy and viable. The allograft was then burred down to make a smooth surface for the reconstructed tendon to travel. Using a single incision approach about the wrist flexor crease, a tendon stripper was used to harvest as much of the PLT as possible proximally. The tendon was then utilized to reconstruct the extensor tendon and the remaining portion was used to reconstruct the sagittal band to prevent subluxation (Figure 3). All surgical sites were closed, and a volar splint was placed to protect the tendon repair.

Discussion: Reconstruction of the extensor tendon and sagittal band was successfully achieved using the PLT. Further patient follow-up will elucidate the extent of return of normal finger activity. Despite its insignificance, the PL may redeem importance as an autologous graft for improving previously limited hand function.

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Seizure-Like Activity in an Adolescent with Fahr syndrome - Case Report

Sara Farran[1], Farah Al-bitar[1], Lubaina Ehsan[1], Nahal Massoudi[2], Berrin Ergun-Longmire[1]
[1]Department of Pediatrics, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI.
[2]Department of Emergency Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Incidental finding of basal ganglia calcifications in CT or MRI scan is common in asymptomatic individuals, particularly, in elderly. However, basal ganglia calcifications can be sporadic or familial and is termed as Fahr disease. The majority of basal ganglia calcification is associated with neurological and endocrine disorders particularly parathyroid gland disorders and is referred as Fahr syndrome.

Case presentation: We report a previously healthy 15-year-old male who presented to local ED with a sudden-onset of seizure-like activity. His laboratory evaluation showed serum calcium of 6 mg/dL (8.6-10.3), phosphorus of 7 mg/dL (2.7-4.5), and elevated parathyroid hormone (PTH) of 419 pg/mL (15-65). He had low 25 hydroxy vitamin D 17 ng/mL (30-100) but had normal alkaline phosphatase. While both the electrocardiogram (EKG) and electroencephalogram (EEG) results were unremarkable, CT-scan of the brain revealed abnormal mineralization of the basal ganglia, thalami, and subcortical white matter of the frontal lobes, concerning for Fahr disease. Renal ultrasound was normal. The rest of his work up including thyroid function, ACTH, cortisol, PTH-related peptide, and FGF23 was normal. Throughout the hospital stay, the patient consistently exhibited a normal physical examination. His clinical and laboratory findings were suggestive of pseudohypoparathyroidism. Following successful calcium stabilization, initially IV then oral calcium supplements, the patient was discharged home with calcium and calcitriol supplements. His outpatient endocrine follow-up revealed clinically and hemodynamically stable patient with normal neurological exam. Patient's family history was significant for vitamin D deficiency in his mother, hypothyroidism in his maternal aunt, hyperparathyroidism in his maternal first cousin, and renal stones and hypertension in his maternal grandfather.

Discussion: Basal ganglia calcification could be idiopathic or a symptom of a serious underlying condition such as neurodegenerative disorders or endocrine disorders. We report a previously healthy 15-year-old male presenting with a seizure-like episode. His laboratory findings were suggestive of pseudohypoparathyroidism which responded to calcium and calcitriol treatment. Brain calcification raised suspicion of Fahr syndrome which is associated with pseudohypoparathyroidism, further ascertaining the diagnosis. This case underscores the complexity of integrating endocrine and neurological considerations in diagnosis and management, emphasizing the need for collaborative care across medical specialties.

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Serotonin Syndrome: Rare or under-diagnosed toxicity? A Case Report

Kyra Grove[1], Taylor Elshaw[1], Douglas Grove[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Anesthesia Service Medical Group, San Diego, CA

Introduction: Serotonin Syndrome (SS) is an iatrogenic drug-induced clinical syndrome characterized by a combination of altered mental activity, neuromuscular hyperactivity, and autonomic disturbances resulting from an increased intrasynaptic concentration of serotonin (5-HT).[1] Though most cases of serotonin syndrome are precipitated by therapeutic doses of a combination of two or more selective serotonin reuptake inhibitors (SSRIs), the polypharmaceutical environment inherent during surgery elevates the potential for toxicity and complicates the timely diagnosis of SS during the perioperative period. We present an operative patient with a history of generalized seizures complicated by a diagnosis of SS that has not been well described in the literature.

Case Presentation: A 56-year-old female with a history of generalized tonic-clonic seizures and major depressive disorder underwent bilateral ptosis repair. Her medication list included Doxepin, Fluoxetine, Klonopin, Lamotrigine, Omeprazole, Mucinex, and hyoscyamine. Tramadol was listed as an allergy with a reaction of seizures. Anesthesia was induced with intravenous Fentanyl, Propofol, and Lidocaine. Ondansetron was administered for nausea prophylaxis. The surgery was uneventful. Post-operatively, the patient appeared anxious with rigid upper and lower extremities. Her symptoms progressed to generalized tonic-clonic seizure-like activity with ocular myoclonus. Her temperature was 36.5 Celsius. In the ICU, the patient was diagnosed with acute status epilepticus. No seizure activity was noted on her EEG. A further review of her medical history revealed that this patient demonstrated multiple episodes of probable serotonin toxicity over the past five years.

Discussion: With the rise in the number of patients prescribed antidepressants presenting to the operating room and the concomitant increase in patients with a history of seizures disorders, serotonin toxicity must be considered with any patient displaying altered consciousness or a movement disorder postoperatively. It is essential for physicians caring for susceptible patients during this period to have a heightened awareness of the signs and symptoms of serotonin syndrome for the timely diagnosis and treatment.

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Cardioversion Induced Takotsubo Cardiomyopathy

Ryan Clydesdale, Shivani Reddy, Jagadeesh Kalavakunta, Jose Ricardo
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Takotsubo cardiomyopathy (TC), also known as stress-induced cardiomyopathy or "broken heart syndrome," is a rare and reversible condition characterized by transient left ventricular dysfunction. Patients generally present with chest pain and dyspnea, mimicking coronary artery disease (CAD).

Case Description: A 77-year-old obese woman with a history of hypertension, hyperlipidemia, chest pain with abnormal stress test, and atrial fibrillation (AF) presented with sporadic palpitations and fatigue. Vital signs revealed tachycardia and the physical exam was normal. Holter monitoring revealed 100% burden of AF. Coronary angiography showed no obstructive disease. TEE showed normal global systolic function, mild to moderately dilated atria, and moderate mitral and tricuspid regurgitation. Cardioversion successfully converted AF to sinus bradycardia. Patient was discharged home on amiodarone 400 mg BID and dabigatran (Pradaxa) 150 mg BID. Four days later, the patient presented with substernal chest pressure, exertional dyspnea, mild weight gain, and lower extremity edema. She also noted an increase in family stress in the past few months. Exam findings included 2/6 holosystolic murmur in the mitral position, elevated JVP, diminished breath sounds, and bilateral lower extremity pitting edema. BNP was elevated at 1204 and troponin peaked at 0.227. ECG showed sinus rhythm at 62 bpm and T wave inversions. Echocardiogram demonstrated a significant decrease in ejection fraction (EF 20-25%) with hypokinesis of several regions, consistent with a possible LAD infarct or atypical TC. Chest CT ruled out acute pulmonary embolism. Patient was started on IV furosemide, was switched from carvedilol to metoprolol, and continued on amiodarone. Two days later, the patient's symptoms resolved. Cardiac MRI showed improved left ventricular ejection fraction at 35%.

Discussion: Electrical cardioversion is a procedure used to treat irregular heart rhythms like AF. The incidence of cardioversion-associated TC in patients with AF is fairly low. Among 154, 919 patients admitted with AF who underwent electrical cardioversion in the National Readmission Database from 2018, 0.027% were readmitted with TC. Acute heart failure due to apical type TC is the most common presentation within 48 hours. However, it is important to consider cardioversion induced TC in patients even beyond the 48-hour window.

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Concurrent Pleural and Pericardial Effusion: An uncommon initial presentation of systemic Lupus Erythematosus

Ali Baidoun[1], Asra Usmani[1], Aaron Mahoney[2], Megan Sikkema[3]
[1]Department of Pediatrics, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Department of Emergency Medicine, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [3]Bronson Children's Hospital, Kalamazoo, MI

Introduction: Systemic lupus erythematosus (SLE) is an autoimmune condition affecting one or more organ systems. Presentation of SLE ranges from localized to systemic and may be life threatening. Common features include arthritis, serositis, malar rash and Raynaud phenomenon. Early diagnosis of SLE is vital for the immediate initiation of appropriate therapy and to delay progression of disease. In this case presentation we report a unique case of a 16-year-old who presented with pleural and pericardial effusion and was subsequently diagnosed with SLE.

Case Presentation: A 16-year-old previously healthy girl was seen at her pediatrician's office for left sided chest pain for 4 weeks. Initially diagnosed with GERD she was managed with Omeprazole, however, following persistent chest pain, intermittent fevers, shortness of breath and negative viral panel, a chest x ray was ordered. The chest x ray revealed bilateral pleural effusion and antibiotics were initiated for concern of pneumonia. However, following no improvement despite completion of course, child was admitted, and CT chest obtained which revealed large pericardial effusion and left sided pleural effusion with near complete lung collapse requiring transfer to PICU. Immediate pericardiocentesis with pericardial drain placement and left pleural effusion drainage with chest tube was done. Subsequent work up revealed high ANA titer (>1:640), elevated anti DS DNA, ESR and CRP substantiating diagnosis of SLE-related autoimmune pericardial effusion. Patient was started on high dose steroids which dramatically improved symptoms.

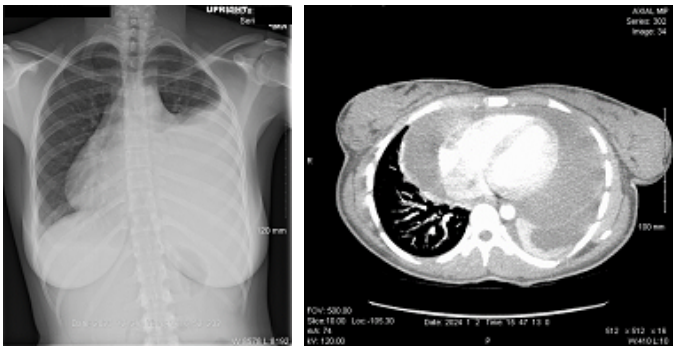

Figure: Chest x ray (left) and CT scan (right) showing grossly enlarged cardiac silhouette and left sided pleural effusion.

Discussion: Only a handful of cases of concurrent pleural and pericardial effusion in SLE patients have been reported in the literature, with only one other case being of initial presentation. Given the unlikely initial presentation of pulmonary and cardiac findings early in the disease, this case highlights the variable presentation of SLE. A high index of suspicion must be maintained to make a timely diagnosis.

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Development of a Novel Electrical Stimulation Apparatus Using PEDOT for Enhanced Biomedical Applications

Mitchell Kenter, Adil Akkouch
Department of Orthopaedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Electrical stimulation is a promising strategy for modulating cellular behavior and promoting tissue regeneration. To investigate these processes in vitro, and to harness electric field stimulation as a biophysical environmental cue for cells, an electric field stimulation system is necessary. This study introduces a novel stimulation apparatus incorporating poly(3,4-ethylenedioxythiophene) (PEDOT) as a substrate. PEDOT is known for its superior conductivity, biocompatibility, and electrochemical properties. We hypothesize that our electrical stimulation apparatus will validate the potential of PEDOT to be used in future electrical stimulation studies.

Methods: The stimulation apparatus was designed using FreeCAD 3D modeling software and fabricated via stereolithography with the Anycube Photon 3D printer. PEDOT nanocomposites were synthesized through oxidative polymerization of 3,4-Etylenedioxythiophene (EDOT) in the presence of ferric chloride ($FeCl_3$). PEDOT nanocomposites were combined with Polycaprolactone (PCL) and 3D printed into a circular scaffold tailored to fit the apparatus. Gold electrodes were then attached to the outer cylinders of the top part of the apparatus, and a closed loop was achieved by attaching electrical wires to a Keithley multimeter and a BK precision waveform generator. The electrical stimulation was applied using the waveform generator and the output of electrical stimulation between the 2 electrodes was measured using an automatic multimeter, see figure.

Results: We successfully designed and fabricated a novel electrical stimulation device utilizing PEDOT as a substrate. Validation of the electrical stimulation system was achieved by confirming the applied voltage from the waveform generator to the multimeter without interference.

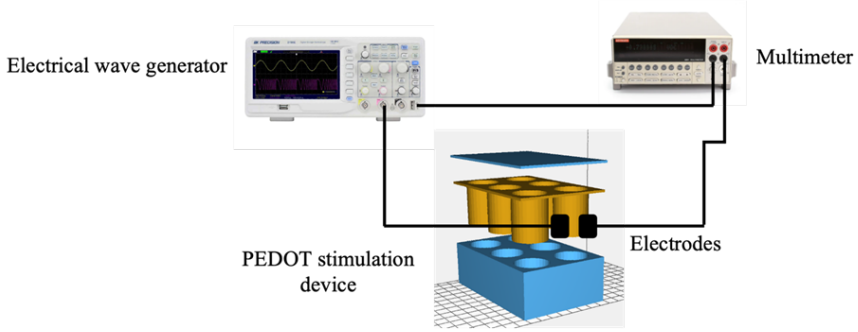

Figure: Electrical stimulation apparatus schematic highlighting the different parts of the design.

Conclusion: Our electrical stimulation apparatus holds significant clinical potential for advancing electrical stimulation techniques in various medical applications such as bone, nerve, and skin regeneration, as well as cancer therapy. This modular device will help us understand the mechanisms by which electrical stimulation enhances cell behaviors. Harnessing PEDOT-based electrical stimulation systems may enhance therapies in tissue engineering and regenerative medicine, ultimately benefiting patients by promoting tissue repair.

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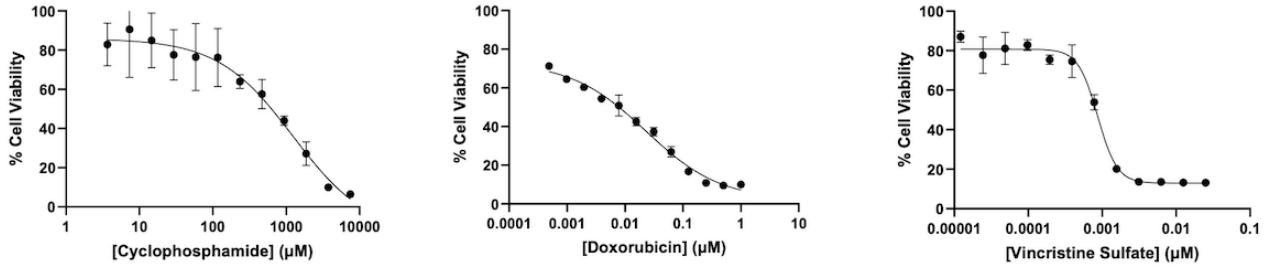
Novel Antineoplastics for the Treatment of Follicular Lymphoma

Sasank Sakhamuri, Lauren Herschelman, Ali Vural
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Follicular lymphoma is the second most common form of Non-Hodgkin's lymphoma in the United States. As many patients are diagnosed late in disease course with widespread involvement to multiple lymph nodes and organs, ongoing research focuses on finding drugs with fewer side effects and minimal long-term risk. Thymoquinone is a natural compound derived from *Nigella sativa* (fennel flower) that has demonstrated strong apoptotic effects against lymphoma models in culture as well as *in vivo*. However, thymoquinone's poor solubility and low bioavailability hinders its use as a chemotherapeutic. In this study we aimed to circumvent this difficulty by utilizing a novel nano-encapsulation technique to improve bioavailability and overall efficacy of the drug. IC50's of nano-encapsulated thymoquinone, standard therapy chemotherapeutics, and parent thymoquinone were determined in WSU-FSCCL and WSU-DLCL2 lymphoma cell lines to compare the efficacy of nano-encapsulation.

Methods: Cancer cells (10,000/well) were seeded three replicates per arm in 50uL of complete media. 12-point 1:2 serial dilutions were then performed per arm and 50uL of diluted drug was transferred for a total working volume of 100uL. Cellular proliferation and viability were determined 72 hours later using a CyQuant™MTT cell proliferation assay kit (Invitrogen™, cat# V13154) and read using SpectraMax plate reader.

Results: Preliminary data generated characterizes IC50s for three standard chemotherapeutics and initial testing of Thymoquinone formulations. Figure 1 includes the completed IC50 characterization for standard chemotherapeutics for the FSCCL line. While our previous experiments have suggested that nano-encapsulated thymoquinone demonstrate stronger therapeutic effects compared to parent thymoquinone, the strong pigments of the natural compounds have interfered with the accuracy of the assay which we hope to solve.



Conclusion/Clinical significance: With the long-term disease course for patients with follicular lymphoma, exploration of therapeutics with fewer side effects and safe long-term use has been increasing. Our preliminary assay results suggest this assay will allow us to characterize the anti-proliferative effects of nano-encapsulated thymoquinone on lymphoma cells lines compared to parent thymoquinone, ultimately addressing the bioavailability obstacle which currently hinders the use of thymoquinone as a cancer therapy.

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Effectiveness of the “One Good Thing” Gratitude Journaling Intervention for Burnout in Third-Year Medical Students: A pilot study

Shivani Reddy, Christopher Haymaker, Cynthia Bane, Theresa McGoff, Sarah Gerger, Steven Kienle
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Background: Many medical trainees experience burnout (characterized by feelings of emotional exhaustion, cynicism, and detachment from patients and work) because of work-related stress. Despite extensive research on burnout among medical students, effective interventions are lacking. Positive psychology practices like the “Three Good Things” gratitude journaling offer a low-cost, individual-level solution and have been shown to significantly improve burnout, happiness, and gratitude, specifically in health care practitioners and residents.

Objective: This pilot study was designed to assess burnout in third-year medical students and determine the effects of a brief online gratitude journaling practice on students' burnout, gratitude, and life satisfaction.

Methods: Students from the Class of 2024 who were actively participating in clinical work were recruited during rotation 4 of their third year of medical school. Participants filled out a short REDCap form before the start of and at the end of the rotation; this form included three standardized surveys: Copenhagen Burnout Inventory (CBI), Gratitude Questionnaire (GQ-6), and Satisfaction with Life Questionnaire. Additionally, intervention participants completed two additional questions included on the pre-established mandatory Daily Preceptor Reporting Form on Elentra. Question 1 asked students to reflect on "one good thing" that happened that day and Question 2 asked them to identify the positive emotion(s) evoked by that "one good thing" from a list of pre-specified emotions.

Results: Fifteen participants were recruited. On average, they completed 28 days of journaling. No significant difference was noted between median pre-clerkship and post-clerkship CBI scores (primary outcome). However, as for secondary outcomes, life satisfaction scores significantly increased post-clerkship, while gratitude scores showed no significant difference. Interestingly, there was no observable ‘dose effect’ of gratitude journaling.

Conclusions: The results demonstrate the feasibility of implementing a web-based ‘one good thing’ journaling intervention for medical school students. Further iterations of this study with more participants are needed to assess the efficacy with greater power.

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Infection Risk in the Setting of Whole Blood Trauma Resuscitation: An added benefit?

Desmond Zeng[1], Victoria Addis[1], Sheri VandenBerg[2], Tjasa Hranjec[2], Robert Sawyer[1]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Bronson Methodist Hospital, Kalamazoo, MI

Introduction: Use of whole blood has become relatively common in trauma-related damage-control resuscitations, with an associated increase in survival. Since component resuscitation has been implicated as a risk factor for infection via an immunosuppressive effect, we hypothesized that infection rates would increase in patients receiving whole blood transfusion.

Methods: A retrospective review of all adult trauma patients who received blood transfusions during initial resuscitation at a single community hospital over a two-year period was performed. Patients were stratified into 3 groups based on the type of transfusion received: whole blood only (WB), component transfusion only (RBC), or a combination of both (WB+RBC). Demographic and infection data were collected prospectively and analyzed retrospectively using univariate analysis accounting for multiple comparisons. Risk factors for infection and in-hospital mortality were evaluated using multivariate analysis.

Results: A total of 277 patients were analyzed; most were male (70.8%) with mean age 50.9 ± 1.3 years old. Fifty-eight (20.9%) patients had one or more infection, lowest was noted in the WB group (13%). Patients in the WB+RBC group were more severely injured, more likely to require mechanical ventilation, had lower GCS score, and increased mortality. When adjusted for age, gender, presence of infection and type of injury, transfusion with WB resulted in 92% decreased risk of mortality compared to component transfusion.

The most important predictors of infection were injury severity, head trauma and the type of transfusion. When adjusted for risk factors, WB did not carry a statistically significant protective effect. Patients in the WB+RBC group had 2.6 times increased risk of infection, but this may be related to their injury severity.

Conclusions: Whole blood transfusion for trauma patients during initial resuscitation was associated with significant decrease in hospital mortality compared to component transfusion. Reduction in infection following WB transfusion was not statistically significant, likely due to the sample size. Whether this phenomenon is related to better resuscitation with whole blood or immunological changes is yet to be determined.

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The Impact of Family Interviews on Fetal Infant Mortality Recommendations

Vaishali Patil, Fernando Ospina, Ruth Butters, Nia Evans, Cynthia Bane, Catherine Kothari
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Fetal Infant Mortality Reviews (FIMR) serve a core public health function of surveillance, quality improvement, policy development, and community education and mobilization. FIMR teams conduct root cause analyses to identify proximal and distal determinants, examining socioeconomic exposures and biomedical outcomes. Family interviews prioritize family voice/input and provide contextual information not available in administrative records. The current study examined possible differences between cases with and without family interviews in case review findings and recommendations.

Methods: This study used a mixed-methods convergent design; combining secondary analysis of administrative records from the 158 stillbirth and infant deaths reviewed by Kalamazoo County FIMR between 2015-2023 and a prospective open-ended survey from 14 FIMR team members in 2023. Multivariate analyses were done using Generalized Estimating Equation with two-sided alpha <.05 (SPSSv.29). WMed IRB deemed this study exempt.

Results: Thirty-four percent(n=53) of the 158 cases reviewed included a family-interview, 66% (n=69) were lost to contact, and 34% (n=36) declined an interview. Case reviews with family interviews were 6.8 times as likely to document one or more medical stressors than case reviews without interviews (CI 1.6-28.9, p=.01) and generated more recommendations for provider communication (average 1.4 versus 0.8, p=.01), person-centered decision-making (average 0.5 versus 0.3, p=.02), and bereavement resources (average 0.6 versus 0.1, p=.007). The majority of FIMR members (71%, 10 of 14) reported that family-interviews were critical to identifying gaps within systems of care and producing effective recommendations.

Conclusion: Family interviews have irreplaceable value for identifying the layered circumstances underlying infant-fetal deaths, generating prevention recommendations to close gaps that are frequently invisible to providers, and identifying factors not captured in medical records. Resourcing FIMR programs to promote family interviews holds promise for empowering families and communities suffering infant loss, improving health system functionality, stimulating effective systems change and improving health equity. Adapting the family interview for other morbidity and mortality reviews could extend this benefit.

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Accuracy and Readability of AI Generated Patient Education Content on Rhinosinusitis

Adithya Reddy, Luke Shultz, Corbin Sullivan
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Chronic rhinosinusitis (CRS) is a common condition which requires regular adherence by patients (often utilizing daily nasal saline irrigation or corticosteroids) to control symptoms. This high level of patient involvement means that accurate and accessible education for patients is of particular importance. Many patients turn to online sources for education materials. Interestingly, the artificial intelligence (AI) chatbot, Chat GPT, is an emerging source of information, though its validity has not been established. Despite the questioned validity of the AI generated responses, the on-demand and specificity of AI generated information makes this an appealing resource. There remain concerns that Chat GPT may be unable to sufficiently simplify complex medical information to the 6th grade reading level, as is recommended for patient education content. As a language-based AI, requests such as “repeat that but in simpler terms” may offer solutions to the readability problem. To our knowledge, there have been no studies evaluating prompted simplification of AI responses.

Methods: Common points of emphasis from reputable CRS patient education sources were identified. GPT 3.5 was asked to explain these concepts. Accuracy was assessed by cross-referencing AI responses with published content. Readability was assessed using Flesch-Kincaid grade level. The chatbot was then asked to simplify its responses, and analysis was repeated.

Results: On preliminary analysis, most GPT responses were deemed completely correct (75%), most others being mostly correct (20%) a small number (5%) being mostly incorrect, with no irrelevant answers. Mean Flesch-Kincaid grade level of initial GPT responses (13.5 ± 2.2) was higher ($p=.01550$) than reputable source content (11.3 ± 2.8). However, the mean grade level of simplified GPT responses (8.2 ± 2.0) was lower ($p=0.00019$) than those of reputable sources.

Conclusion/Clinical significance: Initial results suggest that AI is capable of producing semi-reliable patient education information, though errors remain fairly common. The strength of GPT in patient education appears to be its flexibility and ability to simplify content. This study suggests that prompted simplification of AI answers produces content that is closer to the recommended 6th grade reading level than content published by reputable sources.

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Low-Density Lipoprotein Particles Inhibit the Osteogenic Potential of Human Osteoblasts Through miR-3145

Abraham Konjoh[1], Hong Phan[2], Mitchell Kenter[3], Drew Frase[2], James Springstead[4], Adil Akkouch[3]
[1]Undergraduate student, Kalamazoo College, Kalamazoo, MI. [2]Medical student, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [3]Department of Orthopaedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [4]Chemical and Paper Engineering Department, Western Michigan University, Kalamazoo, MI

Introduction: Oxidized low-density lipoprotein particles (OxLDL) tend to increase with age. Previous studies have shown that increasing LDL levels are negatively associated with bone marrow density which is correlated with increasing age-related bone loss through the production of proinflammatory cytokines that inhibit signaling pathways important for bone metabolism and remodeling. We hypothesize that oxidized LDL-particles may play a role in the reduction of the osteogenic potential of osteoblasts via microRNA (miRNAs) modulation. miRNAs are small non-coding RNA molecules that play crucial regulatory roles in gene expression by binding to complementary sequences in the messenger RNA, leading to translational repression or mRNA degradation. MiRNAs are involved in various biological processes, including development, differentiation, apoptosis, and metabolism. They act as key regulators of gene expression networks and can influence the activity of multiple genes simultaneously, making them important players in the fine-tuning of cellular functions. Our study aims to demonstrate the role of miR-3145 in the osteogenic differentiation of osteoblasts when exposed to OxLDL.

Methods: LDL was oxidized using the Fenton Reaction. Saos-2 human osteosarcoma cells were cultured with increased concentrations of OxLDL for up to 21 days. Expression of osteogenic (Osteocalcin, ALP and RUNX-2) markers and miR-3145 was conducted via qRT-PCR. Cells were transfected with miR-3145 mimics and inhibitor using HiPerfect transfection reagent (Qiagen). Cytotoxicity and proliferation were performed using lactate dehydrogenase, live/dead staining and AlamarBlue assay. Transfection was monitored using fluorescent microscopy. Alizarin red staining was performed to visualize calcium deposition.

Results: OxLDL-treated osteoblasts show a decrease in osteogenic markers (ALP and osteocalcin). OxLDL particles treatment increased miR-3145 expression. Bioinformatic analysis showed that miR-3145 is a target of BMP-2 and osteomodulin which have been shown to enhance osteogenic differentiation.

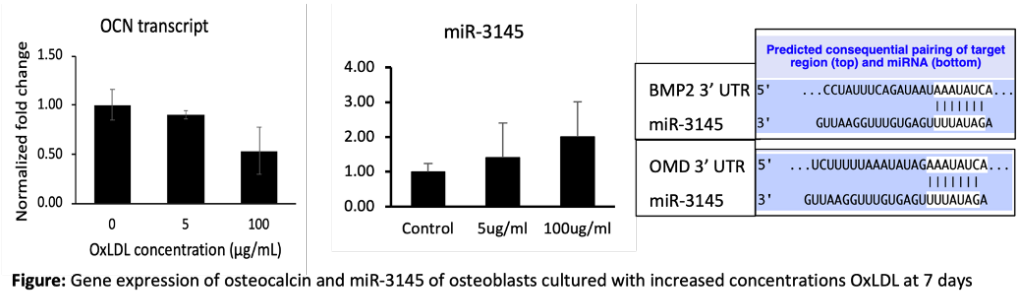

Figure: Gene expression of osteocalcin and miR-3145 of osteoblasts cultured with increased concentrations OxLDL at 7 days using RT-qPCR. Bioinformatic predictions of BMP2 and osteomodulin (OMD) targeted by miR-3145.

Conclusion/Clinical significance: We have determined the anti-osteogenic effect of OxLDL particles on human osteoblasts through miR-3145. We propose a novel mechanism provided by OxLDL particles in osteoporosis through miRNA modulation.

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Modulation of the Osteogenic Potential of Osteoblasts Using Substance P

Noah Chukwuma[1], Mitchell Kenter[2], Adil Akkouch[2]
[1]Undergraduate student, Kalamazoo College, Kalamazoo, MI. [3]Department of Orthopaedic Surgery, Division of Medical Engineering, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI.

Introduction: Substance P is a chain of 11 amino acids that form a neuropeptide responsible for the regulation of many bodily functions. These functions include but are not limited to stress response, collagen synthesis, anti-inflammatory responses, and regulatory responses. Substance P is an important regulatory neuropeptide since it binds to the neurokinin-1 receptor which is located in the spinal, and both in the nervous and immune systems. Substance P can enhance osteoblast activity, promote angiogenesis, and modulate immune responses, thereby facilitating the bone healing process. Additionally, substance P may contribute to pain modulation during bone repair, potentially influencing patient comfort and recovery outcomes. Our study aims to demonstrate the involvement of microRNAs in the modulation of osteogenesis by substance P.

Methods: SAOS-2 cells cultured in an osteogenic medium were treated under varied concentrations of substance P: 0, 10^{-10}, 10^{-8}, and 10^{-6} micromolar. Cell proliferation was tracked using AlamarBlue essay. Alkaline Phosphatase Activity (ALP) was monitored utilizing an ALP Assay. Bone nodules formation was determined from Alizarin Red Staining, while qPCR testing monitored osteogenic markers and microRNAs gene expression.

Results: It was determined that SP has no effect on osteoblasts proliferation. SP at lower doses such as 10^{-10} and 10^{-8} micromolar enhance the gene expression of osteogenic markers osteocalcin and RUNX2 at short stimulation period (7 days) whereas higher doses act as an inhibitor.

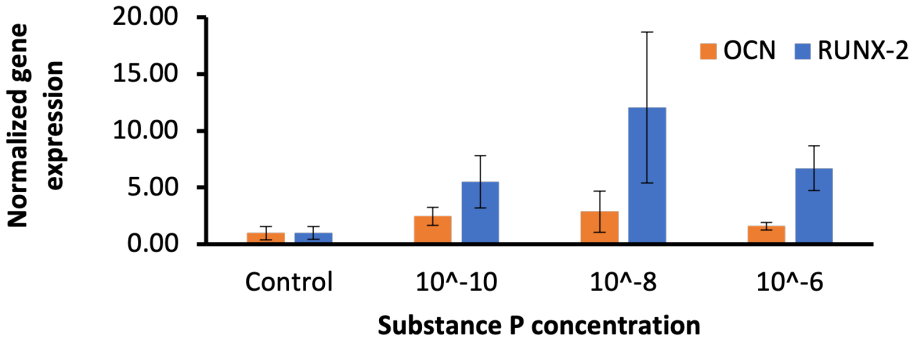

Figure: Osteocalcin and RUNX-2 expression in osteoblasts treated with increased concentrations of substance P at 7 days using RT-qPCR.

Conclusion/Clinical significance: Both SP concentrations and treatment period will affect the bone formation by osteoblasts. When using substance P, it is necessary to determine the effective treatment regimen and the delivery method for safer and successful application in bone regeneration and healing. Novel discovered microRNAs can open new avenues to apply microRNA-based gene therapy in clinical settings.

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The Role of Programmed Death Receptor-1 Inhibitors in the Surgical Management of Advanced Cutaneous Squamous Cell Carcinoma

Clayton Wyland, Laurence McCahill
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Cutaneous squamous cell carcinoma (cSCC) can present as a locally advanced disease in challenging anatomic locations, making standard surgical resection difficult. Recent evidence from Gross et al. published in the NEJM has shown neoadjuvant programmed cell death receptor-1 (PD-1) targeting therapy cemiplimab to be effective for invasive cSCC. We present two cases involving the neoadjuvant treatment of cSCC with PD-1 inhibitors. Each of these individuals was referred to the clinic for treatment of recurrent disease requiring surgical management.

Case Descriptions: A 65-year-old male with biopsy-proven cSCC presented with a complaint of a rapidly enlarging lesion to his right zygomatic region. PET-CT revealed a 2cm lesion with markedly avid activity in the right zygomatic region in addition to mild/moderate cervical activity, suspicious for locoregional metastasis. Surgical options such as excision of the facial lesion with rotational cutaneous flap or grafting were discussed, and the patient expressed intent to limit the extent of surgical resection. The patient underwent four cycles of cemiplimab followed by wide local excision with primary closure, which was readily achieved. The pathological report demonstrated no residual disease.

An 81-year-old male with a known history of biopsy-proven cSCC of the right chest wall presented with an enlarged right axillary node with workup consistent with metastatic cSCC. The patient was referred for axillary dissection, but upon arrival, the patient's lesion had progressed with eruption through the cutaneous surface. It was felt unlikely to achieve good local control with surgery alone, and options of initial radiation or neoadjuvant anti-PD-1 therapy were considered. The patient underwent four cycles of pembrolizumab with nearly a complete resolution of cutaneous involvement. Right axillary lymphadenectomy with excision of the overlying scar revealed a complete pathologic response.

Discussion: Surgeons are often called to manage complex cases of cSCC that have failed prior treatment modalities. Many patients favor limiting surgical resection or avoidance of radiation therapy. Neoadjuvant anti-PD-1 therapy may provide an avenue for decreased morbidity and improved patient outcomes in those with locally advanced cSCC.

Reference: Gross, et al (2022). Neoadjuvant Cemiplimab for Stage 2-4 Cutaneous Squamous-Cell Carcinoma. *The New England journal of medicine,* https://doi.org/10.1056/NEJMoa2209813

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Examining Common Pathogens of Post-Operative Intra-Abdominal Infections

William Wames[1], Robert Sawyer[1], Tjasa Hranjec[2]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Bronson Methodist Hospital, Kalamazoo, MI

Introduction: Post-operative intra-abdominal infection (IAI) is a commonly found pathology amongst patients in surgical critical care units. These infections lead to prolonged hospital and critical care stays, increased cost, and very often secondary interventions ranging from percutaneous drain placement to multiple operative interventions. Consensus has been to treat susceptible patients with empiric antibiotics to cover the most common enteric bacteria as well as MRSA. While this practice has been beneficial, we hypothesized that this regimen may be creating an environment in which previously uncommon pathogens were making up the majority of the microbiome, contributing to ineffective treatment and therefore increased morbidity & mortality.

Methods: Data were compiled from 1997 thru 2023 from surgical critical care patients treated for culture positive post-operative intra-abdominal infection with primary diagnoses running the gamut of general, transplant, and trauma surgery. Patient data was compiled including basic demographics, comorbidities, antibiotic treatment, and pathogens identified. Data was then examined to find the most common pathogens and determine if the “standard” empiric antibiotics covered such pathogens.

Results: Among the 934 IAIs identified, the vast majority were secondary to residual contamination (n=516) with anastomotic leak (n=283), & new perforation (n=135) making up the remainder. The most common single pathogens found on culture were Candida species (n=403) with C albicans (n=231) being the single most common subspecies across all identified. Enterococcus species (n=344) were the second most likely identified with E faecium VRE the most common subspecies (n=150). Common enteric pathogens E coli (n= 151), Klebsiella (n=85), & Bacteroides (n=67) were found to make up far less of the bacterial burden than predicted by previous data.

Conclusion: Intra-abdominal infections are commonly polymicrobial necessitating a broad empiric regimen however our data would suggest that current practice leaves a vacuum for Candida and Enterococcus species to propagate. It is unclear at this time what the clinical significance of these results are regarding patient morbidity. Further study to examine clinical outcomes will need to be undertaken, however data would suggest that early broadening of antimicrobial coverage to include an appropriate anti-fungal and enterococcal regimen should be considered in these patients.

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Mpox Myocardial Injury

Erik Krueger, Philip Pazderka, Mariah Smith, John Shinners, Mark Miller
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Cardiac concerns with concurrent viral infections may cause unusual disease processes.

Case presentation: This case represents an occurrence of chest pain in the setting of monkeypox. In this case we describe an otherwise healthy male in his early thirties with EKG changes and significant troponin elevations.

Discussion: There are multiple proposed causes of this cardiac damage including monkeypox infection, vaccine adverse event and Tecovirimat adverse reaction.

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The Role of c-di-GMP Specific Phosphodiesterase's (PDEs) in Regulating *Shigella flexneri* Phenotypes

Candice Churaman, Benjamin Koestler
Western Michigan University, Kalamazoo, MI

Introduction: Shigella causes bacillary dysentery, known as Shigellosis. Shigellosis is characterized by fever, abdominal cramps and diarrhea. Shigellosis affects an estimated 80-165 million persons yearly. Currently, there are no vaccine for shigellosis. Antibiotics are effective; however, Shigella's advancing antibiotic resistances makes treatment challenging. Shigella's success is owed to its low infectious dose and ability to invade epithelial cells.

Shigella uses the second messenger c-di-GMP to regulate various bacterial phenotypes including virulence and biofilm. C-di-GMP homeostasis within a bacterial cell is maintained by two classes of enzymes: diguanylate cyclases (DGC) which synthesize c-di-GMP and specific phosphodiesterases (PDE) which hydrolyze c-di-GMP.

Shigella encodes 4 putative DGCs, and 6 putative PDEs. These enzymes contain sensory domains which interacts with environmental cues, and in turn dictates their activities. Deletion of Shigella DGC's results in decreased invasion, plaque size, biofilm, and increased resistance to acid shock. However, we do not know how c-di-GMP specific PDE's regulate these phenotypes.

Methods: The objective of my research is to determine how PDEs regulate some of Shigella's phenotypes. I created Shigella knockouts of the 6 PDEs to characterize their impact on Shigella's behavior. I have found that Shigella's PDE knockout strains formed larger plaques, had greater invasion frequency in Henle-407 cells, increased biofilm formation and decreased resistance to acid shock. I have also noted that some PDEs contribute in controlling the global c-di-GMP pool while other PDEs are possibly operating at a local signaling level.

Results: Shigella PDE mutants behave diametrically opposite to DGC mutants. Here we demonstrate how varying c-di-GMP levels in bacterial signaling can impact phenotypic expression.

Conclusion: This study will provide a greater understanding of Shigella's ability to overcome environmental hurdles through regulating their c-di-GMP levels, which in-turn enables it to cause its grave disease.

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Overexpression of *unc-82* Serine/Threonine Kinase Causes Wasting and Abnormal Body and Muscle Cell Morphology in *C. elegans*

Jacob Mastenbrook, Pamela Hoppe
Department of biological sciences, Western Michigan University, Kalamazoo, MI

Introduction: Kinase phosphorylation is a ubiquitous signaling mechanism used in numerous cellular processes, including apoptosis, metabolism, and cell growth. Comprised of over 530 protein kinases, the human kinome and kinase interactions have become a major focus of biological and biochemical studies.1 Genetic manipulation of protein-coding kinase genes and screening for phenotypes in live animals and cells is a powerful technique to uncover kinase interactors. *unc-82* is a serine/threonine kinse homologous to human NUAK1/2 and has been shown to be a key regulator in muscle development. In *C. elegans, unc-82 (0)* mutants are viable and hit normal developmental checkpoints. In contrast, SNARK/NUAK null mutations are embryonic lethal in mice, C2C12 cultured muscle cells, and fruit flies. The goal of this study was: 1) To determine if overexpression of transgenic *unc-82* causes wasting and abnormal body morphology; 2) To determine key signaling interactors of *unc-82* that possibly drive the wasting phenotype.

Results: Our results show that wasting worms have increased exogenous UNC-82 and decreased endogenous UNC-82 protein levels. Additionally, transgenic animals containing different *unc-82* constructs exhibit both decreased body size and myocyte size.

Conclusion: These data support our hypothesis that *unc-82* independently regulates thick filament assembly and pro-lifespan pathways. The future goals of this study include identifying candidate gene expression changes driven through RNA sequencing and how manipulation of these candidate genes affects the wasting phenotype.

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Analyzing Student Response to Peer Led Content Review Through CRAM in the Pre-Clinical Curriculum

Emily Hinners, Caroline Hall, Autumn Fritz, Dhruthi Reddy, Morgan Helmich, Scott Garber, Chidambaram Nachiappan, Ryan Wakley, Carlie Weaver, Alice Wei, Sara Allison
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Undergraduate medical education is often a stressful, difficult transition and has been shown to impact feelings of burnout and hinder academic performance[1]. Previous studies have shown that peer-assisted learning can improve knowledge of material taught in medical school while enhancing student well-being[2]. This study aims to determine if implementation of peer-led review sessions alters first-year medical student success and assess student perceptions of the incorporation of peer-led review.

Methods: During the Musculoskeletal System (MSK) course, students created practice questions and review material for each learning event in the corresponding week. These materials were presented at peer-led sessions to fellow students as a method of reviewing concepts for the summative exam. Following the MSK course, class averages for the summative exam were obtained from the classes of 2025, 2026, and 2027 for comparison. Additionally, averages from the Hematology and Oncology (HEM) were obtained from the same classes to be used as a control. To gain insight into student perceptions of the peer-led content review, student feedback was collected via a post-course survey using Redcap.

Results: Upon initial data collection (Table 1), the inclusion of peer-led content review did not appear to positively alter success on summative exams. There is no significant difference between student score averages on either the HEM or MSK summative exams. Continued statistical analysis and subjective data collection is ongoing.

Table 1: GC, Graduating Class; HEM, Heme/Onc; MSK, Musculoskeletal

	HEM	MSK
GC2025	81.9 ± 7.0	86.1 ± 7.3
GC2026	81.2 ± 8.2	84.6 ± 7.6
GC2027	82.3 ± 8.3	83.0 ± 8.3

Conclusions: Completion of this study will mark the first time that perceptions and utility of CRAM have been studied at WMed.

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Missed Abdominal Aortic Aneurism Screenings in Western Michigan University Homer Stryker M.D. School of Medicine Family Medicine Practice, a Quality Improvement Project

Natan Harel
Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI

Introduction: Abdominal aortic aneurism (AAA) rupture is the 16th leading cause of death for adults over age 65 in the United States.[1] It carries a 30 day fatality rate of 35-40% following rupture and emergency surgical repair. One-time screening with ultrasound reduces AAA-related mortality and AAA rupture in men 65 years and older. AAA screening is also associated with increased elective AAA operations and decreased emergency operations.[2]

This Quality improvement (QI) project's purpose is to increase Natan Harel, D.O.'s ordering rate for AAA screening from baseline of 55% to >95% by December 30, 2023 (in patients seen at Western Michigan School of Medicine's Family Medicine Crosstown Parkway and Street Medicine clinics).

Methods: Standard QI methodology was implemented, including problems statement, root cause analysis, aim statement, and design of Plan-Do-Study-Act (PDSA) cycles.
PDSA cycles were implemented from November to December 2023.
PDSA cycle #1 utilized "dotphrase" for well-man exams, prompting orders for AAA screening.

Results: Over the course of the first PDSA cycle, ordering rates for AAA screening increased from 55% (27/48) to 100% (6/6).

Discussion: "Dotphrase" implementation increased ordering of AAA screening to goal rate >95%.
Future QI efforts are needed to address whether patients receive previously ordered AAA screenings. Such efforts may identify and reduce barriers, and inform whether point-of-care-ultrasound (POCUS) access improves screening rates in these patient populations.
Obtaining accurate tobacco use history is important to direct AAA screening efforts, and provides opportunity to support tobacco cessation.

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Rare Manifestation of Large B-Cell Lymphoma on Cheek: A clinical picture

Rami Madani[1], Talal Al-Assil[1], Steven Stone[2,1], Mohammad Omaira[2,1]
[1]Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, MI. [2]Bronson Cancer Center, Kalamazoo, MI

Introduction: Large B-Cell Lymphoma (LBCL), constituting approximately 25-30% of all non-Hodgkin lymphomas, predominantly manifests through enlarging masses or lymphadenopathy in nodal or extranodal locations. Typically, LBCL cases are notably responsive to a treatment regimen known as R-CHOP, which includes six cycles of rituximab, cyclophosphamide, doxorubicin, vincristine, and prednisone.

Case presentation: We present a distinctive case involving a Caucasian female in her early 80s, afflicted with a large, ulcerated soft tissue lesion on both the superior and inferior regions of her right cheek. Histopathological analysis revealed a dense infiltrate of poorly differentiated basaloid cells within the dermis. Immunohistochemical staining yielded positive results for LCA, CD20, CD3, and negative for S-100, Melan-A, pankeratin, HMW keratin, CD68, CD10, CD30, synaptophysin, and chromogranin. Additionally, PET scan revealed no abnormal FDG uptake to suggest concern for metastasis affirming a diagnosis of Stage IAU large B-cell lymphoma. Her medical history was notable for a benign meningioma, chronic kidney disease, peripheral neuropathy, and a past episode of herpes zoster. Following diagnosis, she underwent three cycles of chemotherapy with the R-CHOP regimen, concluding four months post-diagnosis, and subsequently received involved-field radiation therapy to a total of 30 Gy across 15 fractions, completed two months thereafter.

Discussion: This case underscores a rare presentation of non-Hodgkin lymphoma as an ulcerated soft tissue lesion on the cheek, delineating a subtype of primary cutaneous large B-cell lymphoma. This subtype, not yet comprehensively documented in literature or the latest WHO - European Organization for Research and Treatment of Cancer (EORTC) classification of 2018, demonstrates a potentially less aggressive behavior compared to its leg type counterpart and shows a favorable response to a reduced R-CHOP treatment regimen. The patient's follow-up care, conducted biannually, has revealed no signs of tumor recurrence, and her cheek healed remarkably well, highlighting the efficacy of the treatment strategy and the patient's resilience. This account adds valuable insight into the spectrum of LBCL manifestations and treatment responses, contributing to the evolving understanding of this complex disease.

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