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The complete program including abstracts is available on the
Western Michigan University Homer Stryker M.D. School of Medicine website:
http://www.med.wmich.edu/research/research-activities/research-day.

WIFI Information:
| WIFI Username/Network: WMUGuest |
| WIFI Password: manualarts1921 (all lowercase) |

CME CREDIT

The CME Activity Code is available on screen at the Check-in table and on the screens in the ballroom.

Western Michigan University Homer Stryker M.D. School of Medicine is accredited by the Accreditation Council
for Continuing Medical Education (ACCME) to provide continuing medical education for physicians.

Western Michigan University Homer Stryker M.D. School of Medicine designates this live activity for a maximum
of 5.0 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of
their participation in the activity.

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for Continuing Medical Education (AACME). The Michigan Board of Nursing accepts continuing education credits
from the ACCME.

DISCLOSURES

Please see the handout offered at the registration table for a
listing of disclosure statements from today’s presenters.
INTRODUCTION

RESEARCH, EDUCATION AND SCHOLARSHIP

The commitment and participation of Western Michigan University Homer Stryker M.D. School of Medicine (WMed), its faculty, and the Kalamazoo scientific community in “Research Day” continues on this day marking a 36th anniversary milestone. One-hundred thirty-one abstracts were received and reviewed by a panel of 34 judges. One-hundred thirteen have been accepted for either oral or poster presentation.

Such success is due, of course to a large number of talented and dedicated people. We wish to acknowledge the participation of a group of faculty and thank them for volunteering their time and expertise to review the submissions. A panel of over 30 judges participated in the reviews. Each judge typically reviewed approximately 16 submissions, which were assigned based upon area of expertise. The judges’ evaluations were critical in determining the award winning presentations and posters, as well as those selected for presentation in the oral sessions.

In addition, it is my privilege to have worked with this year’s Research Day organizing committee. This committee worked diligently over an extended period of time to endeavor to bring you an exceptional learning and networking opportunity. Members of this year’s committee were: Leah Bader, BS; Bethany Banner; Laura Bauler, PhD; Craig Beam, PhD; Richard Brandt, BS; Heather Chen; Sandra Cochrane; Shanna Cole, PharmD; Ethan Cutler; Mireya Diaz, PhD; Laura Eller; Rex Hall; Maddie Harlan; Prentiss Jones, PhD; Keith Kenter, MD; Wendy Lackey-Cornelison, PhD; Samuel Lai; David Lee; Elizabeth Lorbeer, EdM; Benjamin Roush; David Spillers; Dale Vandre, PhD.

We hope this year’s Research Day will inspire you to pursue your own research and to, as well, support the basic, medical and healthcare research of our Southwestern Michigan Community colleagues. As you attend today’s activities, please be sure to stop by the various tables in the venue to learn about the many resources that have been created to support your research activities.

Craig Beam, PhD
Chair
2018 Research Day
We wish to thank the following WMed professionals who dedicated their time to participate as abstract scoring judges and/or session moderators for today’s event.

<table>
<thead>
<tr>
<th>Roger Apple, PhD</th>
<th>Myrtha Gregoire-Bottex, MD</th>
<th>Dale Rowe, MD</th>
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</thead>
<tbody>
<tr>
<td>Roua Azmeh, MD</td>
<td>Krishna Jain, MD</td>
<td>Carrie Sandborn, MD</td>
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<tr>
<td>Robert Baker, MD</td>
<td>Keith Kenter, MD</td>
<td>Robert Sawyer, MD</td>
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<td>Jayne Barr, MD</td>
<td>Richard Lammers, MD</td>
<td>Neelkamal Soares, MD</td>
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<tr>
<td>Laura Bauler, PhD</td>
<td>Silvia Linares, MD</td>
<td>Deb Taubel, MD</td>
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<tr>
<td>Tim Bauler, PhD</td>
<td>Mark Loehrke, MD</td>
<td>Timothy Trichler, MD</td>
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<tr>
<td>Karen Bovid, MD</td>
<td>Liz Lorbeer, EdM</td>
<td>Kristi VanDerKolk, MD</td>
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<tr>
<td>Mireya Diaz, PhD</td>
<td>Josh Mastenbrook, MD</td>
<td>Erica VanderKooy, MD</td>
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<tr>
<td>Martin Draznin, MD</td>
<td>Tracey Mersfelder, PharmD</td>
<td>Dale Vandré, PhD</td>
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<td>Glenn Dregansky, DO</td>
<td>Dilip Patel, MD</td>
<td>Perry Westerman, MD</td>
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<tr>
<td>Ransome Eke, PhD</td>
<td>Philip Pazderka, MD</td>
<td>Priscilla Woodhams, MD</td>
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</tbody>
</table>
WMU JOHN T. BERNHARD CENTER FLOOR PLANS

WEST SUITE 210
- Oral Presentation Session 1A & 2A

WEST SUITE 209
- Oral Presentation Session 1B & 2B

WEST SUITE 208
- Oral Presentation Session 1C & 2C

MARTIN LUTHER KING ROOM (204)
- Oral Presentation Session 1D & 2D

LOBBY
- Check-in
- Vendor Tables

EAST BALLROOM
- Poster Displays
- Keynote Speaker
- Innovation Center Presentation
- Oral Presentation Session 3
- Award Presentation
- Breakfast/ Lunch
SCHEDULE

8:00 – 8:30 am  
Check-in  
Refreshments available

2nd floor Lobby

8:30 – 9:45 am  
Oral Presentation Session 1  
Session 1A  
Session 1B  
Session 1C  
Session 1D

West Suite 210  
West Suite 209  
West Suite 208  
MLK Room

9:50 – 10:50 am  
Poster Presentations  
Vendor Display Tables

East Ballroom  
2nd Floor Lobby

11:00 am – 12:15 pm  
Oral Presentation Session 2  
Session 2A  
Session 2B  
Session 2C  
Session 2D

West Suite 210  
West Suite 209  
West Suite 208  
MLK Room

12:15 – 12:25 pm  
Break  
Restrooms, pick up lunch, find seat

12:30 – 1:40 pm  
Lunch / Keynote Speaker

East Ballroom

1:45 – 2:15 pm  
Innovation Center Presentation

East Ballroom

2:15– 3:45 pm  
Oral Presentation Session 3  
2:15-2:30 pm  Clinical Research  
2:30-2:45 pm  Quality Improvement Research  
2:45-3:00 pm  Educational Research  
3:00-3:15 pm  Community Research  
3:15-3:30 pm  Basic Science Research  
3:30-3:45 pm  Medical Humanities Research

East Ballroom

3:45- 4:00 pm  
Award Presentation

East Ballroom

4:00 pm  
Farewell

East Ballroom
KEYNOTE SPEAKER

The Dr. Robert P. Carter Research Lecture

This is the tenth year of this annual lecture supported by the Board of Western Michigan University Homer Stryker M.D. School of Medicine to celebrate the Research Day activities and to recognize Dr. Carter’s commitment and support of research.

James Cook, DVM, PhD, OTC, OTSC
William & Kathryn Allen Distinguished Professor in Orthopaedic Surgery
Director, Thompson Laboratory for Regenerative Orthopaedics, Orthopaedic Research Division & Mizzou BioJoint Center

presents

Biologic Joint Replacement – Does it really work?

After receiving his B.S. degree from Florida State University and competing for 5 years as a professional waterskier, Dr. James (Jimi) Cook completed his DVM in 1994 and PhD in 1998. In 1999, he founded the Comparative Orthopaedic Laboratory at the University of Missouri, a multi-disciplinary team of physicians, veterinarians, engineers, and basic scientists dedicated to translational orthopaedic research, which has now been endowed and moved into its own 12,000 sq ft facility as the Thompson Laboratory for Regenerative Orthopaedics. He has over 200 peer-reviewed publications, over $20 million in research funding, received numerous awards including America’s Best Veterinarian (2007), holds 16 patents and has seen 4 biomedical devices through FDA approval to human clinical trials.

He is currently Director of the Mizzou BioJoint Center, Director of The Thompson Laboratory for Regenerative Orthopaedics and the William and Kathryn Allen Distinguished Chair in Orthopaedic Surgery, and serves as Chief of the Division of Research for the Department of Orthopaedics at the University Hospital’s Missouri Orthopaedic Institute. He is also co-founder of Be The Change Volunteers ¬a NGO dedicated to building schools in remote villages in the developing world whose teams have built 39 educational facilities in 16 countries, providing educational opportunities to more than 6,700 students.
Oral Presentation
Breakout Sessions
### ORAL PRESENTATIONS

**SESSION 1A**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenters</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30-8:45 am</td>
<td>The Role of Structural and Interpersonal Discrimination in Birth Outcomes.</td>
<td>Catherine L. Kothari, PhD; Grace Lubwama, DPP; Terra Bautista, BS; Arthur James, MD; Alyssa Woodwyk, MS; Lisa Graves, MD</td>
</tr>
<tr>
<td>8:45-9:00 am</td>
<td>Differential Pathways to Infant Health, by Race and by Income.</td>
<td>Charlene Lin; Catherine L. Kothari, PhD; Terra Bautista, BS; Duncan Vos, MS; Lisa Graves, MD</td>
</tr>
<tr>
<td>9:00-9:15 am</td>
<td>Maternal Care Coordination and Program Triage.</td>
<td>Heather Rauch; Catherine L. Kothari, PhD; Richard Brandt, BS</td>
</tr>
<tr>
<td>9:15-9:30 am</td>
<td>Impact of Race on Postpartum Reproductive Health Choices.</td>
<td>Kathryn Jones; Laura Bauler, PhD; Kailin Kuo; Terra Bautista, BS; Catherine L. Kothari, PhD</td>
</tr>
<tr>
<td>9:30-9:45 am</td>
<td>Natural Language Processing as a Tool for Screening Depression in Postpartum Women Suffering from Intimate Partner Violence.</td>
<td>Duncan Vos, MS; Catherine L. Kothari, PhD; Joseph Costello, MS; Richard Brandt, BS; Angie Moe, PhD</td>
</tr>
</tbody>
</table>

**SESSION 1B**

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenters</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30-8:45 am</td>
<td>Incidence of Aortic Stenosis in Obese Patients: An Analysis Using the NIS Database.</td>
<td>Raphael M. Szymanski, MS; Duncan Vos, MS; Peter Hoeksema; Anish Chaudhary; Vishal Gupta, MD</td>
</tr>
<tr>
<td>8:45-9:00 am</td>
<td>Ten-Years Trend in Hospitalization Rates of Intra-Hepatic Cholangiocarcinoma in the United States.</td>
<td>Ransome Eke, MD PhD; Tooba Tariq, MD; Tong Li; Gitonga Munene, MD</td>
</tr>
<tr>
<td>9:00-9:15 am</td>
<td>National Trends in Surgery for Intraheptic Cholangiocarcinoma: 2004-2014.</td>
<td>Jesse Chou; Jairo Espinosa, MD; Ransome Eke, MD PhD; Gitonga Munene, MD</td>
</tr>
<tr>
<td>9:15-9:30 am</td>
<td>Opioid Consumption after Elective Shoulder Arthroscopy Surgery.</td>
<td>Alexander Connaughton, MD; John Livingstone; Rebecca Sigourney; Keith Kenter, MD; Matt Jaykel, MD</td>
</tr>
<tr>
<td>9:30-9:45 am</td>
<td>Factors Influencing Length of Hospital Stay and Hospital Charges in Patients with Inflammatory Bowel Disease: a Five-Year Population Based Study.</td>
<td>Ransome Eke, MD PhD; Tooba Tariq, MD; Tong Li; Jay Patel, MD; Keshav Patel, BS</td>
</tr>
</tbody>
</table>
## ORAL PRESENTATIONS (cont.)

### SESSION 1C

**Moderator:** Robert Baker, MD; Orthpaedic Surgery

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Presenters</th>
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<tbody>
<tr>
<td>8:30-8:45 am</td>
<td>A Stochastic Finite Element Method for Simulating Patient Specific Trabecular Bone</td>
<td>Saif Alrafeek, MS; James Jastifer, MD; Peter Gustafson, PhD</td>
</tr>
<tr>
<td>8:45-9:00 am</td>
<td>The Effect of Pitch Variation and Diameter Variation on Screw Pullout in 3D Printed Screws</td>
<td>Joshua Veenstra, MD; Peter Gustafson, PhD; Cody Bearden, MD; James Jastifer, MD</td>
</tr>
<tr>
<td>9:00-9:15 am</td>
<td>Mechanics of Progressive Failure of No. 2 FiberWire Suture</td>
<td>Arz Qwam Alden, MS; Andrew Geeslin, MD; Peter Gustafson, PhD</td>
</tr>
<tr>
<td>9:15-9:30 am</td>
<td>Injury Prevention Based on Computer Modeling of Cleat Traction</td>
<td>Justin Rittenhouse, BS; Peter Gustafson, PhD</td>
</tr>
<tr>
<td>9:30-9:45 am</td>
<td>Correlation of Pre-Operative Radiographic Analysis with Intra-Operative Competency of the Spring Ligament for Flat Foot Reconstruction</td>
<td>Justin Roberts, MD; Patrick Albright; Jacob Hall, BS; Matthew Pate, BS; Donald Bohay, MD; John Anderson, MD</td>
</tr>
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### SESSION 1D

**Moderator:** Kristi VanDerKolk, MD; Family and Community Medicine

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
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<tbody>
<tr>
<td>8:30-8:45 am</td>
<td>Fifteen-Month Anxiety and Depression Symptom Screenings of Caregivers and Patients with Cystic Fibrosis (CF).</td>
<td>Sheryl Lozowski-Sullivan, MPH PhD; Myrtha Gregoire-Bottex, MD; Andrea Caskey, LMSW</td>
</tr>
<tr>
<td>8:45-9:00 am</td>
<td>Improving the Retrieval Rate of Inferior Vena Cava Filters: Impact of Inferior Vena Cava Filter Retrieval in the Office Endovascular Center.</td>
<td>Nathan VanderVeen; Jeffrey Friedman; Mark Rummel, MD; Daniel Johnston, MD; Syed Alam, MD; John Munn, MD; Chris Longton, BSN; Krishna Jain, MD</td>
</tr>
<tr>
<td>9:00-9:15 am</td>
<td>Efficacy of Enhanced Recovery After Surgery in a Community Hospital Setting</td>
<td>Gulrez Mahmood, MD; Edward Itawi, MD</td>
</tr>
<tr>
<td>9:15-9:30 am</td>
<td>Emergency Department Utilization of CAT Scans in Embolism</td>
<td>Kathryn Redinger, MD; David Gibbons, DO; Mauli Shah, DO; Lovita Scrimshaw, DO; Daniel Scrimshaw, DO; Ramya Venigalla, DO; Nour Sinno, MD; Collin Sabatini, DO; Will Schaeffer, DO; Paul Cohen, MD; Aaron Rumburg, MD</td>
</tr>
<tr>
<td>9:30-9:45 am</td>
<td>Comparison of Pre-Hospital Survival of Manual and Mechanical CPR Using the LUCAS-2: a Retrospective Study.</td>
<td>Raphael M. Szymanski, MS; Kristina Le; Joshua Mastenbrook, MD; Tyler Vaughn, MD; Ron Slagell, EMT-P; Cheryl Dickson, MD</td>
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</table>
## ORAL PRESENTATIONS (cont.)

### SESSION 2A  
WEST SUITE 210

**Moderator:** Karen Bovid, MD; Orthopaedic Surgery

<table>
<thead>
<tr>
<th>Time</th>
<th>Presentation</th>
<th>Authors</th>
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<tbody>
<tr>
<td>11:00-11:15 am</td>
<td>Surgical Reconstruction Technique of Two Patients with Tarsal Type Preaxial Polydactyly: Two True Prehalluces.</td>
<td>Daniel Ferman; Karen Bovid, MD; Laura Bauler, PhD</td>
</tr>
<tr>
<td>11:15-11:30 am</td>
<td>Survival After a Severe Case of Metformin-Associated Lactic Acidosis.</td>
<td>Anita Shallal, MD; Matthew Kelly, MD; Michael Reaume, MD; William Nichols, DO</td>
</tr>
<tr>
<td>11:30-11:45 am</td>
<td>Death Due to Atypical Urinothorax Following Percutaneous Nephrolithotomy: Case Report and Review of Literature.</td>
<td>Ray-Young Tsao; Thomas Duong; Minhaj Khaja, MD; Joseph Prahlow, MD</td>
</tr>
<tr>
<td>11:45 am-12:00 pm</td>
<td>First Reported Delayed Repair of Paravalvular Leak Post Transcatheter Aortic Valve Replacement (TAVR).</td>
<td>Raphael M. Szymanski, MS; Christopher Rogers, DO; Alphonse DeLucia III, MD</td>
</tr>
<tr>
<td>12:00-12:15 pm</td>
<td>Proximal Biceps Tenodesis Incorporated into Rotator Cuff Repair.</td>
<td>Joshua Veenstra, MD; Andrew Geeslin, MD; Christopher Uggen, MD</td>
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### SESSION 2B  
WEST SUITE 209

**Moderator:** Joanne Baker, DO; Medicine

<table>
<thead>
<tr>
<th>Time</th>
<th>Presentation</th>
<th>Authors</th>
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<tbody>
<tr>
<td>11:00-11:15 am</td>
<td>Psychiatric Manifestations of Adult-Onset Still's Disease and Treatment Considerations.</td>
<td>Randall Kirk, DO; Anish Desai, MD</td>
</tr>
<tr>
<td>11:15-11:30 am</td>
<td>Improving Point-of-Care Ultrasound Proficiency of Primary Care Residents Through a Formal, Faculty-Led Training Course.</td>
<td>Michael Reaume, MD; Nicholas George, MD; Dagan Hammar; Thomas Melgar, MD</td>
</tr>
<tr>
<td>11:30-11:45 am</td>
<td>Analysis of Dosing Errors Made by Paramedics During Simulated Pediatric Patient Scenarios After Implementation of State-Wide Pediatric Drug Dosing Reference.</td>
<td>John Hoyle, MD; Glenn Ekblad, DO; Bill Fales, MD; Tracy Hover, BS; Richard Lammers, MD; Dena Smith, MS; Richard Brandt, BS; Alyssa Woodwyk, MS</td>
</tr>
<tr>
<td>11:45 am-12:00 pm</td>
<td>Creation of a Longitudinal Elective Training for Medical Students to Address Health Inequities: A Focus on Social Determinants of Health, Anti-Racism, and Implicit Bias.</td>
<td>Ryan D’Mello; Gina Bravata; Cheryl Dickson, MD MPH</td>
</tr>
<tr>
<td>12:00-12:15 pm</td>
<td>Developing a Residency Wellness Curriculum Utilizing Self-Care Plans.</td>
<td>Emily Cordes, DO; Joanne Baker, DO; Jayne Barr, MD</td>
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ORAL PRESENTATIONS (cont.)

SESSION 2C

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<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
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<tbody>
<tr>
<td>11:00-11:15 am</td>
<td>Olfactory Bulb Astroglial Response to Olfactory Organ Damage in Adult Zebrafish.</td>
<td>Jackson Scheib; Christine Byrd-Jacobs, PhD</td>
</tr>
<tr>
<td>11:15-11:30 am</td>
<td>A Stress-Enhanced Model for Discovery of Disease-Modifying Gene: Ece1-Suppresses the Toxicity of Alpha-Synuclein A30P.</td>
<td>Alex Chen; Tim Tully, PhD</td>
</tr>
<tr>
<td>11:30-11:45 am</td>
<td>Sequence and Structural Determinants of Polycystic Kidney Disease.</td>
<td>Monica Ellis; Emma Swayze; Aaron Zebolsky; Gregory Vanden Heuvel, PhD; Erik Larson, PhD</td>
</tr>
<tr>
<td>11:45 am-12:00 pm</td>
<td>Histologic Characterization of the Anterior Intermeniscal Ligament (AIML) in the Human Knee: Characteristic of a Potential New Cell Type.</td>
<td>Conner Ahlgren; Keith Kenter, MD</td>
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SESSION 2D

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<th>Time</th>
<th>Title</th>
<th>Authors</th>
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<tbody>
<tr>
<td>11:00-11:15 am</td>
<td>Emergence of Idiopathic Mast Cell Activation Syndrome Status Post Hysterectomy in a 44 y.o. Caucasian Woman.</td>
<td>Patricia Choi; Roua Azmeh, MD; Andrey Leonov, MD; Jesse Duranceau, MD</td>
</tr>
<tr>
<td>11:15-11:30 am</td>
<td>Myocardial Abscess Complicated by Communication with the Right Atrium: A Source of Sepsis and Thrombotic Events.</td>
<td>Kim Aldy, DO; Sean Barkan, MD; Kelly Halt, DO; Padma Chandika, MD</td>
</tr>
<tr>
<td>11:30-11:45 am</td>
<td>A Rare Occurrence of Pacemaker Infection with Mycobacterium Abscessus: A Case Report.</td>
<td>Alison Radigan, MD; Susan Jevert-Eichorn, DO</td>
</tr>
<tr>
<td>11:45 am-12:00 pm</td>
<td>Barriers to HPV Vaccination at Kalamazoo, Michigan's Federally-Qualified Health Center.</td>
<td>Nathan VanderVeen; Arike Wienke; Samantha Tran; Amie Kim; Kathryn Davis; Richard Brandt, BS; Duncan Vos, MS; Debra Taubel, MD</td>
</tr>
<tr>
<td>12:00-12:15 pm</td>
<td>Assessment of Oral Antibiotic Prescribing Practices in WMed Outpatient Clinics.</td>
<td>Alyssa Woodwyk, MS; Heather Rauch; Mark Schauer, MD; Shun Yi Felix Wan; Glenn Dregansky, DO; Michael Klepser, PharmD</td>
</tr>
</tbody>
</table>
ORAL PRESENTATIONS (cont.)

The following presentations represent the top-scoring abstracts in each of the six topic areas. Together with Dean Jenson, we congratulate all of the authors on their fine work.

SESSION 3  EAST BALLROOM

**Moderator:** Craig Beam, PhD; Biomedical Sciences

2:15-2:30 pm  **Clinical Synergism: Combined Fungal and Bacterial Intra-Abdominal Infections Associated with Increased Mortality.** Elizabeth Krebs, MD; Taryn Hassinger, MD; Nathan Elwood, MD; Zachary Dietch, MD; Kimberly Popovsky, RN; Traci Hedrick, MD; Robert Sawyer, MD

2:30-2:45 pm  **Monetary Impact and Geographic Distribution of Cybersecurity Breaches on Health Records in the United States.** Kamil Cwikla; J. Erik Winterholler; Jay G. Ronquillo, MD

2:45-3:00 pm  **Assessment of Student Perceptions on Skills Required for Optimal Collaboration on Service-Learning Teams.** Laura Bauler, PhD; Ransome Eke, MD PhD MPH; Cheryl Dickson, MD MPH

3:00-3:15 pm  **Crime Victimization of Individuals with Mental Illness: Response by the Criminal Justice System.** Nikki Nguyen; Kristi VanDerKolk, MD; Alyssa Woodwyk, MS; Bob Butkiewicz, MA LPC; Jeff Patton, MSW; Rebecca Sherwood, MD; Jeff Getting, JD; Catherine L. Kothari, PhD

3:15-3:30 pm  **Lisfranc Fixation Revisited: Is Joint Sparing Bone Fixation Possible? An Anatomic and Computational Study.** Eric Christianson, MD; Daniel VanZweden; James Jastifer, MD

3:30-3:45 pm  **An Ethical Review Concerning the Use of Physical Restraints on Intubated Patients in the ICU.** Daniel Ferman; John Livingstone; Tyler Gibb, JD PhD; Parker Crutchfield, PhD
Oral Presentation Abstracts
THE ROLE OF STRUCTURAL AND INTERPERSONAL DISCRIMINATION IN BIRTH OUTCOMES

Catherine L. Kothari, PhD; Grace Lubwama, DPP; Terra Bautista, BS; Arthur James, MD; Alyssa Woodwyk, MS; Lisa Graves, MD

Western Michigan University Homer Stryker M.D. School of Medicine, Division of Epidemiology and Biostatistics; YWCA of Kalamazoo; Kalamazoo County Health and Community Services, Healthy Babies Healthy Start; Ohio State University Medical Center; Western Michigan University Homer Stryker M.D. School of Medicine, Division of Epidemiology and Biostatistics; Western Michigan University Homer Stryker M.D. School of Medicine, Department of Family Medicine

CONTEXT: In Kalamazoo today, infants of color are dying at four times the rate of white infants, and the black infant mortality rate in Kalamazoo County is nearly double that of the state and the nation. Unlike white families, where health improves as socioeconomic resources improve, among black families socioeconomic gains have marginal effects on maternal infant health. Both structural and interpersonal discrimination have been implicated as root causes of health inequity.

OBJECTIVE: The primary goal of this study is to assess the association of structural and interpersonal discrimination with stress and, ultimately, with birth outcome. The secondary goal was to compare exposure to interpersonal discrimination reported by women of color compared to white women, and the degree to which it predicts stress and birth outcomes.

STUDY DESIGN: This was a mixed methods prospective study conducted in Kalamazoo County, Michigan. Women were recruited from the postpartum floors of both delivering hospitals. Eligibility criteria included being Kalamazoo County resident, being English speaking and being medically cleared by medical staff. Of the 471 eligible women during the recruitment period (January, 2017 to September, 2017), 426 were approached and 300 consented to study participation. Medical records were abstracted for 298 and 8-week postpartum phone surveys were completed with 244 of the participants. The dependent variable, birth outcome, was operationalized as infant birthweight (grams). The primary independent variables were measured by socioeconomic status (structural discrimination) and by self-reported Experiences of Discrimination scale (Cronbach’s alpha 0.74) (interpersonal discrimination). Two variables measured stress: the Perceived stress scale short form (alpha 0.56) and the Vigilance scale (alpha 0.77). Race was measured based upon self-report. The covariate prior poor birth outcome (a key contributor to current birth outcome) and was included in the final model. Statistical analyses were conducted using Pearson Chi Square for bivariate analysis and linear regression for multivariate (two-sided statistical significance set at α<.05).

RESULTS: The 240 women with single gestation delivery who completed a survey had mean birthweights of 3468 grams (CI 3398, 3539) and 11 (4.8%) delivered a low birthweight infant (under 2500 grams). Women of color had significantly lower birthweight infants than white women, with means of 3273 grams and 3581 grams, respectively (p<.001). They were more than twice as likely to be low income (70.2% of color, 30.1% white, p<.001), but just as likely to have had a prior poor birth outcome. Women of color reported significantly higher prevalence of ongoing discrimination than white women across multiple circumstances including: being treated with less courtesy or respect (43.6% of color, 26.0% white, p=.005), being treated as if they were not smart (28.7% of color, 16.0% white, p=.018), receiving poorer service than others at restaurants or stores (22.3% of color, 12.3% white, p=.040), and being followed around in stores (16.0% of color, 4.1% white, p=.002). Summed into a discrimination index (0-30, where higher value reflects more discrimination), a simple regression revealed discrimination to be a significant predictor of birthweight (unstandardized coefficient -16.25 (CI -32.34, -0.16), p=.048). Although discrimination was significantly associated with both stress and vigilance, neither of these variables were significant predictors of birthweight, and so were not included in the final model. In the multivariable model, controlling for prior poor birth outcome, income was a significant predictor of birthweight (unstandardized coefficient -8.85 (CI -18.94, -0.76), p=.02), but self-reported interpersonal discrimination was not (unstandardized coefficient -12.75 (CI -28.65, 3.16), p=.116). Stratification by race did not change this outcome.

CONCLUSION: Women of color experience substantially higher levels of interpersonal discrimination compared to white women; a factor which, alone, is a significant predictor of both stress and of birthweight. But when both are taken into account, the structural inequity of poverty outweighs interpersonal discrimination in predicting poor birth outcomes.
DIFFERENT PATHWAYS TO INFANT HEALTH, BY RACE AND BY INCOME

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CONTEXT: Within Kalamazoo County, as across the United States, white infants die at markedly lower rates than infants of color. Not only do they die at different rates, but they die from different causes: leading cause of death among higher-income white infants is congenital anomalies compared to prematurity, which is the leading cause of death among higher-income infants of color. This study is unique in examining whether infants from different racial and socioeconomic groups have different factors which impact prenatal health, birth outcomes and infant survival.

OBJECTIVE: The goal of the current study was to examine whether variations in infant health by race and by income were associated with different sets of predictors, including maternal demographics, health behaviors, obstetric history, maternal health condition, prenatal care.

STUDY DESIGN: Population-based cross-sectional study using secondary analysis of infant birth and death records. Sampling method was census, and the study sample consisted all infants born to Kalamazoo County residents during the study period, 2008 through 2014 (N=21,858). The study outcome was infant health, as defined by full-term gestation (>37 weeks), adequate birthweight (>2,500 grams) and infant survival to first birthday. Predictors included maternal demographics, health factors and prenatal care. Logistic regression models, stratified by race (of color, white) and income (Medicaid, private insurance), were conducted with two-sided statistical significance set at \( \alpha < .05 \). Each predictor was tested through Baron and Kenny’s process of mediation.

RESULTS: Eighty seven percent (87.2%, 18,783 of 21,858 births) resulted in a full term, adequate weight infant who survived its first year. Regarding health risk and protective factors, white infants were 2.7 times more likely to be higher-income than infants of color (62.3% and 23.1%, respectively). Higher-income women had fewer risk factors (adolescent pregnancy, prior poor birth outcome, chronic disease, late prenatal care, STI, prenatal smoking), except for infertility treatment. Stratification revealed important differences regarding determinants of infant health based upon race and income.

- Having a prior poor birth outcome, the greatest risk to infant health overall, was more prevalent and was associated with greater risk to infants of color and to low-income infants
- First trimester prenatal care, a protective factor, was more prevalent and brought significant health gains to white infants and to higher income infants but not to infants of color or low-income infants

Multivariable logistic regression confirmed that, even after accounting for key contributors, race and income were significant independent predictors of infant health: white infants and higher-income infants had better health than infants of color and lower-income infants (race aOR 1.41 (1.27, 1.55) and income aOR 1.25 (1.12, 1.39)). Goodness of fit statistics were 0.6853 to 0.6972 (AUC) for the final four stratified models. A race-by-income interaction was tested, but did not improve model fit.

CONCLUSION: Infants of color face different health risks than white infants; risks that vary not just in magnitude but in the character. The same is true for low- and high-income infants. This points to the need for tailored approaches to risk assessment, clinical care and public health interventions; such as patient centered clinical care models at the individual level and targeted population-level interventions which structure resources to meet the nature and degree of risk specific to a group.
MATERNAL CARE COORDINATION AND PROGRAM TRIAGE

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BACKGROUND: Kalamazoo County is rich with community resources, particularly those surrounding maternal and infant care. Unfortunately, these resources are not being utilized by those with the highest risk of poor birth outcomes (defined as birthweight less than 2500g, gestation less than 37 weeks, or an infant death). The primary risk factors associated with these outcomes are poverty, non-white race, and having experienced a prior poor birth outcome.

In 2016, as part of a community wide collaboration, the Cradle Care Coordination Registry was initiated in partnership with seven maternal care programs and WMed, to coordinate available resources. In addition, a hotline (888-KIDS) was implemented at the local 2-1-1 call center to connect women directly to maternal home visiting services. The goal of the registry is to coordinate incoming referrals to eliminate duplication of efforts and better distribute resources.

METHODS: Using the identified risk factors and the individual eligibility of each partnering program, a triage algorithm was developed and administered via Research Electronic Data Capture (REDCap) forms. Upon receiving a call to 888-KIDS, a trained Family Support Specialist uses these forms, containing a series of questions, to walk the caller through the triage algorithm with the goal of determining eligibility for services. In the event that a caller has no program preference but would still like to receive services, REDCap’s randomization function is used to ensure fair distribution of referrals across programs.

Weekly, the seven maternal care programs share their prenatal referral data with the registry via REDCap Send-It or by submitting a spreadsheet to their designated OneDrive folder. To accurately integrate the data, individual data mapping was developed. These weekly data contributions are combined with 888-KIDS hotline data using SQL Server Integration Services. Referral duplication, within and between programs, is identified through the use of fuzzy logic, accounting for misspelled names, incomplete dates of birth, and other variations that could prevent an exact match between records. Final data is then stored in a SQL Server database known as the Care Coordination Registry. Registry data is distributed weekly as Program Lists, containing referral and enrollment information for all the maternal clients seen or referred. Additionally, if any woman has been seen or referred by another program, the information from that program is also included.

RESULTS: A total of 174 program data submissions have been received for registry integration between March 2017 and February 2018. More than 170 Program Lists have been distributed, identifying 379 clients that were referred to multiple programs. When asked, program partners saw several benefits from the registry, including the availability of additional contact information, breakdown of data silos, reduced competition between programs, and increased referral rates.

CONCLUSIONS: Integration of maternal home visiting referrals allows the higher level services to be coordinated and allocated to the highest risk clients. Moving forward, Cradle Kalamazoo aims to expand upon this registry to include postpartum and pediatric (ages 0-1) care, so appropriate services may be coordinated from conception to the first birthday.
**IMPACT OF RACE ON POSTPARTUM REPRODUCTIVE HEALTH CHOICES**

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**INTRODUCTION:** Across the United States, mortality rates for black infants are twice as high as those for white, and in Kalamazoo County they are four times higher. Among many factors that contribute to infant mortality, rapid repeat pregnancies (RRP) are associated with higher rates of poor birth outcomes. RRP are more likely in African American women and those of lower socioeconomic status. Contraception is a vital aspect of postpartum care that assists women to avoid RRP. This study investigates the impact of race on birth control choices for postpartum mothers in Kalamazoo County.

**METHODS:** A prospective study was conducted to assess the health experiences of mothers in Kalamazoo County, Michigan. Of the 471 eligible women, 244 completed a survey, collected between April and November of 2017. Variables collected included demographic information (race, income, age and insurance), social determinants of health (transportation and childcare), and reproductive health (birth control). A bivariate analysis with Chi-squared tests was conducted to evaluate the impact of these variables on utilization of postpartum birth control, stratified by race.

**RESULTS:** By the second postpartum month, 85.6% of 243 surveyed women report having a birth control method. Reasons for not having a birth control method include not yet having a postpartum visit (31.4%), ambivalence about becoming pregnant (25.7%) or not wanting to use birth control (22.9%). These reasons do not vary by race or by income. Among women who reported using birth control postpartum the three leading methods were: condoms (21.3%), abstinence (18.4%) and birth control pills (16.4%). Interestingly, there were differences in the use of each of these methods between white women and women of color; condoms (23.6% vs. 17.7%), birth control pills (21.6% vs. 8.3%), or abstinence (14.2% vs. 25%). Both postpartum visit and use of a medically prescribed birth control method were significantly lower among women of color compared to white women (p=.003 and p=.021, respectively). Furthermore, significantly fewer women of color report having a medical home compared to white women (88.4% and 95.9%, respectively p=.032), and even fewer report having a primary doctor (one they could name) (34.7% and 54.7%, respectively, p=.002). Women of color are significantly more likely to report the following socioeconomic barriers compared to white women: lack of reliable transportation (11.5% vs 0%, p<.001), non-private insurance (62.5% vs 25.7%, p<.001), or poverty (42.7%, 16.2%, p<.001).

**CONCLUSION:** Our data suggests there are differences in birth control choice between white women and women of color in Kalamazoo county. In addition, women of color experience more barriers that may impact contraception choice. Abstinence only sexual education has been shown to be one of the least effective means to prevent unintended pregnancies, interestingly, this is one of the leading postpartum birth control methods chosen by women in this study and is emphasized in the sexual education provided students in Michigan. Further investigation into the factors that impact postpartum birth control choice by women may address the race-related and socioeconomic disparities seen in infant mortality.
NATURAL LANGUAGE PROCESSING AS A TOOL FOR SCREENING DEPRESSION IN POSTPARTUM WOMEN SUFFERING FROM INTIMATE PARTNER VIOLENCE

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BACKGROUND: Intimate partner violence (IPV) and depression are well-documented psychosocial stressors faced by perinatal women, with estimates of 3.9 to 8.3% who experience intimate partner violence and 7.1 to 12.7% who experience depression. Each presents immediate as well as long-term health risks to both the woman and her newborn. The impact of IPV and depression is often cumulative as each can exacerbate the consequences of the other. Psychosocial screening within clinical settings is common but faces multiple barriers to implementation. Alternative methods of detection, such as the use of natural language processing, which involves the analysis and synthesis of linguistic data, would be a valuable clinical tool.

OBJECTIVE: The goal of the current study is to examine the effectiveness of natural language processing as a tool for screening depression in postpartum women suffering from intimate partner violence.

METHODS: Three-hundred-twenty-six postpartum women were screened for IPV via a phone interview using three questions for current or past emotional or physical abuse. Sixty-four women screened positive, and 31 of these interviews were subsequently completed, taped, and transcribed. The women were screened three times for depression using the Edinburgh Postnatal Depression Scale (EDPS). The National Research Council Word-Emotion Association Lexicon was used to establish percentage of sentiment-associated words within each transcribed interview. Resampling-based permutation tests were performed to assess differences in proportions of sentiment words between those with and without depression. Principal component analysis was used to reduce dimensionality combining the significant sentiment categories into one principal component. Logistic regression was used to associate the principal component with depression. ROC analysis was performed to assess the diagnostic accuracy compared to EDPS.

RESULTS: Permutation hypothesis tests revealed that women with major depressive disorder used a greater proportion of words associated with negativity (p=.0004), anger (p=.0057), disgust (p=.0007), fear (p=.0009), and sadness (p<.0001). These five sentiment categories loaded onto the first principle component explaining 73.10% of the variance. This combined score was significantly associated (p=.0078) with depression. The proposed natural language processing tool is 100% sensitive in its ability to detect depression screened by EDPS. Adjusting for the imperfect standard of EDPS, the perceived sensitivity to detect depression is 92.7%, and the perceived specificity is 24.1%.

CONCLUSION: Natural language processing has the potential to develop into an alternative method of detecting sensitive psychosocial problems. Natural language processing can be used as a reliable tool to detect depression in postpartum women suffering from intimate partner violence, although, further natural language processing methods should be explored to decrease the number of false negatives.
INCIDENCE OF AORTIC STENOSIS IN OBESE PATIENTS: AN ANALYSIS USING THE NIS DATABASE

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BACKGROUND/INTRODUCTION: Aortic Valve Stenosis is a thickening and/or calcification of the aortic valve which leads to Left Ventricular Hypertrophy and subsequent increased left ventricular pressures. This eventually gives rise to a number of complications, the most notable being Congestive Heart Failure. The standard of care in management of Aortic Valve Stenosis is Aortic Valve Replacement, by way of Surgical Aortic Valve Replacement (SAVR) or Transcatheter Aortic Valve Replacement (TAVR). Aortic Valve Stenosis has been associated with a number of factors (coronary artery disease, advanced age, diabetes mellitus, etc.), but its direct associations with obesity remain unclear.

STUDY PURPOSE: This study uses the National Inpatient Sample (NIS) database to assess the relationship between aortic stenosis (AS) and obesity.

METHODS: NIS database for years 2012 through 2014 was used. The incidence of AS was estimated using ICD-9 codes related to AS as a proxy. These codes were divided into surgical and percutaneous AS-related procedures. The incidence of these AS-related codes were then compared across BMI (BMI 25-30 and 30+) and age (Age <60 and 60+). Logistic regression models were used to predict percutaneous procedure, surgical procedure or both percutaneous and surgical. Percutaneous and surgical procedures were analyzed separately since surgery is typically not recommended for obese patients. Age groups were analyzed separately to differentiate AS resulting from congenital causes, which present most commonly before age 60, from AS resulting from acquired causes.

RESULTS: The analysis found that BMI, age, gender, income and bicuspid aortic stenosis are significant predictors of surgical AS-related procedure. Patients with BMI of 25-29 are 2.32 (2.05, 2.63) times more likely to undergo an AS-related surgical procedure than those with no recorded BMI, and are more likely to undergo an AS-related surgical procedure than those with BMI 30+ who are 2.00 (1.95, 2.05) times more likely to undergo an AS-related surgical procedure than those with no recorded BMI. Patients age 60+ are 4.93 (4.82, 5.05) times more likely to have a surgical AS-related procedure. The AS-related surgical procedure model including BMI, age, bicuspid aortic stenosis, gender, and income is correct nearly 75% of the time (AUC=0.745). The estimates for the odds of percutaneous AS-related procedure does not significantly differ for BMI 25-29 and 30+. Those who are 60+ are 15.49 (14.48, 16.57) times more likely to undergo a percutaneous procedure.

DISCUSSION/CONCLUSION: These findings suggest that obesity is associated with an increased risk of AS, as estimated by the increased incidence of both surgical and percutaneous AS procedures in obese patients. This is unsurprising, as many of the risk factors associated with obesity are also associated with AS. However, this relationship may have some utility as a clinical and decision-making tool in establishing a differential or performing workup related to AS. There are several limitations to this study, including the nature of the data itself (ICD codes as proxies for study parameters and outcomes), a substantial number of data missing information related to BMI (which might produce bias), and limited ability to control for known confounds. Nonetheless, establishing such a relationship is a necessary first step in our understanding of how obesity and aortic stenosis are related, and opens the door for further inquiry.
TEN-YEARS TREND IN HOSPITALIZATION RATES OF INTRA-HEPATIC CHOLANGIOCARCINOMA IN THE UNITED STATES.

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BACKGROUND: Intrahepatic cholangiocarcinoma (IHC) is as aggressive tumor of the liver, accounting for about 10% of all cholangiocarcinomas. It is estimated that IHC affects approximately one to two per 100,000 persons in the Western world. The main purpose of the study is to describe trends in incidence of IHC among hospitalized patients in the US hospitals between 2005 and 2014.

METHOD: We estimated the incidence rates of Intrahepatic cholangiocarcinoma in the US from 2005 to 2014, by analyzing the Healthcare Cost and Utilization Project Nationwide Inpatient Sample, a nationally representative sample of discharges from US hospitals sponsored by the Agency for Healthcare Research and Quality. The outcomes of study include changes in the number and incidence rate of IHC hospitalization, cost of care, length of hospital stay and patient demographics. We abstracted all cases of IHC using diagnostic code 155.1 from International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM]). A weighted estimate was used in all analysis.

RESULT: Between 2005 and 2014, about 104,035 IHC related admissions were reported nationwide. The incidence rate of intrahepatic cholangiocarcinoma in United States increased nearly 2-fold from 2.36 per 100,000 (95% CI, 2.03-2.69) in 2005 to 4.38 per 100,000 (95% CI, 4.10-4.67) in 2014. This represents a percentage change of 85.6% from 2005 to 2014. The rates of admission increased among patients within the age group of 60 to 69 years and a decreasing in trend was observe for patients ages 70 years or older (p-value < 0.0001). There was a remarkable increase in IHC diagnosis across all races. Particularly, among White, the rates increased from 1.42 per 100,000 in 2005 to 2.84 per 100,000 in 2014. Total median charge per admission significantly increased from $22,647 in 2005 to $37,611 in 2014. Further, mortality rate among patients with IHC decreased remarkably over a ten-year period (p-value, <0.05). There were no significant differences in admission rates between males and females.

CONCLUSION: The rate of IHC has approximately doubled over the past decade. Although, there was a notable decrease in the mortality over a ten-year period, the cost of care for inpatients care for patients with IHC has risen significantly. This tumor has poor prognosis associated with it and hence further studies to elucidate the risk factors are necessary.
NATIONAL TRENDS IN SURGERY FOR INTRAHEPATIC CHOLANGIOCARCINOMA: 2004-2014

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BACKGROUND: Intrahepatic cholangiocarcinoma (IHC) is a malignancy with an increasing incidence. The only potentially curative option for patients with resectable disease is surgery. The objective of this study was to determine the overall use and temporal trends of surgery for patients with IHC using a nationally representative cohort.

METHODS: Hospital discharge data in the United States from 2004 to 2014, was analyzed using the National Inpatient Sample data compiled by the Healthcare Cost and Utilization Project (HCUP). Trends of different surgical procedures performed on patients with IHC were summarized. Using billing procedure codes, the surgical procedures were analyzed.

RESULTS: During the study period a total of 22,662 persons were diagnosed with IHC, with a nearly 2-fold increase from 2.36 per 100,000 (95% CI, 2.03-2.69) in 2004 to 4.38 per 100,000 (95% CI, 4.10-4.67) in 2014. There was a total of 7,590 (95% CI; 6773 – 8407) surgical procedure performed among patients with IHC from years 2004 to 2014. The median age of patients who had procedure was 66 years (Interquartile rage (IQR); 57-76). The number of procedures increased from 412 to 1055 (p<0.05) with greater than 90% being resections. During the time period there was a reduction in mortality and length of stay p<0.05.

CONCLUSIONS: There has been a concordant increase in surgery for IHC with the increasing incidence of IHC. During the study period there was an improvement in mortality and length of stay.
OPPIOID CONSUMPTION AFTER ELECTIVE SHOULDER ARTHROSCOPY SURGERY

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BACKGROUND/INTRODUCTION: Opioid pain medications are commonly prescribed for post-operative pain control. Historically there has been an emphasis to control pain in our patients; however, more recently this has led to an increase in opioid usage. This increased usage may be a reason for more widespread opioid prescription resulting in a concern for abuse and addiction. Previous studies have examined the use of opioids after upper extremity surgery. Although there are published studies on opioid prescriptions and upper extremity surgery, there is a paucity of literature discussing pain medication after shoulder arthroscopy.

OBJECTIVE/PURPOSE/RATIONALE: The purpose of our study is to quantify the average amount of opioid pain medication consumed by patients after shoulder arthroscopy surgery. Our hypothesis is that patients will consume less pain medications than they are prescribed. This information can then guide orthopedic surgeons as to an appropriate number of pain pills to provide to adequately control pain.

MATERIALS AND METHODS: This study was approved by our IRB committee. Patients scheduled to undergo elective shoulder arthroscopy were invited to participate in this study at their pre-op appointment. Inclusion criteria will include patients >18 years old, ability to give informed consent, and patients undergoing elective shoulder arthroscopy. Exclusion criteria will include patients <18 years old, inability to give informed consent, non-elective shoulder arthroscopy surgeries, any instance where there was a concurrent open procedure in addition to the arthroscopy, and all revision surgeries. All patients underwent elective shoulder arthroscopy in the beach chair position. All patients were given an interscalene block single shot. Patients were given a prescription for 50 tablets of Norco (5mg/325mg) or Percocet (5mg/325mg). Patients were asked to complete a postoperative log form documenting their pain VAS score, number of tablets taken, time, and date. Also recorded was the time and date postoperatively their interscalene block was complete. The form was collected at their two week follow-up appointment. SAS v9.4 was used to perform the statistical analyses.

RESULTS: 16 patients’ completed the study and had data available to analyze at the time of abstract submission. The average total number of opioid pills consumed by the patient’s was 16.56. The average total morphine equivalents consumed by the patient’s was 19.54. The average percentage of pills consumed out of what was prescribed was 31.93%.

CONCLUSION: After shoulder arthroscopy patients in our study consumed on average only a third of the opioid pain medication they were prescribed. This was on average around 17 pills. The average percentage of opioids consumed by patients in this study from what was prescribed is similar to that in other studies. We believe that prescribing less opioids after shoulder arthroscopy will allow for adequate pain control along with minimizing the risk for abuse and addiction to opioid medications. This data also gives surgeons performing elective shoulder arthroscopy a reference in opioid usage to help educate patients preoperatively, which can improve patient expectations and outcomes.
FACTORS INFLUENCING LENGTH OF HOSPITAL STAY AND HOSPITAL CHARGES IN PATIENTS WITH INFLAMMATORY BOWEL DISEASE: A FIVE-YEAR POPULATION BASED STUDY

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BACKGROUND: Inflammatory bowel diseases (IBD) are chronic inflammatory disorders of the gastrointestinal tract. The remitting and relapsing condition of patients with IBD requires long term therapy and periodic inpatient management. However, there is paucity of literature regarding factors having an effect on in-patient mortality and length of stay (LOS) in the hospital among patients with IBD. Hence, the objective of this study is to determine factors associated with prolongation of hospital stay in this population.

METHODS: We conducted a five-year retrospective analysis and estimated the national inflammatory bowel disease related hospitalization from 2009 to 2013 in the United States, using the Healthcare Cost and Utilization Project National Inpatient Survey Database. The main outcome measures were IBD-associated hospitalizations (ICD-9 codes 555.X and 556.X), length of stay, and total hospital charges. A univariate and multivariable analyses of length of hospital stay and total hospital charges were performed while controlling for potentially confounding variables including age, sex, primary payer, hospital type (teaching or non-teaching), hospital size and hospital location (urban or rural), co-infection with Clostridium difficile. We computed the variance estimates accounting for finite population correction (fpc) factor.

RESULTS: A total of 295,296 IBD related hospitalizations occurred between 2009 and 2013. Sixty-four percent of the cases were ulcerative colitis (UC) and 36% had diagnosis of Crohn’s disease (CD). The majority of IBD hospitalizations were elderly patients ages greater than 60 years (37%), females (57%) and Caucasians (80%). Sixty-nine percent of the admission types were through emergency department and about 90% of the admissions occurred in urban hospital locations. The median LOS was 3 days (interquartile (IQR) range, 2–6 days) and median hospital charge per patient was $23,663 (IQR, $13,143–$44,587). Results from the multivariate analysis showed that – Longer LOSs were significantly associated with CD patients compared to those with UC, elderly patients and males compared with females, teaching hospitals compared to non-teaching hospital and urban hospital locations than rural locations (p-values < 0.001). Blacks and Hispanics patients had significantly shorter hospital stay than White (p-values < 0.05). Similarly, there were significantly shorter LOS in those without C. difficile infection compared with having C-difficile infection, and those with private insurance or self-pay compared with having Medicare coverage (p-values < 0.001). Total charges were significantly higher for CD hospitalization compared to UC, other forms of payment (self-pay, private insurance, Medicaid) compared to Medicare coverage, and urban hospital location than rural hospitals (p-values < 0.001).

DISCUSSION: Limited data exists regarding factors affecting hospital stay in IBD patients hence further studies are required to investigate into other potential factors since addressing those factors may reduce hospitalizations and healthcare costs. Increased vigilance to prevent Clostridium difficile infection among patients with IBD could improve outcomes as well.
A STOCHASTIC FINITE ELEMENT METHOD FOR SIMULATING PATIENT SPECIFIC TRABECULAR BONE

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INTRODUCTION: Cancellous bone is a porous, inhomogeneous tissue of moderate stiffness which exhibits anisotropy (directional dependence). Most biomechanical models of cancellous bone incorporate a homogenized continuum mechanics approach which neglects the tissue microstructure. Hence, the method is inherently imprecise and may not be well suited to personalized medicine and other developing clinical techniques. Recent high fidelity trabecular modeling techniques incorporate detailed trabecula microstructure, but are obtainable only with ex-vivo imaging. Thus, existing high fidelity methods have limited applicability in a clinical environment.

RATIONALE: The aim of this research is to create a stochastically accurate high fidelity structural modeling technique to biomechanically represent patient specific trabecular tissue based on existing medical imaging. The method will have applications in clinical precision medicine.

MATERIAL & METHODS: Trabeculae are modeled as beam elements generated via stochastic algorithm to match tissue microstructural distributions. Node positions are assigned randomly with beam connectivity determined by Voronoi diagram. The number of nodes, beam cross sections, and lengths represent the dominant patient factors including bone density, bone adaptation to loading, nutritional status, and the biological response to activity level. The code is general to apply a stochastic approach to all beam properties. Strains were imposed and loads were tracked which permitted extraction of apparent tissue properties.

RESULTS: The stochastic tissue model generation technique produced effective structural properties within published ranges for trabecular bone using inputs which can be based on clinical imaging. The trabecular bone model exhibited a modulus of (198.53 ± 104.5978 MPa). This compares favorably with published values [1,2]. The model bone apparent density was found to be (0.7012 ± 0.2793 g/cm³) which is comparable to established range [1,3]. Additional results will be reported in oral form.

CONCLUSIONS: The proposed finite element technique provides a stochastically accurate structural representation of trabecular tissue and its reaction to applied loads. It incorporate several advantages of high fidelity methods but at lower cost and requiring only clinical imaging. Therefore, the approach may be useful for patient specific musculoskeletal biomechanical models (e.g. osteoporosis, osteoarthritis, joint replacement and implants interface).
THE EFFECT OF PITCH VARIATION AND DIAMETER VARIATION ON SCREW PULLOUT IN 3D PRINTED SCREWS

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INTRODUCTION: There are many screw and thread designs available to the foot and ankle surgeon for bone fixation. Comparing screws between companies is difficult because properties including core diameter, thread diameter, and pitch confound direct comparisons. There is a paucity of literature on comparative mechanical properties of various screw designs including variable pitch screws and tapered screws. The purpose of this study was to determine the effect of varying thread pitch and/or tapering a screws core diameter. Our hypothesis was that variable pitch screws and tapered screws would have decreased strength to screws with constant diameter and constant pitch.

METHODS: 3D metal printing technology was used to manufacture screws that varied in only the test variables. Four different screws designs were created including variable and constant pitch screws in both straight and tapered diameter versions. These screws were pulled out of synthetic bone at a constant rate while force was measured. Pull out strength and stiffness was calculated for each screw. A generalized linear model and ANOVA were completed to assess the effect on pull out strength and stiffness of the pitch and taper variables.

RESULTS: The pull out strength of the constant pitch screws (304.9N±25.3N, p<0.001) was significantly greater than the variable pitch screws (259.7N±23.4N). The pull out strength was also significantly greater for screws with a tapered diameter (305.4N±24.1N) than a constant diameter (259.1N±23.5N, p<0.001). Tapered diameter variable pitch screws had the largest stiffness overall (mean stiffness 556.6 N/mm), which was greater than all other screw designs (p<0.001). The difference in stiffness between all screws with either constant pitch or constant diameter was not statistically significant (p=0.060)

CONCLUSION: The pull out strength is significantly greater for screws with a constant pitch than for a variable pitch and greater for a tapered diameter than a constant diameter. The results of stiffness testing are mixed depending on the screw taper. The clinical significance of this study is that it provides data on the effects that thread design and tapering have on the pullout strength of screws providing some evidence that variable pitch screws may have lower pull out strength than constant pitch screws. Utilizing 3D printed screws allowed for the control of all other variables, which may otherwise confound the comparison of different commercially available screws.
MECHANICS OF PROGRESSIVE FAILURE OF NO. 2 FIBERWIRE SUTURE

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INTRODUCTION: Shear lag is a well-known phenomenon in fiber reinforced structures such as carbon fiber golf clubs and reinforced concrete. It governs the interplay between axial and shear stress around fracture points and provides ongoing load transfer after initial compromise of a structure. Uniaxial tests to failure of No.2 FiberWire surgical suture were reported previously and were found to have a fail/reload/fail pattern where load was transferred between suture core and jacket via the shear lag mechanism [1]. However, traditional tensile testing alone cannot fully describe the mechanics of the driving shear lag phenomenon. Finite element modeling is useful for illustrating the governing mechanics of load transfer, but has not previously been applied to multifilament suture such as FiberWire.

PURPOSE: To apply the finite element method to describe the shear lag phenomenon of suture failure by examining the distribution of axial and shear stresses along a suture of partially failed No.2 FiberWire. To describe the clinical implications of the shear lag phenomenon.

MATERIAL & METHODS: Two 3D finite element models of FiberWire suture were created consisting of separate core and jacket. One model included a broken core to investigate its implications. The filaments were assumed to be homogeneous and isotropic elastic.

RESULTS: At the broken core site, the model shows that the core filament locally stops carrying the axial load and sheds it to the surrounding jacket via shear lag, Fig.1. Also, the jacket surrounding the broken core builds load via shear, and transfers that load across the broken site as axial stress. Subsequently, the load transfers back to the core again via shear. The load transfer occurs over an identifiable characteristic length. The models show detailed stress and strain within the suture: the shear stress in core and jacket varies significantly over their cross-section and is highest close to the broken region. The jacket filaments are able to carry load despite complete failure of the core filament, however, the load transfer mechanism is not preserved over subsequent load cycles.

CONCLUSIONS: The consistency of the experimental and numerical results validates of finite element model. The model describes a biomechanical phenomenon by which failed suture can appear to be competent during a surgical procedure. Hence, the clinician should be aware of the possible failure mode and consider remedial actions when such failures are suspected. The described method may also provide insights in describing load transfer to soft tissue, and thus provide opportunity for optimization of suture/tissue interfaces.
INJURY PREVENTION BASED ON COMPUTER MODELING OF CLEAT TRACTION

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INTRODUCTION: Injuries related to foot traction are ubiquitous ranging from insufficient traction (slip and fall) to excessive traction (failure to release causing fracture or soft tissue damage). The existing literature on computational modeling of the footwear/ground interaction is limited and focused primarily on musculoskeletal dynamics simulation (i.e., the load transfer through the body) rather than on transfer into the body (through the ground/foot interface). Hence, there is opportunity to develop and/or enhance techniques for modeling footwear traction to reduce injury.

RATIONALE: The most common NFL injury is to the foot and ankle region accounting for 26% of all reported injuries [1], of which a significant but unknown number are related to excessive traction. The goal of this research is to determine whether the discrete element method can simulate the interaction between turf and studded footwear. The long-term goal is to optimize the interface between footwear and artificial turf to provide the safest possible environment for athletic participation while balancing demand for dynamic traction against the risk of injury.

MATERIALS & METHODS: Three football studs were torqued to slip on artificial turf in a laboratory setting to provide validation data. The studded assembly was turned at 1 degree per second in artificial grass alone, rubber infill alone, and grass+infill artificial turf on a servo hydraulic load frame for 60 seconds. An increase of over 600% in both max and average torque was found when comparing grass+infill to just infill. The bench results were used to calibrate a discrete element model of three studs. Subsequently, a series of simulations were run to determine the effects of stud geometry and pattern. The models applied 1 degree per second for 60 seconds or 2.58 meters per second for .4 seconds, as with published literature [2, 3]. Each model evaluated the torque/rotation load history and the force/translation history in two directions. The three load scenarios were repeated on four common stud shapes and three unique stud patterns. Filtered torque, force, and kinetic energy were evaluated as indicators of stud grip.
Results: Round, square and hex shape studs were compared in the rubber infill turf model. Peak torque increased 17% and 0.9% for the square and hex stud compared to the round studs. Mean torque over time increased 22% and 0.4%, respectively. Additional results comparing cleat patterns and turf condition will also be described.

DISCUSSION: Stud geometry appears to play a significant role in torque generation in artificial turf. Clinically, the results suggest that round studs may limit torque transfer and thus might reduce injury. However, the optimal balance between traction and release has not been established. Based on these preliminary results, the discrete element method appears to provide effective dynamic stud/turf interaction modeling and may be useful in a broader set of studies.
CORRELATION OF PRE-OPERATIVE RADIOGRAPHIC ANALYSIS WITH INTRA-OPERATIVE COMPETENCY OF THE SPRING LIGAMENT FOR FLAT FOOT RECONSTRUCTION

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INTRODUCTION: Adult acquired flat foot deformity (AAFD) leads to a wide spectrum of deformities in the adult foot and ankle. Spring ligament attenuation or tearing has been implicated in the pathology of AAFD. Treatment as part of a flat foot reconstruction may involve attempts to address spring ligament incompetency, either indirectly through lateral column lengthening or directly through spring ligament repair/reconstruction. When to employ these procedures is controversial. Pre-operative knowledge of the integrity of the spring ligament based on commonly used radiographic measures would be highly valuable for pre-operative planning and decision making for such procedures as part of a flat foot reconstruction. To our knowledge, there has been no attempt to correlate pre-operative radiographs with direct intra-operative evaluation of spring ligament competency.

PURPOSE: The purpose of this study is to perform a retrospective chart review to examine the relationship between pre-operative radiographic measures specific to flat foot deformity and intraoperative competency of the spring ligament during flat foot reconstruction. The goal is to find pre-operative radiographic measures that predict spring ligament attenuation intra-operatively to guide surgical decision making for the addition of procedures to address spring ligament attenuation.

METHODS: The operative reports of 3 fellowship trained orthopaedic foot and ankle surgeons were searched over a 5 year period from 2012-2017. Patients with pre-operative standing AP and lateral radiographs along with an operative report that directly visualized and commented on the integrity of the spring ligament were included in the study. Operative reports were reviewed to identify patients with either an intact or torn spring ligament. Pre-operative radiographs were evaluated and four common radiographic parameters were measured: lateral talo-first metatarsal angle, AP talo-first metatarsal angle, talonavicular coverage angle, and talonavicular coverage percentage. ANOVA and logistic regression analysis were used to evaluate which of the four radiographic parameters were predictors of spring ligament tear.

RESULTS: 58 cases were identified for the study. 29 patients had a confirmed tear intra-operatively, and 29 patients had an intact spring ligament. Increasing values for each of the 4 radiographic measures were statistically significant predictors for spring ligament tear (p=0.001). The lateral talo-first metatarsal angle was the most significant predictor for spring ligament tear (p = 0.001).

DISCUSSION: The results of this study demonstrate the predictive value of 4 different radiographic measurements in predicting the presence or absence of a spring ligament tear. The lateral talo-first metatarsal angle proved to be the best predictor of a spring ligament tear. The study also demonstrated that a lateral talo-first metatarsal angle of greater than 30 degrees is significantly sufficient at predicting a spring ligament tear.

CONCLUSION: This study is the first to correlate pre-operative radiographs with direct visualization and evaluation of spring ligament competency allowing the surgeon to predict spring ligament attenuation and make a pre-operative plan accordingly. It appears that increasing severity of common radiographic measures of flat foot deformity, particularly the lateral talo-first metatarsal angle, correlates significantly with spring ligament disruption observed intra-operatively.
FIFTEEN-MONTH ANXIETY AND DEPRESSIVE SYMPTOM SCREENINGS OF CAREGIVERS AND PATIENTS WITH CYSTIC FIBROSIS (CF)

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BACKGROUND: Patients with cystic fibrosis (CF) and their caregivers experience higher levels of anxiety and depressive symptoms than those without chronic illness. Anxiety and depressive symptoms are correlated with poorer compliance with medical regimens and poorer health outcomes. Findings suggest that caregivers endorse a higher level of anxious and depressive symptomology than patients with CF. In June 2016 a Quality Improvement project was undertaken to screen and treat anxiety and depressive symptoms in patients with cystic fibrosis and their caregivers, based on the Cystic Fibrosis Foundation and European Cystic Fibrosis Society published consensus on mental health.

METHODS: Western Michigan University Homer H. Stryker, MD School of Medicine received a Cystic Fibrosis Foundation grant to facilitate use of the PHQ-9 and GAD-7 with caregivers and patients over the age of 12. Specifically, CF patients age 12 years through adulthood, and caregivers of children with CF from birth to 18 years were screened with the GAD-7 and the PHQ-9.

RESULTS: In the 15 months of screening, there were 90 total GAD-7 and PHQ-9 screens. Twenty-nine (29) individuals were screened with the GAD-7 more than one time with a range of 1-5 separate screens. Similarly, 28 individuals were screened with the PHQ-9 more than one time with a range of 1-5 separate screens. The 15-month data shows that although more caregivers than patients were screened, the ratio of caregivers and patients without symptoms to those with symptoms were similar. That is, 55% of caregivers and 60% of patients endorsed no anxiety symptoms, 45% of caregivers and 40% of patients scored symptomatically. In terms of depressive symptoms, 54% of caregivers and 76% of patients scored asymptomatically and 46% of caregivers and 24% of patients scored symptomatically. Screenings of caregivers and their own child on the same date (N=11), showed the majority of paired scores were asymptomatic anxiety scores (N=5). In three caregiver-patient pairs, caregivers were asymptomatic and patients were symptomatic and in three caregiver-patient pairs, patients were asymptomatic and caregivers were symptomatic for anxiety. Depressive symptom screenings showed seven pairs were asymptomatic (N=11), two pairs showed caregivers were asymptomatic and patients were symptomatic, and two pairs showed patients without symptoms and caregivers with symptoms.

CONCLUSION: Fifteen months of screening shows that symptoms of anxiety and depression occurred in roughly half of patients with CF and caregivers. Patients reported lower levels of depressive symptoms than caregivers. Additional screenings of caregivers and their children are needed to more fully understand the nature and course of anxiety and depressive symptoms among caregivers and patients with CF.
IMPROVING THE RETRIEVAL RATE OF INFERIOR VENA CAVA FILTERS: IMPACT IF INFERIOR VENA CAVA FILTER RETRIEVAL IN THE OFFICE ENDOVASCULAR CENTER

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OBJECTIVES: Retrievable inferior vena cava filters (IVCFs) are important in the prophylaxis and treatment of pulmonary embolism (PE). Historically, IVCFs remained within the vena cava permanently unless significant complications attributed to the filter arose that necessitated its removal. However, a systematic review of adverse complications attributed to the long-term use of these filters performed by the FDA lead them to formally recommend the retrieval of IVCFs between 25 and 54 days post-insertion to ensure a favorable risk-benefit ratio. The current rates of compliance for this procedure remain low, merely 20% despite the FDA’s endorsement, perhaps due to the perceived complications and unclear recommendations for minimizing risk, as well as the lack of a standardized protocol for following patients post-insertion to increase compliance. The objectives of this study are: 1.) compare the removal rates between the hospital and office endovascular center (OEC) setting, and 2.) demonstrate the safety and utility of IVCF removal in the OEC setting.

METHODS: In this IRB-approved retrospective study, data was abstracted from the medical records of patients who had an IVCF placed by an OEC physician either in the clinic or OEC (Advanced Vascular Surgery in Kalamazoo, MI) and removed between January 2011 and January 2017. We assessed demographic data, indication for filter, risk factors, retrieval plan status, surgical strategy, complications, duration that the filter was in place, and the outcomes of removal.

RESULTS: IVCF retrieval was attempted in 116/214 patients, while the rest were lost to follow up, died, or the indication changed. Of the patients who had filters placed in the hospital, 76% (n=83) had a removal attempt in the OEC, while 14% had the filter removed in the hospital. All patients who had IVCFs inserted in an OEC had their filters removed in the OEC only (n=18). Of all the filters removed by physicians in this study, 87% (n=101) were removed in an OEC setting. A documented retrieval plan was found in the medical record of 95% of all patients. All filters were removed via the jugular approach, resulting in 99/101 successful removals (98%) in the OEC. The median time required for the filter removal procedure was 12 minutes. There was no 30-day mortality related to filter removal. Additionally, there were no bleeding complications, despite the fact that patients remained on anticoagulant therapy during the removal.

In 4% of patients, the filter was removed in less than 3 weeks, 29% of patients between 3 and 6 weeks, 26% of patients between 6 weeks and 3 months, and 40% of patients after 3 months.

CONCLUSION: This study showed comparable removal rates between IVCFs placed in the hospital and an OEC, but it highlighted the integral role an OEC can play in redirecting workflow to an out-patient setting with minimal complications and a streamlined procedure. Availability of an OEC may significantly increase filter removal compliance to meet the latest FDA recommendation. The study also suggests that the incidence of removal of retrievable filters improves with a well-documented removal plan, as evidenced by this study’s overall removal rate (54%) compared to the national average (20%). This study also demonstrated that retrievable filters can be safely removed in an OEC with extremely high success rates (98%), minimal complications, and without the need to interrupt the patient’s anticoagulation therapy.
EFFICACY OF ENHANCED RECOVERY AFTER SURGERY (ERAS) IN A COMMUNITY HOSPITAL SETTING

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INTRODUCTION: The benefits of Enhanced Recovery after surgery (ERAS) are well documented in the literature. ERAS studies have indicated faster recovery and reduced length of stay. Although institutional variability exists, the main aspects of ERAS include preoperative patient education, no routine bowel preparation, minimal peri-operative time spent Nil per os, carbohydrate/protein loading, minimizing narcotic use for pain relief, and conservative fluid administration. The relevance of ERAS has now been extended to encompass areas outside of colorectal surgery including hepatobiliary, orthopedics, vascular and gastric surgery. The enhanced recovery protocol was adapted at Bronson Methodist Hospital in Kalamazoo, Michigan in April of 2016. This is a 400 bed community based hospital. The purpose of this investigation is to compare clinical outcomes in patients before and after adaptation of ERAS to see if there was any change in length of stay, readmission rates, or rates of post-operative complications.

METHODS: Database was collected from de-identified data for patients undergoing laparoscopic, robotic or open surgical procedures by 2 colorectal surgeons at Bronson Methodist Hospital. Pre-ERAS group was based on 168 patients admitted to Bronson Methodist Hospital between April 2015 and April 2016. Post ERAS group included 164 patients and was admitted between March 2016 and August 2017. Data parameters included length of stay, readmission rates (within 30 days), and incidence of complications including return to operating room within 30 days, death, cardiac arrest, myocardial infarction, pneumonia, sepsis, Surgical site infection, unplanned intubations, and urinary tract infections. Data was generated by searching for keyword “colectomy” in principal CPT description. Surgical procedures included: partial colectomy with anastomosis, ileostomy, closure of enterostomy, colectomy with coloproctostomy, ileocolostomy, cecostomy, proctopexy for prolapse with sigmoid resection, surgical ileostomy or jejunostomy, complete proctectomy and combined abdominalperineal with colostomy, Hartman's type colostomy with partial colectomy.

ERAS order set comes into effect in post operative recovery unit and includes lactated ringers at 75cc/hr, ondansetron injection 4mg PRN for 1 dose, promethazine 6.25mg PRN for 1 dose, fentanyl 50mcg/ml 25mcg q15 minutes for 2 doses PRN for moderate pain. Oxycodone IR 5mg for 1 dose PRN for moderate pain, fentanyl 50mcg/ml 25 mcg q15 minutes PRN for severe pain for 2 doses, oxycodone IR 10mg for 1 dose for severe pain. Once transferred to the general surgical floor, nursing staff would have the patient ambulate immediately. Patient would be on clear liquid diet and advanced as tolerated within 4 hours of being back in the general surgical floor.

For statistical analysis, continuous non-normally distributed variables such as length of stay were analyzed using the Wilcoxon Mann-Whitney U test. Categorical variables were analyzed using chi-square or when appropriate Fishers exact test. To protect against a type I error, the resulting p-value from each of the 10 statistical tests was compared to the Bonferroni corrected alpha=0.05/10=0.005.

RESULTS: A total of n=332 observations (164 pre and 168 post) were included. For each of readmission within 30 days, return to OR within 30 days, death within 30 days of procedure, any cardiac arrest, myocardial infarction, pneumonia, sepsis, SSI, surgical site complication, and UTI, there was not a significant difference in the frequencies between the pre-period and the post-period as compared using Bonferroni adjusted alpha level. Mean hospital length of stay of 6.2 days in pre-ERAS group and 4.7 days in post-ERAS group, this was not statistically significant.

DISCUSSION: Overwhelmingly, studies have found statistically significant reduction in hospital length of stay with no significant change in perioperative morbidity or mortality. This is generally in line with our findings. Our investigation revealed a mean hospital length of stay of 6.2 days in pre-ERAS group and 4.7 days in post-ERAS group. Although the results do not achieve statistical significance there is an obvious trend. This may partly be due to the relatively small sample size. Our results also verified that there was no statistically significant difference in any of the post operative complications. This indicates that there may be a benefit in implementation of ERAS without any added risks to the patients. Moving forward we plan to pursue larger sample size and to further delineate differences between open, robotic, and laparoscopic surgeries.
EMERGENCY DEPARTMENT UTILIZATION OF CAT SCANS IN EMBOLISM (EDUCATE)

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A pulmonary embolism is a blood clot in the pulmonary vasculature that potentially has a high morbidity and mortality. Diagnosis can be difficult given a wide variety of clinical presentations. At this time, the gold standard for diagnosis of a pulmonary embolism is CT angiography. Per Glenn et al, nearly 120 million people visit an emergency department a year nationally, of which 1.5% receive a CT angiogram. Although CTA is highly sensitive, it warrants further consideration including increased costs of imaging, radiation exposure, as well as over-diagnosis and anti-coagulation of clinically irrelevant pulmonary emboli with minimal clot burden. Thus, it is important to risk stratify which subset of the population is appropriate for CTA. Currently, clinical decision making tools including the Wells criteria and PERC criteria aid physicians in the diagnostic decision making process of a pulmonary embolism.

OBJECTIVE: The aim of this study is to determine whether the implementation of an electronic clinical decision making tool (eCDT) prompt within the EMR system affected change in the utilization of CTA in the diagnosis of pulmonary embolism in non-pregnant patients at least 18 years of age and older at Borgess Medical Center Emergency Department.

METHODS: A retrospective study was conducted to analyze the rate of CTA utilization 12 months prior to and 12 months after the implementation of the Wells’ eCDT using the Pearson Chi-square test of independence. All non-pregnant patients at least 18 years of age and older at Borgess medical Center Emergency Department were included. In May of 2016, Borgess Medical Center implemented an electronic medical record (EMR) prompt requiring all ED providers to calculate a Wells’ score prior to ordering a CTA in the effort to prevent improper utilization of imaging.

RESULTS: Prior to implementation of the eCDT between May 29, 2015 and May 29, 2016, a total of 53,421 patients were seen at Borgess Medical Center of which 612 patients or 1.15% of patients received a CTA. Following implementation of the eCDT between May 30, 2016 and May 30, 2017, a total of 51,446 patients were seen at Borgess Medical Center of which 560 or 1.09% received a CTA.

CONCLUSIONS: The implications of this study are clinically relevant as the current belief is that the mandatory eCDT prompt prior to ordering a CTA is time consuming to complete in a busy emergency department and likely does not accomplish the goal of improving proper CT utilization in the diagnosis of a pulmonary embolism. The results of this study may improve physician willingness to accurately complete the eCDT and validates further research into implementing additional eCDT EMR prompts at Borgess such as a NEXUS eCDT prompt in the CT evaluation of cervical spine injuries in trauma.
COMPARISON OF PRE-HOSPITAL SURVIVAL OF MANUAL AND MECHANICAL CPR USING THE LUCAS-2: A RESTROSPECTIVE STUDY

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BACKGROUND: Cardiopulmonary resuscitation (CPR) is an essential tool in the delivery of emergency medical services (EMS), and one of the most studied components of EMS delivery in the last decade. The vast majority of this research focuses on the delivery of manual CPR. Since its introduction in 2003, several studies have examined the impact of the LUCAS-2, a mechanical CPR device. However, the variability in setting, protocols and training that exists across different EMS services presents a challenge in translating recommendations from one EMS service to another. As such, a preliminary analysis of the effects of the LUCAS-2 in a particular EMS service is a useful and necessary first step in understanding the impact of the device in that population.

METHODS: Retrospective EMS patient records from the last 3 years which included manual CPR or LUCAS-2 as interventions were obtained through the HealthEMS database. These were divided into three groups: manual CPR only, LUCAS-2 only, and both. A preliminary chi-square test was performed to measure pre-hospital survival differences in each group. In addition, a logistic regression was performed to assess the relationship between the use of the LUCAS-2 and other parameters, including: age; time from 911 call to patient contact; cardiac arrest prior to EMS arrival; presence of pulseless V-tach or V-fib (pVT/VF); unconscious status at the time of patient contact; asystole; PEA. In turn, the above parameters can all affect the outcome of CPR, therefore the three groups were subdivided based on the presence or absence of these parameters individually, and compared against each other.

RESULTS: The preliminary chi-square test showed that there is no difference in outcome between the CPR and LUCAS-2 groups (p = 0.802). It also showed that the choice to use the LUCAS-2 was not statistically associated with age, cardiac arrest prior to EMS arrival, pVT/VF, unconscious status, asystole and PEA. While a statistically significant association between time from 911 call to patient contact was present, the coefficient of partial determination was very small and therefore not predictive of a relationship between this parameter and the outcome variable. When normalizing for each of the following parameters, the three groups did not demonstrate a statistically significant difference in outcome in the presence or absence of: pVT/VF, asystole, PEA, and unconscious status.

DISCUSSION/CONCLUSION: These results suggest that use of the LUCAS-2 has not been associated with statistically significantly different pre-hospital survival than standard manual CPR. There are several limitations to the study design that must be considered. Our data pertain to one EMS system. Our data did not provide information on hospital course or cerebral performance category upon discharge from the hospital. While we examined potential bias in the choice of intervention using recorded parameters, it would also be ideal to assess other unknown parameters that may influence a crew member’s choice of manual CPR vs LUCAS-2 intervention. Finally, the value of the LUCAS-2 might extend beyond its CPR function, as it also frees up a crew member to perform other tasks. All of the confounders associated with out-of-hospital cardiac arrest, however daunting, provide future direction in the study of mechanical CPR.
SURGICAL RECONSTRUCTION TECHNIQUE OF TWO PATIENTS WITH TARSAL TYPE PREAXIAL POLYDACTYLY: TWO TRUE PREHALLUCES

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INTRODUCTION: Limb anomalies are relatively common and of these, polydactyly of the foot occurs in 1.7 cases per 1000 live births, comprising 45% of congenital abnormalities of the foot. The majority of reported polydactyly cases of the foot are postaxial, only 15% are preaxial polydactyly and tarsal type preaxial polydactyly (a true prehallux) occurs in only 3% of preaxial polydactyly cases. Due to the rarity of tarsal type preaxial polydactyly, there is minimal literature available to guide management. Potential treatment options include observation, shoe modification to accommodate the extra digit, a simple surgical resection of the extra digit by cutting all attaching structures, or a surgical resection with identification of the extra extensor tendon going to the extra digit and transfer of this tendon to the remaining foot near its normal insertion.

CASE HISTORY: Two newborns presented with similar tarsal type preaxial polydactylies in the context of VACTERL syndrome at a single institution. Patient 1 initially presented at birth with an accessory digit arising medially from the right foot at what appeared to be the level of the medial malleolus. Two weeks later, seemingly unrelated, patient 2 presented at birth with an accessory digit arising medially from the right foot at what appeared to be the level of the navicular. Due to concerns regarding interference with shoewear and cosmesis, both patients underwent resection of the extra digit and reconstruction including transfer of the accessory anterior tibial tendon arising from the preaxial extra digit to the remaining first ray. Two years following surgery both patients are walking well with preserved dorsiflexion strength. One patient utilizes a supramalleolar foot orthosis to support flexible hindfoot valgus, and both are able to wear shoes without difficulty.

DISCUSSION: Given the rarity of publications of similar cases with surgical treatment and outcomes reported, this case report demonstrates the management of these two patients to better guide future patient care. While nonsurgical treatment with shoewear modification is an option, surgical reconstruction facilitated wearing typical shoes while preserving ambulatory ability. It is important to note that both patients in this series had an accessory anterior tibial tendon, and this tendon appeared to be the dominant dorsiflexor of the ankle in one patient. Transferring this tendon during surgical reconstruction, rather than simply releasing it, prevented loss of dorsiflexion strength and foot drop postoperatively.
Survival After a Severe Case of Metformin-Associated Lactic Acidosis

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Metformin is an oral anti-hyperglycemic agent that is recommended as first line therapy for type 2 diabetes mellitus. A rare but widely recognized side effect of its use is metformin-associated lactic acidosis (MALA). It occurs in less than 10 in 100,000 patients being treated with metformin and carries a mortality rate of nearly 50%. We present a case of severe metformin-associated lactic acidosis and discuss the implications for current practice guidelines.

A 66-year-old male with a past medical history of bipolar disorder, type 2 diabetes mellitus (T2DM), and stage 3 chronic kidney disease (CKD) with baseline glomerular filtration rate (GFR) of 46mL/min presented to the emergency department (ED) complaining of shortness of breath and malaise. His T2DM had been treated with metformin therapy for over ten years. In the ED, labs were remarkable for blood glucose of 60mg/dL, GFR of 4mL/min, lactic acid >20mmol/L, and a high anion gap of 55mmol/L. His arterial pH was 6.83 with a bicarbonate level of 3mmol/L. Computed tomography of his abdomen and pelvis showed non-specific distended loops of bowel. He became obtunded in the emergency department and was intubated for airway protection and subsequently admitted to the intensive care unit. He was started on continuous renal replacement therapy with intravenous bicarbonate for two days after which the serum bicarbonate, lactic acid, and anion gap were corrected and stable. He required intermittent hemodialysis three times weekly for three weeks, after which his renal function improved and dialysis was discontinued. At two-month follow-up, his GFR was 32mL/min and he otherwise made a complete recovery.

In 2016, the guidelines for the use of metformin were liberalized to incorporate more patients with renal insufficiency, including those with a GFR of 30-45mL/min. Thus, with these more inclusive criteria, along with an increasing incidence of T2DM, a growing number of patients will be prescribed metformin. Consequently, an increasing number of patients will develop MALA, even when metformin is appropriately prescribed, as in this case. Our patient had severe metabolic derangements with nearly non-survivable lactic acidosis, received the standard therapy for MALA, and lived. While early recognition and appropriate therapy can lead to favorable outcomes, predicting the potential for MALA before it occurs would be immensely valuable. This highlights an area for research into a tool for monitoring patients on metformin therapy in order to predict early toxicity and thus prevent this potentially deadly side effect. Similarly, a tool that analyzes laboratory data to identify patients at higher risk of mortality if they develop MALA would also be beneficial. In clinical practice, physicians must be alert to the indications and implications of prescribing metformin.
DEATH DUE TO ATYPICAL URINOPTHORAX FOLLOWING PRECUTANEOUS NEPHROLITHOTOMY: CASE REPORT AND REVIEW OF LITERATURE

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INTRODUCTION: Urinothorax refers to urine in the pleural space, and is a rare cause of pleural effusion. Urinothoraces can occur secondary to urinary obstruction (e.g. renal calculi), trauma, retroperitoneal inflammation or malignancy, and surgical procedures that produce pleuroretroperitoneal fistulas. As a cause of pleural effusion, they can lead to dyspnea, severe pulmonary complications, and death. Here we present a case of urinothorax secondary to percutaneous nephrolithotomy that resulted in unilateral lung collapse and death. The purpose of this case is to highlight urinothorax as a cause of death, its distinguishing biochemical profile, and its diagnostic features found on autopsy.

MATERIALS: This case was selected from the files of one of the authors, Joseph A. Prahlow, M.D.

CASE REPORT: A 39-year-old female presented to the emergency department with right-sided low back pain and dysuria. Her past medical history was significant for hypertension and recurrent urinary tract infections over the past 2 years. An abdominal and pelvic CT showed a large staghorn calculus occupying most of the upper and middle pole caliceal system of the right kidney. After a urine culture revealed a Proteus mirabilis infection, the patient was treated with levofloxacin as an outpatient.

The patient was then offered percutaneous nephrolithotomy. After upper and lower pole accesses were successfully placed, the patient returned to her hospital room in stable condition. However, she became febrile overnight, and so ampicillin and gentamicin therapy were provided throughout her stay.

On post-operative day (POD) 1, the patient remained febrile and complained of pain in her right lower back and with deep inspiration. CXR was performed and revealed increased right pleural fluid. On POD 2 the patient continued to be febrile and her breath sounds were decreased bilaterally. On POD 3, the patient’s pain decreased and her nephrostomy tube was removed. However, she continued to have difficulty breathing and was found apneic later that evening. Resuscitation was attempted but unsuccessful.

Autopsy revealed marked compression and collapse of the right lung as well as a right-sided 1,200 mL pleural effusion consisting of cloudy yellow fluid which smelled like urine. Examination of the chest wall and right hemidiaphragm revealed a surgical track that originated from the skin of the back at the 10th intercostal space, crossed the right pleural cavity, went through the right hemidiaphragm, and ended in the upper pole of the right kidney. The primary cause of death was listed as complications of right percutaneous nephrolithotomy, with right urinothorax and collapse of right lung.

DISCUSSION: Urinothoraces as a cause of pleural effusion can be missed due to their perceived rarity and a lack of awareness. They can also be incorrectly classified due to their unusual biochemical pattern including transudative characteristics that deviate from Light’s criteria. Furthermore, presenting cases may differ from the established diagnostic criteria resulting in decreased clinical suspicion. Nevertheless, they can cause respiratory failure and death. Thus, when analyzing a case involving urinary tract infections, pleural fluid, and respiratory complications, it is important to keep this diagnosis within the realm of possibility.
FIRST REPORTED DELAYED REPAIR OF PARAVALVULAR LEAK POST TRANSCATHETER AORTIC VALVE REPLACEMENT (TAVR)

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INTRODUCTION: While surgical aortic valve replacement (SAVR) has long been the standard for aortic valve replacement (AVR), transcatheter aortic valve replacement (TAVR) has become increasingly more common, particularly in populations at high risk for adverse surgical outcomes. While it is considered safer in this regard, it is nonetheless associated with a variety of non-surgical valvular, cardiovascular, pulmonary and hematologic complications. Notably, paravalvular leak (PVL) is estimated to occur after 85% of cases of TAVR, and persisting for 1 year in 75% of cases. PVL presents within a relatively brief window of time (median = 4 months) and it is typically repaired within a short period of time. PVL is associated with several risk factors, including annular calcification and endocarditis, and estimates of 10-year survival after the procedure range from 30% to 88%.

STUDY PURPOSE: This study discusses a case of percutaneous PVL repair taking place approximately 6 months after a TAVR procedure. While cases of PVL incidence and subsequent repair that exceed 6 months after SAVR are present in the current literature, we could not find this same timespan in TAVR cases, particularly considering that the onset of PVL symptoms and repair spanned the majority of those 6 months.

CASE REPORT: An 83-year old woman underwent TAVR in March 2016. During this procedure, a presumed wire perforation caused left ventricular injury and tamponade, the latter requiring drainage of the pericardial effusion. We presume that PVL was likely present at the time of this procedure, but could not be repaired due to the aforementioned complications. It is likely that the surgical team at this hospital chose to pursue aggressive pharmacological therapy to mitigate symptoms while the left ventricular wall healed.

Following the procedure, the patient presented to us approximately six months later complaining of severe exertional dyspnea following the procedure, which did not resolve itself (NYHA Class III dyspnea with exertion). She denied any anginal symptoms, palpitations, syncope or bleeding. She reported difficulty pronouncing words correctly for one month following the procedure, but this resolved itself. She denied any stroke-like symptoms, including slurred speech, unilateral weakness or paralysis, facial droop or changes in vision. She denied cough and dyspnea at rest.

A TEE demonstrated moderate aortic PVL. History obtained at this time did not reveal any changes, including the persistence of severe exertional dyspnea. Significant physical exam findings included transmission of murmur to the right carotid, no JVD, harsh early peaking grade 2/6 systolic ejection murmur, blowing grade 2/6 decrescendo in the left sternal border, lack of S3, peripheral pulses 2+, and lack of peripheral edema.

Repair of the PVL by balloon aortic valvuloplasty was completed in October 2016. While calcification of the native aortic valve prevented optimal balloon expansion during the first two attempts, this was ultimately accomplished after two successful inflations. TEE demonstrated a trivial leak. Supravalvular aortography demonstrated no evidence of aortic insufficiency.

DISCUSSION/CONCLUSION: To our knowledge, this is the first case study in the current literature describing a case of PVL repair 6 months after the original TAVR. The success of balloon aortic valvuloplasty in the repair of PVL provides a promising outlook for future cases that follow a similar timeline. Continuing follow-up, we will be able to report on the natural history of this case, and provide a point of comparison against cases where the interval between TAVR and PVL repair is shorter.
PROXIMAL BICEPS TENODESIS INCORPORATED INTO ROTATOR CUFF REPAIR

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PURPOSE: Multiple different techniques have been described for performing long head of the biceps tenodesis but most of these studies are biomechanical with few clinical studies. Presented here is a study evaluating the outcomes of an all-arthroscopic intra-cuff tenodesis technique.

METHODS: 19 patients were followed for an average of 2.0 years after biceps tenodesis and concomitant rotator cuff repair. A suture anchor was placed for the rotator cuff repair. The biceps was tenotomized arthroscopically. Suture from the most medial and anterior rotator cuff repair anchor was shuttled through the biceps tendon followed by the rotator cuff. This suture was then tied incorporating the biceps tenodesis into the cuff repair.

RESULTS: ASES scores improved from 45.9 pre-operatively to 91.6 at 2 years (p<0.001). VAS scores improved from 5.2 pre-op to 0.7 at 2 year follow up (p<0.001). 18 patients had a positive Speed’s test pre-operatively and all 18 had a negative test at 5 months post-operatively. 21 patients had bicipital groove tenderness pre-operatively which resolved in all 21 patients at 5 months post-op. Two patients had cramping pain at 2 years. There were no reoperations. No complications occurred in the study group.

CONCLUSION: All-arthroscopic intracuff biceps tenodesis appears to be a safe and reliable option for biceps pathology with a concomitant rotator cuff tear. Advantages of this technique include the all-arthroscopic technique and the decreased cost of avoiding an extra anchor or hardware.
PSYCHIATRIC MANIFESTATIONS OF ADULT-ONSET STILL’S DISEASE AND TREATMENT
CONSIDERATIONS
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INTRODUCTION: Adult-Onset Still’s Disease (AOSD) is a rheumatologic disorder characterized by quotidian fevers, arthritis, arthralgias, tachycardia, and evanescent rash. Rarely, psychiatric symptoms are reported. Although etiology and pathophysiology is still unknown, treatment includes a prolonged course of corticosteroids that could precipitate or exacerbate psychiatric symptomatology such as mood dysregulation and/or psychosis. Here we observe how the treatment of rheumatologic disorders can manifest into neuropsychiatric symptoms.

CASE PRESENTATION: The patient is a 32 year old Caucasian female with a past medical history significant for rheumatoid arthritis and a psychiatric history of postpartum depression who was initially admitted to the psychiatric unit for evaluation of bizarre behavior, auditory hallucinations, and delusional thought content. She was transferred to the medical service for persistent tachycardia, fever, disorientation, bilateral wrist swelling, and arthralgia. A thorough workup was conducted which ultimately led to a diagnosis of AOSD. Yamaguchi & Fautrel’s Criteria were utilized in diagnosis. Prednisone 60mg daily was started and she was medically stabilized. However, she was not near her baseline and was subsequently transferred to the psychiatric unit. On admission, the patient exhibited symptoms consistent with manic episode with psychotic features (auditory hallucinations, paranoid delusions). Prednisone taper was continued. We initiated treatment with risperidone and valproic acid. The patient began showing a slight improvement over the course of four days while titrating risperidone. This improvement continued after the addition of valproic acid. The patient was monitored for 7 days after starting valproic acid and at discharge exhibited significant improvement in mood stability, thought process, and resolution of psychosis. The patient continued treatment with risperidone, valproic acid, and prednisone taper following discharge. Review of outpatient documentation indicates that since completing the prednisone taper she has not experienced a relapse of these symptoms.

DISCUSSION/CONCLUSION: Psychiatric symptoms such as those described above are very rarely reported in literature regarding AOSD. However, a well known adverse effect of systemic corticosteroid treatment is the potential to precipitate a variety of psychiatric and cognitive symptoms even in patients without a history of psychiatric disorders. The incidence of symptoms varies depending on dose.

It is difficult to determine a solitary precipitating factor for the patient’s reported psychiatric symptoms and as such multiple factors likely played a role. The patient may have been exhibiting neuropsychiatric symptoms associated with AOSD. This is reinforced by reported failure to respond to therapy with atypical antipsychotic monotherapy prior to this admission and significant improvement with combination therapy involving high dose oral prednisone and subsequent taper, risperidone, and valproic acid. Exacerbation of mania and psychotic symptomatology coincides with initiation of high dose prednisone and their continued improvement with completion of the prednisone taper reinforces this idea. This case underlines the importance of recognizing and treating psychiatric symptoms in patients with rheumatologic conditions, especially those on high dose systemic corticosteroids. Improvement with a standard therapy for bipolar I disorder suggests that the psychiatric manifestations should be managed similarly to the primary psychiatric disorder.
IMPROVING POINT-OF-CARE ULTRASOUND PROFICIENCY OF PRIMARY CARE RESIDENTS THROUGH A FORMAL, FACULTY-LED TRAINING COURSE

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INTRODUCTION: Point-of-care ultrasound (POCUS) is gaining momentum as a tool with the capability to improve patient care. POCUS has been shown to enhance the information gathered by physicians during physical examinations, and also plays a major role in improving procedural outcomes. In addition, ultrasound is portable, cost-effective, non-invasive, and does not expose the patient to radiation as with other imaging modalities. Despite its utility, the vast majority of primary care residents in the United States receive little to no training in POCUS during their residency. The purpose of this study was to evaluate an ultrasound-training program for primary care residents and assess participants self-rated proficiency in POCUS before and after the course.

METHODS: Over a 6-month period, a 10-session ultrasound course took place, involving 45 residents in primary care specialties. The course was led by a medicine-pediatrics faculty member with a broad experience in multiple areas of ultrasound training. The course took place from September 2017 through February 2018. Each session lasted 2-hours and consisted of both a didactic lecture and hands-on supervised scanning time. Participants were expected to complete required readings and to view a variety of training videos demonstrating organ or exam specific ultrasounds prior to each session. Participants were surveyed prior to and following the course. The survey aimed to primarily assess participants self-rated proficiency in POCUS.

RESULTS: The pre-survey response rate was 53.3%. The majority of participants reported some degree of prior POCUS exposure, mainly for procedures (58.3%) or on patients for diagnostics (50%). Several residents involved in the course (25%) had no prior POCUS training. Participants were asked to rate their proficiency within 16 different POCUS categories on a 5-point Likert scale (1 = not at all proficient, 5 = expert). The areas where residents identified greatest proficiency were in using ultrasound for procedures (2.66), pulmonary exam (1.75) and cardiac echocardiography (1.65). The average score between all 16 categories was 1.42. The post-survey had a response rate 40%. Self-rated proficiency was highest for POCUS use for procedures (3.66), pulmonary exam (3.05) and examination of the kidneys (2.94) and bladder (2.94). The average score for all 16 categories 2.45.

DISCUSSION: Our study showed that a 10-session POCUS course consisting of self-study, didactic, and hands-on practical experience yielded significant improvement in self-rated proficiency with POCUS. Including all 16 categories assessed, respondents indicated an absolute increase in self-rated POCUS proficiency by 1.03 points on a 5-point Likert scale. This amounts to a relative 72.5% increase in self-rated proficiency. There was an increase in self-rated proficiency in every category included in the survey (16/16), even those where there was no formal teaching in the course (obstetrics, POCUS for procedures). This demonstrates a broader increase in comfort with performing POCUS from the course, including the mechanics of machine use, as well as obtaining and interpreting images, as opposed to simply enhanced exam-specific proficiency.

Overall, our study demonstrated the benefit of a 10-week POCUS course for primary care residents. These benefits included enhanced self-rated proficiency in using POCUS for a variety of examination categories and provided an avenue for residents to practice hands-on ultrasound scans on their colleagues to enhance familiarity with using POCUS in the clinical setting.
ANALYSIS OF DOSING ERRORS MADE BY PARAMEDICS DURING SIMULATED PEDIATRIC PATIENT SCENARIOS AFTER IMPLEMENTATION OF STATE-WIDE PEDIATRIC DRUG DOSING REFERENCE

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BACKGROUND: Medication errors occur at a high rate for prehospital pediatric patients. Epinephrine dose errors have been ≥ 60%. To reduce errors, Michigan implemented a pediatric dosing reference (PDR), with doses listed in milliliters, the requirement that doses be drawn into a smaller syringe from a pre-loaded syringe using a stop cock and dilution of drugs to standard concentrations.

PURPOSE: To evaluate the prevalence of medication errors by paramedics treating pediatric patients after the implementation of a state-wide PDR.

METHODS: 8 EMS agencies completed 2 validated, pediatric scenarios: infant seizing and infant cardiac arrest. Agencies were private, public, not for profit, for profit, urban, rural, fire-based and third service. Simulations took place in a simulation center or mobile simulation unit. EMS crews used their regular equipment with sham drugs and were required to carry out all the steps to administer a drug dose. Two evaluators scored crew performance via direct observation and video review. A dose error was defined as ≥ 20% difference compared to the weight-appropriate dose. Descriptive statistics were utilized.

RESULTS: 80 simulations have been completed and initial analysis has been conducted using descriptive statistics. The majority of crews were EMTP/EMTP. In cardiac arrest scenarios, 8/20 (40%; 95% CI 18.5%, 61.5%) epinephrine doses were incorrect. In 0/20 doses, there was no cross check of the drug volume prior to administration. There were 6, ten-fold overdoses and one, ten-fold underdose. In seizure scenarios, 5/11(45%; 95% CI 16%, 74.9%) benzodiazepine doses were incorrect (2 underdoses, 3 overdoses). 2/9 (22%; 95% CI 0%, 49.4%) drug dilutions were incorrect resulting in large dosing errors. In 1/10 cases (10%; 95% CI 0%, 28.6%) the crew was unable to dilute D50 to D25. Unrecognized air bubbles were frequently entrained in the administration syringe resulting in underdoses. In 11/20 (55%) of cases there was an error using the length-based tape for weight determination.

CONCLUSION: Epinephrine dose errors have decreased since implementation of PDR, but frequent ten-fold errors still occur. Cross checks of drug doses do not occur. Errors occur with dilution and length-based tape use. Error reduction strategies are needed for pediatric prehospital drug administration.

DENOMINATOR: 13 sims per case

Epi 1:10,000
Adrenalin vs adenosine
Air bubbles
Little closed loop and no cross check
Error of omission (checking bld glc, not giving epi for anaphylaxis )
Error of commission (repeat doses of midaz)
Faulty use of the BLT (not pulling child out straight or not measuring in sections)
Using BLT for doses, confusion whether to use BLT or cards
Errors with dilution (too much too little)
CREATION OF A LONGITUDINAL ELECTIVE TRAINING FOR MEDICAL STUDENTS TO ADDRESS HEALTH INEQUITIES: A FOCUS ON SOCIAL DETERMINANTS OF HEALTH, ANTI-RACISM, AND IMPLICIT BIAS

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BACKGROUND/INTRODUCTION: Studies show structural racism and implicit bias are significant contributors to health inequity. It is essential that all healthcare providers, especially new providers, are not only competent in the science of medicine, but are also explicitly educated on social determinants of health, implicit bias, and structural racism.

OBJECTIVE/PURPOSE/RATIONALE: Medical students desire to have more health equity education in their curriculum, spending more time to discuss these topics in an active way and delve deeper into the material. Given the constraints of a medical school curriculum schedule, the authors decided to explore the creation of a longitudinal elective and evaluate its effectiveness as a means to educate on health inequity.

MATERIALS/METHODS: Medical students, administrators, the Arcus Center for Social Justice Leadership, and antiracism trainers from Eliminating Racism and Claiming/Celebrating Equality (ERACCE) collaborated to design an innovative, longitudinal elective course for M1 and M2 WMed students to explore racism, social determinants of health, and implicit bias. The longitudinal course consists of six (2.5 hour) Friday afternoon sessions and a 4-hour capstone session. Sessions are spread out over a 3-month period, and between sessions students are asked to complete experiential learning assignments, reflective journaling, and assigned TedTalk videos. Homework assignments are designed to connect students with the community and the social determinants of health that affect it. During sessions, students engage with material through active and facilitated learning, discussion, and reflection. Throughout the course students learn strategies and gain tools to address health inequity in their future roles as health providers. The course will culminate with individual student projects, where students reflect on their experiences, challenges, and growth. The cohort of students then work to develop a year-long campus-wide project to further health inequity discussions for the medical school.

RESULTS/DISCUSSIONS: There was strong student interest in this course; spaces were added to accommodate all interested students including those that had already complete their elective requirements. A preliminary survey of students, with 100% response rate (n=16) revealed that students talk about these topics with people outside of the course. Students felt the course provided a safe space to ask questions (94%) and express opinions (88%), and are motivated them to learn more (100%). Students expressed that the assignments and discussions have provided a “visceral experience,” “broadened [their] perspective,” and “motivated [them] to think critically about these topics.” Students stated they felt “inspired” and felt they could “grow out and have a much greater impact,” after taking this course.

CONCLUSIONS: Given the strong preliminary feedback from this pilot course, it is evident that medical students are interested in learning more about the factors impacting health inequity, as well as strategies that they can employ to reduce it. Engaging with a varied perspective in designing the course allowed for an interactive and reflective learning environment, which has made difficult conversations easier. A thorough longitudinal observation should be done to gather more data on the long term effectiveness of this style of course, as well as the impact that it can make to medical school education.
DEVELOPING A RESIDENCY WELLNESS CURRICULUM UTILIZING SELF-CARE PLANS

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BACKGROUND: The ACGME has placed an emphasis on implementing wellness guidelines, including processes to assess burnout and mechanisms to intervene if a resident is at risk. Our study aims to evaluate and improve resident understanding of wellness and burnout, and to develop a self-care plan in an effort to reinforce compliance and effect change in individual wellness behaviors.

METHODS: Residents and faculty from Internal Medicine, Med-Peds and Pediatrics were included in the study. A pre-survey was distributed to obtain baseline information regarding burnout, perceptions of wellness and reflections of the individual's state of wellness. An educational intervention was conducted as a five-hour workshop emphasizing signs of burnout and promoting self-reflection. Each resident and faculty member were educated and encouraged to create a self-care plan that included two wellness goals. Following the workshop, a post-survey assessed knowledge of burnout, wellness and self-care wellness plan initiation. After 3 months, participants were surveyed again to assess retention of knowledge about burnout and wellness, as well as the ability to follow through with a self-care plan.

RESULTS: A total of 48 respondents completed the pre-seminar survey. Of those 48 respondents, 26 (54.17%) also completed the post-seminar survey. The three-month follow up survey had a total of 22 (45.83%) responses. Frequent self-care domains chosen by participants included diet, physical exercise, and mindfulness/meditation. Prior to the five-hour workshop, 30.77% of respondents felt confident in their knowledge of resources for addressing burnout; this increased to 88.46% after the workshop, which was statistically significant (p-value = 0.0468). Although not statistically significant, at 3-months 63.64% of respondents were knowledgeable in regards to resources when experiencing burnout. On the pre-workshop survey and the 3-month follow up survey, 81.82% of respondents were personally satisfied with their work and 86.36% were happy with their career choice. Of those individuals that completed a self-care plan, there was increased awareness of the signs of burnout in themselves (66.67% vs 100%), signs in others (50% vs 100%) and resources available (50% vs 80%).

DISCUSSION: Although there has been a focus on physician burnout in the last few years, there are few studies that assess educational interventions to improve understanding of burnout and wellness. Our study demonstrates the continued need for a wellness workshop that focuses on diet, physical exercise and mindfulness/meditation. The workshop was successful in educating attendees on the resources available to address burnout. In addition, there have been no studies that have utilized self-care plans as part of a wellness educational intervention. Our results did not demonstrate a statistical significance for the impact of an individual's self-care plan on their perception of wellness due to sample size. However, there was a noted trend toward improved awareness of signs and resources. For future workshops, by providing time to create self-care plans, we anticipate that self-care plans will be efficacious in the future. Finally, although not formally assessed, individual self-care plans provide a guide of the domains and areas of need for the Wellness Committee to focus on interventions.
OLFACTORY BULB ASTROGLIAL RESPONSE TO OLFACORY ORGAN DAMAGE IN ADULT ZEBRAFISH

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Reactive glial cells are present in multiple neurological conditions including Alzheimer’s disease, ALS, and traumatic brain injury. In the mammalian CNS, astrocytes proliferate in response to CNS insults, and in severe cases will form a permanent glial scar. This is due to two distinct subclasses of astrocytes: scar-forming, and hypertrophic astrocytes. Zebrafish do not have mammalian-type astrocytes but instead have astroglia that have been shown to have processes and roles similar to mammalian astrocytes but also serve as a neural progenitors. Zebrafish have been shown to be a reliable model of neuroplasticity. Studying these astroglia in a regenerative model may lead to novel treatment methods of neurological disorders where reactive astrocytes are present.

In this study, we used the zebrafish olfactory system to study reactive astroglia in response to peripheral damage. Our hypothesis is that insults to the zebrafish olfactory organ will cause astroglia to react similar to mammalian astrocytes. The olfactory organ was damaged using a wax plug inserted into the right nasal cavity every twelve hours for varying time points, while the left organ was kept as an internal control. Astroglial processes in the olfactory bulb were observed and identified using antibodies for glial fibrillary acidic protein. Preliminary data suggests that astroglial processes proliferate in the olfactory bulb bilaterally up to and including seven days of olfactory organ damage, and return to control levels after the cessation of treatment. Our data also suggests that antibodies for a known astrocyte glutamate receptor, mGluR 2/3, increase in expression within the olfactory bulb after olfactory organ insult. Our data suggests there is no detectable scar found in the olfactory bulb after three weeks of recovery. These finding are similar to both hypertrophic and scar-forming astrocytes in the mammalian CNS. However, the non-local hypertrophy of astroglial processes and the lack of scar formation are not indicative of mammalian astrocytes. These unique glial populations might be the key to understanding the dynamic neuroplasticity of zebrafish. Further study of reactive glia in zebrafish may eventually lead to novel medical practices for a wide variety of neurological disorders.
A STRESS-ENHANCED MODEL FOR DISCOVERY OF DISEASE-MODIFYING GENE: ECE1-SUPPRESSES THE TOXICITY OF α-SYNUCLEIN A30P

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Parkinson’s Disease (PD) is a progressive motor neurodegenerative disorder, characterized by a selective loss of dopaminergic neurons in the substantia nigra. The complexity of disease etiology includes both genetic and environmental factors. No effective drug that can modify disease progression and protect dopamine neurons from degeneration is presently available. Human α-Synuclein A30P (A30P) is a mutant gene identified in early onset PD and showed to result selective dopamine neuron loss in transgenic A30P flies and mice. Paraquat (PQ) is an herbicide and an oxidative stress generator, linked to sporadic PD. We hypothesized that vital PD modifier genes are conserved across species and would show unique transcriptional changes to oxidative stress in animals expressing a PD-associated gene, such as A30P. We also hypothesized that manipulation of PD modifier genes would provide neuroprotection across species. To identify disease modifier genes, we performed two independently-duplicated experiments of microarray, capturing genome-wide transcriptional changes in A30P flies, chronically fed with PQ-contaminated food. We hypothesized that the best time point of identifying a disease modifier gene is at time when flies showed maximal combined toxicity of A30P transgene and PQ treatment during an early stage of disease and that effective disease modifiers gene are those showing transcriptional changes to oxidative stress in A30P expressing and not in wild type animals. Fly Neprilysin3 (Nep3) is one identified gene that is highly conserved. Its mouse and human homolog is endothelin-converting enzyme-1 (Ece1). To investigate the neuroprotective effect of Ece1, we used NS1 cells and mouse midbrain neurons expressing A30P, treated with or without PQ. We found that ECE1 expression protected against A30P toxicity on cell viability, on neurite outgrowth and ameliorated A30P accumulation in vitro. Expression of ECE1 in vivo suppressed dopamine neuron loss and alleviated the corresponding motor deficits in mice with A30P-expression. Our study leverages a new approach to identify disease modifier genes using a stress-enhanced PD animal model.
SEQUENCE AND STRUCTURAL DETERMINANTS OF POLYCYSTIC KIDNEY DISEASE

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Autosomal Dominant Polycystic Kidney Disease (ADPKD) is a severe but relatively common (1/500 incidence) renal disease. It results from an inherited mutation in one \textit{PKD1} gene, followed by a “second hit” mutation in the other normal gene leading to a cellular recessive mechanism. The \textit{PKD1} gene appears to be prone to these somatic inactivation events, but the mutagenic mechanisms are unknown. Moreover, suitable molecular markers for diagnosis and prevention remain elusive. We have discovered that the \textit{PKD1} gene in humans contains repeats of guanine capable of forming four-stranded structures known as G-quadruplex (G4) DNA. G4 DNA is a structure that leads to genetic instability, and it is found at oncogenic translocation hot spots, cancer genes, and at sites of recombination. Interestingly, the murine \textit{Pkd1} homolog is not prone to mutation like the human gene, so we compared the genome sequences to look for patterns that may explain the differences in mutation rate. Compared to human, murine \textit{Pkd1} is not repetitive. The human homolog contains G4 sequence motifs throughout the gene, and extensive repeats concentrated in several introns. Circular Dichroism spectroscopy confirms that those sequences indeed adopt G4 structures in solution. Our results suggest a mechanism for \textit{PKD1} inactivation and the emergence of ADPKD. G4 structure formation during replication or transcription blocks polymerase activities, leading to DNA breaks and recombination. This elevates the risk of sequence changes that inactivate the gene. Our results not only provide a molecular rationale for ADPKD, but also identify a DNA structure within \textit{PKD1} that could be targeted for diagnosis or disease prevention.
HISTOLOGIC CHARACTERIZATION OF THE ANTERIOR INTERMENISCAL LIGAMENT (AIML) IN THE HUMAN KNEE: CHARACTERISTICS OF A POTENTIAL NEW CELL TYPE

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BACKGROUND: The anterior intermensical ligament (AIML) is a unique ligament that has only recently been described anatomically, while its functional role remains elusive. To date, few investigations have addressed the histological composition of the AIML and none, to our knowledge, have focused on the transition zone where the AIML inserts on the medial and lateral menisci. The purpose of our study is to investigate the histological characterization of the AIML, specifically looking at the cellular and collagenous distribution within this transition region. We hypothesize that there is a transition zone between the AIML body and the meniscus that represents distinct alterations in cellular and collagenous organization.

METHODS: The AIML was dissected in total from eight cadaveric knees and fixed in 10% neutral formalin at room temperature. The patient’s age, knee side, and intra-articular pathology to include chondral changes were documented. Samples were embedded in paraffin and 5 μm sections were taken incrementally at steps of 50 μm from both the medial and lateral meniscal insertions for examination under light microscopy. Sections were taken in both transverse and longitudinal planes. These sections were stained with hematoxylin and eosin and Masson’s trichrome stain to evaluate the extracellular matrix. Cadavers that had previous surgery to the knee were excluded from our study. This project was approved by the institution and determined to be IRB exempt.

RESULTS: There were four right knees and four left knees included from patients whose age ranged from 60 to 71 (mean 66.2 ± 4.76). Histologically, the body of the AIML was composed of tight and cohesively arranged, dense collagen bundles accompanied by numerous spindle-shaped fibroblasts, which is consistent with other ligamentous structures. However, both the cellular and collagenous organization within the transition zone differ markedly from that of the ligamentous body. There was a consistent alteration in the morphology of the ligament progressing from the distal body to the proximal insertions. This transition region showed variability between samples, but overall displays abundant collagen fiber disarray where collagen bundles interdigitate with fibrocartilaginous ground matrix. Furthermore, the cellular changes were observed within the regions in which alterations in collagen organization were apparent. These cells show both nuclear rounding and lacunar formation, which becomes more marked toward the proximal insertion sites. Thus, there was a progression from proximal spindle-shaped fibroblasts to intermediate cells with more rounded nuclei and variable lacunae to overt chondrocytes within fibrocartilaginous ground matrix distally.

CONCLUSIONS: Our samples allowed us to observe and characterize the detailed histological composition of the AIML throughout both its ligamentous body and meniscal insertions. Though these results are preliminary, there appears to be an intermediate cell type between that of a spindle-shaped fibroblast and chondrocyte, with apparent nuclear rounding and variable lacunar formation. Further investigation into the origin and intracellular characteristics of these cells are required to help identify this potentially new cell type as well as its possible role in cartilaginous growth and/or regeneration.
THE DIAGNOSIS AND PATHOGENESIS OF DIAMOND-BLACKFAN ANEMIA: VALIDATION OF A NOVEL RPL5 MUTATION

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Diamond Blackfan anemia (DBA) is a rare inherited bone marrow failure syndrome mostly caused by heterozygous mutations in ribosomal proteins, which play an essential role in protein translation and usually results in a severe macrocytic red blood cell (RBC) cytopenia along with congenital malformations. How a defect in the ubiquitous ribosome can lead to a specific failure of RBC formation is not well understood and requires further study. In this case study, we present a child with characteristic features of DBA along with a novel RPL5 mutation and concomitant SLX4 mutation. In this patient, the RPL5 mutation was discovered by genomic analysis performed by INVITAE labs. We are currently in the process of validating this novel mutation by polysome analysis in the laboratory, which we expect will reveal a decrease in large ribosome subunits as well as a decrease in total ribosome content. This case is also the impetus for a future study in which stem/progenitor cells will be isolated from patients with known or suspected DBA to confirm the diagnosis by DNA, RNA, protein, or polysome analysis. The study will also look at cell phenotypes of DBA patients vs normal patients vs. silent carriers who have a DBA mutation but no apparent hematological phenotype. Once an underlying aberrant pathway is identified, compounds targeting these pathways will be tested in vitro using cells from DBA patients to determine whether they correct the aberrant phenotype.
EMERGENCE OF IDIOPATHIC MAST CELL ACTIVATION SYNDROME STATUS POST HYSTERECTOMY IN A 44 Y.O. CAUCASIAN WOMAN

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Mast cell disorders may be attributed to neoplastic proliferation such as mastocytosis or inappropriate activation of mast cells known as Mast Cell Activation Syndrome (MCAS) as defined in 2010 proposed diagnostic criteria. MCAS is a multisystem disease with variable presentations, making diagnosis elusive and often delayed.

A 44-year-old Caucasian woman with history of hypothyroidism developed MCAS following hysterectomy for menometorrhagia. Before hysterectomy, patient experienced occasional hives and diarrhea. A few months after surgery, patient developed sudden reaction to food and medications, frequent urticarial reactions and flushing, mental fogginess, neck angioedema, bronchoconstriction with wheezing, and anal and bladder sphincter spasms. While patient manifested symptoms of mast cell disorder, her tryptase level was normal at 3.8 ng/mL. 24-hour urine Leukotriene E4 and 2,3-dinor 11B-Prostaglandin F2a were both normal at <51 pg/mg Cr and 2839 pg/mg Cr respectively, adding to difficulty of diagnosis. Further testing revealed elevated 24-hour urine N-methylhistamine at 224 mcg/g Cr. Bone marrow biopsy and peripheral blood flow cytometry including genetic analysis for Jak2, c-KIT, FIP1L1, and PDGFRA mutations were normal. Patient’s final diagnosis was idiopathic MCAS.

MCAS is a heterogeneous disease associated with increased risk of anaphylaxis. Treatment includes H1 and H2 antihistamines, mast cell stabilizers, leukotriene inhibitors, and occasionally prednisone. Although the patient did not tolerate cromolyn, she has tried H1/H2 antihistamines with some relief. She is currently trying imatinib. Self-injectable epinephrine and anaphylaxis education should be provided to MCAS patients. High index of suspicion is important for timely diagnosis and treatment that significantly improves quality of life.
MYOCARDIAL ABSCESS COMPLICATED BY COMMUNICATION WITH THE RIGHT ATRIUM: A SOURCE OF SEPSIS AND THROMBOTIC EVENTS

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INTRODUCTION: Myocardial abscesses are a serious and life-threatening condition that can originate as a complication of infective endocarditis or systemic infection. A variety of organisms are involved, but the most common is Staphylococcus aureus. Patients affected by myocardial abscesses typically have significant comorbidities that place them at risk, including malignancy, alcoholic hepatic disease, chronic renal failure, congestive heart failure, stroke, or various collagen diseases. The diagnosis of myocardial abscess can be aided by imaging, with transesophageal echocardiography (TEE) being highly sensitive and specific. Here we report a case of several complications arising from an aortic root abscess with communication into the right atrium in a patient with preexisting malignancy.

CASE DESCRIPTION: A 55-year-old female presented to the hospital twice within a span of several months for sepsis. She had a complex prior medical history of rheumatic heart disease with mechanical mitral valve replacement in 2013 and aortic insufficiency with mechanical aortic valve replacement in 2013. In addition, she had non-metastatic breast cancer for which she had received three rounds of chemotherapy, chronic obstructive pulmonary disease, coronary artery disease and congestive heart failure. On her first presentation, she had complaints of abdominal pain, respiratory distress and fever. She was admitted to the ICU for neutropenic fever and septic shock secondary to Escherichia coli (E. coli) pneumonia. On admission, she required intubation, vasopressors, and was started on broad spectrum antibiotics. Bronchial cultures grew E. coli and her blood cultures were negative. She later developed Clostridium difficile colitis. She continued to require ventilatory support throughout her stay in the ICU and a tracheostomy was subsequently placed. After this, she was weaned from vasopressors, her respiratory status improved and she was discharged to a nearby long-term acute care hospital (LTACH).

Five weeks later at the LTACH, she developed fever and leukocytosis. Sputum and blood cultures were obtained, including one set from her chemotherapy port placed three and a half months prior, which grew Methicillin Resistant Staphylococcus aureus (MRSA). Tissue samples from the port site also grew MRSA. She was started on broad spectrum antibiotics and Interventional Radiology removed the port. After nearly seven weeks at the LTACH, and two weeks after being diagnosed with MRSA bacteremia, the patient began to complain of left lower leg pain. Her left lower extremity appeared mottled and cool with non-palpable pulses. She was immediately transferred back to the primary hospital where she was admitted for complete occlusion of the distal left common femoral artery and proximal superficial femoral artery. On the second day of her readmission, she became hypotensive requiring vasopressors. She underwent a TEE for concerns of a septic emboli secondary to presumed MRSA prosthetic valve endocarditis. The TEE revealed large vegetation and an aortic root abscess adjacent to the mechanical aortic valve, which had perforated from the aortic root into the right atrium. There were additional smaller vegetations seen on the mechanical mitral valve. Later that night, the patient continued to decompensate and suffered a cerebral vascular accident resulting in right sided deficits, likely secondary to septic emboli. Family was notified and the patient was made comfortable. She passed away a few hours later with her husband at the bedside playing the guitar and singing to her.

CONCLUSION: Myocardial abscess with direct communication into the vascular system is rare and carries high mortality. It can be a continued source of recurrent sepsis or emboli and should be suspected in patients with high risk factors, such as those with a history of mechanical valve replacement.
A RARE OCCURRENCE OF PACEMAKER INFECTION WITH MYCOBACTERIUM ABSCESSUS: A CASE REPORT

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Nontuberculous mycobacteria (NTM) first gained widespread attention as a cause of opportunistic infection, namely by Mycobacterium avium complex. For the last several decades however, other NTM species have been increasingly identified as important pathogens behind both nosocomial and community-acquired disease. Since the 1990s, sporadic case reports of NTM infections of cardiac implantable electronic devices (CIEDs) have appeared. These represent approximately 0.2% of CIED infections, but have important clinical consequences. We present a case of CIED infection with Mycobacterium abscessus, which, to our knowledge, is only the third reported case in the literature.

A 63-year-old male presented to our emergency department with a three-day history of increased drainage from the site of his pacemaker extraction, performed nine days prior due to infection. Wound cultures taken during surgery were positive for Mycobacterium abscessus and Staphylococcus epidermidis and he was initially treated with linezolid and sulfamethoxazole-trimethoprim. Past medical history included sick sinus syndrome for which the pacemaker was placed, daily intravenous heroin use, and chronic hepatitis C. Exam revealed normal vital signs and an incision in the left upper chest with interrupted sutures in place and surrounding induration and mild erythema. Initial labs were significant for acute kidney injury, negative blood cultures, and pancytopenia felt to be secondary to his hepatitis C. Ultrasound imaging showed a large, multiseptated fluid collection, and fluid aspiration grew Mycobacterium abscessus. Multiple cardiac imaging studies showed thrombi thought to be secondary to pacemaker removal but no vegetations. In conjunction with the National Jewish Health Division of Mycobacterial and Respiratory Infections, a treatment plan was developed for a two-month induction phase with amikacin, cefoxitin, and clarithromycin followed by a 12-month maintenance phase with clarithromycin and clofazimine, the latter of which was obtained after IRB and the Food and Drug Administration (FDA) approval. Further debridement of the wound was deferred after consultation with multiple surgeons. At follow-up two months later, the patient was doing well with good healing of his surgical site and no new symptoms. This case highlights some of the unique qualities and challenges of NTM infections. Though ubiquitous worldwide in soil and water, NTM infection is uncommon and detection requires a high index of suspicion. Treatment is complicated by unpredictable resistance patterns, a need for compliance with up to year-long antimicrobial medications, and thoughtful evaluation of the use of arrhythmogenic drugs in patients with removed CIEDs. Finally, it describes a rare manifestation of extrapulmonary Mycobacterium abscessus disease.
BARRIERS TO HPV VACCINATION AT KALAMAZOO, MICHIGAN’S FEDERALLY-QUALIFIED HEALTH CENTER

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BACKGROUND: Human Papillomavirus (HPV) is the most common STI in the US and a cause of genital warts and cancer. Even though the HPV vaccine is safe and effective, the vaccination rate is low among the general population. Studies have shown that the underserved population has an even lower rate of vaccination, but have not elucidated the reasons for this low rate. This population presents with a unique set of obstacles, including lack of access to healthcare, that places them at a higher risk for HPV infection sequelae. Our study aims to explore the factors contributing to the low rates of HPV vaccination at the Family Health Center (FHC) in Kalamazoo, a Federally Qualified Health Center (FQHC). By determining the barriers to vaccine completion, we can improve the health of our community.

METHODS: Surveys were administered to vaccine-eligible (9-27 years old, male and female) FHC patients from September 2017 to January 2018 to elucidate self-reported vaccination status and to identify barriers influencing vaccine acquisition.

RESULTS: Survey results (n=98) indicate that 46% of respondents (patients or patients’ guardians) completed the multi-dose vaccination course, with 61.5% of those being female. Furthermore, 50% of white respondents reported being vaccinated, in contrast to 29.4% of African Americans. Of those vaccinated, common factors cited for obtaining vaccination include: “physician recommendation” (44%), “heard it was important” (37.5%), and “health” (25%). Of those not fully vaccinated, common factors cited for not starting or completing vaccination include: “vaccine is unsafe” (21.4%), “newness of the vaccine” (14.3%), “uncertainty about the vaccine and its side effects” (14.3%). Interestingly, individuals who had started, but not completed, the vaccination course reported that their provider had not spoken to them about future vaccines either at the time of the last vaccination (87.5%) or during the visit on which they completed the survey (50%).

DISCUSSION: This study reveals significant disparities in vaccination rates between the sexes and different racial groups, and also highlights the positive influence physician recommendation has on vaccination. The gender disparity in vaccination is unique to the HPV vaccine compared to other vaccines. The racial disparities and the influence of physician recommendation are in trend with nationwide rates. Interestingly, the frequently cited barrier of the vaccine’s potential effect on sexual behavior was expressed by 1 patient out of 98 surveyed, while previous studies have cited concerns over the sexualization of this vaccine. Based on our results, providers’ initiation to educate and remind patients about the HPV vaccine is a significant tool to minimize missed vaccination opportunities.
ASSESSMENT OF ORAL ANTIBIOTIC PRESCRIBING PRACTICES IN WMED OUTPATIENT CLINICS

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BACKGROUND: Inappropriate antibiotic use in the outpatient setting is a growing concern that can lead to microbial resistance, increased treatment costs, poor health outcomes, and increased hospital admission and readmission rates. National antibiotic prescribing data typically has a considerable time lag. Recent estimates of national oral antibiotic use based on data from 2010-11 reveal a rate of 506 antibiotics per 1,000 patients, demonstrating the need for a stewardship program to ensure appropriate antibiotic use. This study sought to establish the oral antibiotic prescribing rate within the WMEd clinic outpatient setting using a novel method developed by our group, as well as identify facets of patient care that correlate with physician prescribing practices.

METHODS: Data were collected retrospectively from WMEd’s electronic medical record (EMR) for encounters resulting in any prescription, dated January 1, 2012, to August 31, 2014. Global oral antibiotic use rates were calculated per 1,000 patients, based on WMEd prescribing rates, to provide a metric comparable to published estimates. Antibiotic prescribing patterns were examined by comparing choice of agent and dosing regimen to published treatment guidelines. Simple Poisson regression was used on patient-level data to determine patient demographics predictive of count of antibiotics prescribed offset by number of patient clinic visits. Generalized logistic regression with repeated measures for patient encounters was used to analyze differences in antibiotic prescribing rates for various provider roles, as well as trends in prescribing across time.

RESULTS: Our sample included 57,125 clinic encounters for 8,329 patients. These encounters included 1,854 (3.25%) visits where at least one antibiotic was prescribed. Global oral antibiotic use was estimated at 380 antibiotics per 1,000 patients (95% CI: 370, 391).

When offset by number of clinic visits per patient, patient age, gender, race, and primary payer were found to be predictive of antibiotic utilization (all P<0.0001). Specifically, average antibiotic use was significantly greater for individuals between the ages of 18 and 53, females, of black race, or on Medicaid.

Physician Assistants (PA) and Nurse Practitioners (NP) were approximately 10.5 times more likely to prescribe an antibiotic than Faculty providers; residents were roughly 2.6 times more likely compared to faculty, and PA/NP about 4.1 time more likely than residents. Overall, 26.5% of antibiotics prescribed and 47.9% of dosing regimens were not aligned with published guidelines. Roughly 89.5% of discordant dosing was higher than recommended. Medical residents selected dosing regimens outside of recommended guidelines 51.4% of the time. Pediatric patients were frequently prescribed a non-recommended dose (98.2%), with most dosed too high (98.2%).

It was noted that antibiotic prescribing rates at WMEd decrease over time. The odds of an oral antibiotic prescription were approximately halved by the end of our study period.

CONCLUSIONS: Our study found that the WMEd antibiotic prescribing patterns are lower than those reported nationally. This research has highlighted areas in which to focus stewardship efforts. Further research is in progress that will provide a more complete picture of antibiotic prescribing practices at WMEd.
Award Winning Presentation Abstracts
CLINICAL SYNERGISM: COMBINED FUNGAL AND BACTERIA INTRA-ABDOMINAL INFECTIONS ASSOCIATED WITH INCREASED MORTALITY

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OBJECTIVES: Multiple synergistic interactions have been identified between fungi and bacteria, including coaggregation into mixed biofilms, enhanced growth via signaling molecules, and shared metabolic byproducts. However, the clinical implications of these interactions are largely unknown. While fungal and bacterial co-infection is common in complicated intra-abdominal infections (IAI), outcomes from combined infection have not been well studied. We hypothesized that synergistic interactions between fungus and bacteria would lead to higher mortality in patients with combined IAI.

METHODS: All surgical patients admitted to a single academic institution between 1996 and 2014 were queried for presence of a culture-proven bacterial IAI. Univariate analyses compared characteristics between patients with a combined fungal and bacterial IAI and those with bacterial IAI alone. Multivariable logistic regression evaluated the effect of fungal presence in IAI on in-hospital mortality, while controlling for APACHE II score and select comorbidities. A subgroup analysis evaluated unadjusted mortality rates for common fungal-bacterial combinations.

RESULTS: Of 1887 patients with culture-proven bacterial IAI, 503 (26.7%) were co-infected with fungi. Patients with a fungal component were older (57.0 vs. 55.5 years, p=0.025) with a higher median APACHE II score (15 vs 13, p < 0.01) but without differences in trauma or transplant status or comorbidities including diabetes, coronary artery disease, liver disease or kidney disease. The most common bacterial pathogens were Enterococcus spp. (25.6%), E. coli (16.9%) and Streptococcus spp. (12.0%). The most common fungal pathogens were Candida albicans (40.4%) and Candida glabrata (24.9%). The presence of fungal species was associated with increased crude in-hospital mortality (16.9% vs. 9.8%, p<0.01), and on multivariable regression, fungal co-infection remained associated with death (Table). The highest mortalities were associated with fungal co-infection with Enterobacter spp. (28.6%), Enterococcus spp. (28.3%), and P. aeruginosa (26.3%).

CONCLUSION: We identified an association between fungal presence and in-hospital mortality in patients with bacterial IAI. Continued research into cross-kingdom synergistic relationships will identify potential therapeutic targets in the management of IAI.
MONETARY IMPACT AND GEOGRAPHIC DISTRIBUTION OF CYBERSECURITY BREACHES ON HEALTH RECORDS IN THE UNITED STATES

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INTRODUCTION: Information Technology in health care has rapidly expanded in the past decade, fundamentally changing the way clinicians care for their patients. With this rapid adoption, cybercriminals have increasingly targeted the health industry due to a large amount of vulnerable patient health and financial information. A growing body of research suggests that the health care industry lags behind other industries in securing vital data, and should devote more effort and funding to mitigate this risk [1]. In this study, we generate monetary estimates to quantify how much hacking incidents could cost the country and compare how geographical regions within the United States differ. Understanding the potential financial impact of a hacking breach is vital for health care organizations as well as policy makers in the United States.

METHODS: All available reported breaches classified as an information technology (IT) hacking breach, including completed and ongoing investigations, were downloaded from the U.S. Department of Health and Human Services Office for Civil Rights (as of September 21, 2017). An application in the Python programming language was developed to identify, extract, and quantify the distribution of breach locations for IT hacking breaches. Summary statistics, including total number of breaches within stated range, by breach type, and by region were calculated using Microsoft Excel version 15.24 (Redmond, WA). We utilized an average per-record cost of $355 for health care organization data breaches, reported by the 2016 Cost of Data Breach Study: Global Analysis performed by the Ponemon Institute [2]. We included data breaches with the highest likelihood of cybercrime involvement (i.e. hacking/IT incident, and hacking/IT incident/unauthorized access or disclosure). Estimates of monetary loss for each compromised record included all breaches affecting between 3,000 and 100,000 individuals, as larger, more catastrophic breaches were out of scope of the Ponemon estimates. We stratified the data by region of the United States as per boundaries set by the U.S. Census Bureau to identify areas at greatest risk of financial harm from health IT data breach. We included nine regions with the following designations: New England, Mid-Atlantic, East North Central, North Central, South Atlantic, East South Central, West South Central, Mountain, Pacific. Several tables and figures were constructed to visualize this data.

RESULTS: Each compromised record poses a monetary risk of approximately $355 [2]. In total, the reported breaches pose a potential loss of $1,346,671,555 between 2013 and 2017. The three regions with the largest number of individuals affected, and thus at risk of largest potential financial loss, are the South Atlantic (745,355), West South Central (650,929), and Middle Atlantic (499,443).

CONCLUSIONS: There are well-documented cases where organizations were affected by cybercrime and resulted in catastrophic loss of patient care [3]. With the rapid growth of electronic health records comes the rapid growth of risk. This study shows that over 1.3 billion USD was at risk of compromise in the United States between 2013 and 2017, with significant geographical variation. We have established a simple method to quantify cybercrime risk for healthcare organizations, which can be useful when budgeting security information technology and disaster mitigation strategies.
ASSESSMENT OF STUDENT PERCEPTIONS ON SKILLS REQUIRED FOR OPTIMAL COLLABORATION ON SERVICE-LEARNING TEAMS

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INTRODUCTION: One essential skill of a medical professional is the ability to collaborate in a team, thus medical students should have opportunities and feedback to develop this skill. Recently, there has been a growing interest in utilizing peer assessment to provide feedback for students engaged in group activities, due to evidence that it encourages learning, engagement, participation and success. Peer evaluation provides an environment to broaden and deepen students’ reflection of their learning by comparing their own involvement to that of their colleagues. Medical students at Western Michigan University Homer Stryker M.D. School of Medicine (WMed), participate in a service-learning curricular component, focused on creating collaborative student teams that develop service projects supporting the health of our community members.

OBJECTIVE: Evaluation of the utility of peer assessment for medical education has been largely limited to clerkships, professionalism and team based learning activities. In this study we examined the perspectives of students on components essential for effective team collaboration in service-learning projects, to determine if student perspectives of involvement, both of themselves and their peers, correlate with team success.

METHODS: Medical students participating in service-learning component (Active Citizenship) of the WMed curriculum from the 2019 and 2020 classes were surveyed via REDCap to evaluate their perception on effectiveness of: their team collaboration, high and low performing team members and themselves. Survey questions examined skills essential for team collaboration including communication, organization, motivation, critical thinking, collaboration, and technical knowledge.

RESULTS: Of the 131 students eligible for participation in the study, 96 responded (73.4%). When asked to rank group collaboration overall, similar numbers of students responded to each collaboration category: average (n=32), above average (n=33) or excellent (n=31). Among students who reported average group collaboration, a majority (56%), felt their individual effort was higher than peers, suggesting that they performed the bulk of the group work. In contrast, in groups with excellent collaboration, 64% of those students felt the team members contributed equally. Team members who were perceived as low-level contributors were more often ranked as unsatisfactory among groups with average level collaboration perception. Additionally, student perception of highly contributing team members collaboration skills increased with perception of overall team collaboration level. Finally, students ranked their own collaboration skills higher when they perceived their overall team collaboration as excellent.

CONCLUSIONS: Our data suggests that student perception of team success depends largely on the level of contribution they perceive from team members; teams with members that contribute equally have better perceived collaboration. Literature suggests that to improve collaboration within teams, emphasis should be placed on positive leadership, communication strategies, training, and resources. Further research will evaluate changes in collaboration over time following provision of peer-feedback, and education regarding skills that can improve team success.
CRIME VICTIMIZATION OF INDIVIDUALS WITH MENTAL ILLNESS: RESPONSE BY THE CRIMINAL JUSTICE SYSTEM

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CONTEXT: Within Kalamazoo County, as across the United States, individuals with severe or persistent mental illness (SPMI) report high levels of crime victimization. Systematic screening for crime victimization is not widely implemented in community mental health settings. Additionally, victims with a mental illness face multiple barriers to criminal justice protections. To date, criminal justice responses to individuals with mental illness has largely focused upon perpetrators. Less is known about victims’ experiences.

OBJECTIVE: The overall research goal is to examine the relationship between a crime victim’s mental illness and adjudication within the criminal justice system. Specifically, research study questions are:

1) Do victims with severe and persistent mental illness (SPMI) have different adjudication outcomes than those without?
2) Is the perpetrators’ SPMI status (having a mental illness or not) significantly associated with adjudication outcome, when other criminogenic characteristics are controlled for?

STUDY DESIGN: This was a cross-sectional study of all consumers receiving services from Kalamazoo Community Mental Health and Substance Abuse Services (KCMHSAS) in 2009 (N=5906) as a surrogate marker for SPMI. A database was built integrating administrative records from KCMHSAS and crime records from Kalamazoo County prosecutor’s office for the study period 2008-2010. The study outcome was highest level of adjudication reached: (1) not prosecuted, (2) prosecuted but no conviction, (3) perpetrator convicted. The primary predictor was whether victim had an SPMI or not. Covariates included demographics, crime incident characteristics and perpetrator characteristics (criminal history, SPMI). Statistical analyses were conducted using sequential Generalized Estimating Equation (two-sided statistical significance set at $\alpha<.05$), to account for nesting of individuals within crime incidents; first modelling the progression from level 1 to 2.

RESULTS: Of the 9,622 crimes where the final disposition was known, 37.6% were not prosecuted, 22.5% were prosecuted but there was no conviction and 40.0% were convicted. Individuals with SPMI had double the crime victimization rate compared to those without SPMI: 10.8 charges submitted to the prosecuting attorney versus 5.1 charges per 100 population, respectively. Crimes with SPMI victims resulted in significantly fewer convictions (34.1% versus 40.4%, $p=.008$), with fall-out equally split between each of the two prior adjudication steps. Multivariable analyses reveal that, once other crime factors are taken into account, there is no statistical difference in adjudication outcomes associated with victim SPMI status (aOR 1.00 (CI 0.78, 1.29)). Instead, SPMI victims’ lower conviction rates may be explained by differences in their crime characteristics; characteristics which strongly predict adjudication and subsequent conviction and include whether crime was assault-related or not, whether it was a misdemeanor or felony, the number of crime counts, and criminal history of the perpetrator. Of note, victims with SPMI are twice as likely to have been victimized by a perpetrator with SPMI (13.6% versus 6.5%) and, unlike victim SPMI status, perpetrator SPMI status significantly increases the odds of conviction (aOR 1.54 (CI 1.23, 1.94).

CONCLUSION: The higher rates of victimization experienced by individuals with SPMI, coupled with lower conviction rates, speaks to the need for greater advocacy for victims’ rights and safety, within criminal justice settings as well as community mental health service settings. This same advocacy is arguable necessary for perpetrators with SPMI, as well. While conviction rates for victims with SPMI are not explained by their mental health status, their higher rates of victimization can adversely impact their overall health and SPMI treatment.
LISFRANC FIXATION REVISITED: IS JOINT SPARING BONE FIXATION POSSIBLE? AN ANATOMIC AND COMPUTATIONAL STUDY

Eric Christianson, MD; Daniel VanZweden; James Jastifer, MD

Western Michigan University Homer Stryker M.D. School of Medicine, Department of Orthopaedic Surgery; Western Michigan University, Department of Engineering; Borgess Medical Center, Department of Orthopaedic Surgery

INTRODUCTION: The Lisfranc fracture or dislocation is a painful and disabling injury of the midfoot. While operative treatment remains the standard of care for displaced injuries, controversy exists on the best operative strategy. Some studies are critical of open reduction and internal fixation with screw fixation and report articular joint damage from the screws as a possible reason for persistent morbidity after surgery. To our knowledge, this concept has never been studied as the dimensions of the articular surface have never been reported. The purpose of the current study was to describe the morphology of the joints involved in Lisfranc fixation and to determine if it is possible to perform nonarticular transosseous internal fixation. Our hypothesis was that nonarticular transosseous Lisfranc fixation is possible with commonly available orthopaedic implants.

METHODS: Twelve cadaver feet were dissected and the associated joints between the medial (C1) and middle (C2) cuneiform and first and second metatarsals were quantified by calibrated digital imaging using software (ImageJ, 1.48k). Additionally, utilizing CT scan data, a computational three-dimensional (3D) model of the foot was developed using 3D Slicer v4.8. The first and second metatarsals and cuneiform bones were isolated. The model was transferred to MeshLab, processed, and transformed into a solid part using FreeCAD, an opensource CAD platform. Based on cadaveric dissection, joint surfaces were quantified and mapped, and potential nonarticular screw paths between the bones were determined. These fixation constructs were 3D printed for further visual analysis.

RESULTS: For the intercuneiform (C1-C2) connection, a mean of only 27.2% of the lateral face of C1 and 43.0% of the medial face of C2 was articular cartilage. Three variations of articular joint morphology were observed on C1 and two variations on C2. From the 3D models it was determined that a joint sparing, transosseous screw trajectory is possible between the medial cuneiform and the second metatarsal and between the medial and intermediate cuneiform. These screw paths were large enough to accommodate for even the largest clinically useful screw diameter (>5mm). The screw trajectories are roughly perpendicular to the long axis of the foot and take a plantar-medial to dorsal-lateral orientation with one screw from the C1 to the second metatarsal and one screw from C1 to C2.

CONCLUSION: The clinical significance of the current study is that internal fixation with screws can be performed without causing articular joint damage. Additionally, the articular surface is quantified for the first time and may be smaller than some surgeons realize. This study demonstrates the orientation required to avoid articular damage and helps guide the surgeon on the placement of these screws. The described use of screws in the current study (as opposed to plates and screws) would save thousands of dollars per surgery and still have the added benefit of avoiding damage to the articular joint surface.
AN ETHICAL REVIEW CONCERNING THE USE OF PHYSICAL RESTRAINTS ON INTUBATED PATIENTS IN THE ICU

Daniel Ferman; John Livingstone; Tyler Gibb, JD PhD; Parker Crutchfield, PhD

Western Michigan University Homer Stryker M.D. School of Medicine, MD Class of 2020; Western Michigan University Homer Stryker M.D. School of Medicine, MD Class of 2018; Western Michigan University Homer Stryker M.D. School of Medicine, Department of Medical Ethics, Humanities, and Law; Western Michigan University Homer Stryker M.D. School of Medicine, Department of Medical Ethics, Humanities, and Law

INTRODUCTION: Physical restraints are common devices used to reduce a patient’s mobility. Often applied in intensive care units with patients experiencing agitation and insufficient sedation, physical restraint techniques are advised for prevention of self-harm and unplanned extubations. In practice, however, there is significant variability in use and many patients across the US and other countries worldwide are restrained while awake, calm, and co-operative. While most clinicians believe that restraining a patient will limit risk for self-extubation and subsequent poorer health outcomes, the evidence that this is the case appears to be contrary. Moreover, physical restraint is associated with many significant negative physiological and psychological health impacts, including increased agitation and ICU delirium, prolonged intubation and ICU times, and even increased risk for self-extubation when used without focused education or specific intervention.

When reviewing the use of physical restraint, it is important to consider the ethical justification for or against such use. As a basic moral principle of medical ethics, patient autonomy is upheld only when adequate informed consent is obtained from the patient or from appropriate proxy.

In cases of patient self-endangerment, autonomy may be viewed as secondary to safety; however, it is our intention to demonstrate that such instances requiring physical restraint interventions can sometimes be avoided through a number of other practices. Equally important to autonomy is the principle of non-maleficence, that it is a clinician’s duty to do no harm to a patient, and thus the negative impacts of restraint are also investigated.

METHODS: Two authors conducted separate literature reviews in the following databases: PubMed, Scopus, Google Scholar. 38 journal articles were collected with evidence included in this review pertaining to physical restraint, self-extubation, and medical ethics.

DISCUSSION: While the current use of physical restraint varies widely, the effectiveness of physical restraints in preventing self-extubation is limited. There is, in fact, sufficient evidence that up to one third of self-extubations occur even with wrist restraints. In some studies, restraints actually increase the risk for self-extubation and can lead to less favorable health outcomes. Inappropriate use can be detrimental to a patient’s health, causing serious concerns including nerve damage, asphyxiation, and death. Because of this, general guidelines recommend minimizing the use of physical restraints, however, these consistently remain outdated and non-specific for strategies to do so. Several studies demonstrate alternative strategies, although their effectiveness as individual interventions to reduce physical restraint use has yet to be fully elucidated. Such alternatives include better education for the clinical care team and staff regarding restraint, increased number and familiarity of staff on duty, occupational and recreational therapies, pain management, sleep promotion, additional and more frequent supervision, observation, and companionship of staff, family, friends, and volunteers, as well as many more. Restraint is not always removed rapidly following resolution of patient agitation, which can lead to further negative impacts including PTSD for ICU survivors. This is consistent with a 2010 review of physical restraint examining patient perspectives from 1966 to 2009 which found four major themes: negative psychological impact, retraumatization, perceptions of unethical practices, and the broken spirit. This focus on negative consequences is addressed in our analysis of physical restraint practices and examined in an ethical light. In delivering optimal care to ICU patients, both patient comfort and safety must be evaluated. It is therefore recommended to always minimize use of restraints and to specifically avoid their use during end of life care.

CONCLUSION: There is lacking evidence to support the use of restraints on ICU patients and many studies have shown that restraints increase the risk of self-extubation and patient harm. Ethical concerns for patient autonomy and non-maleficence in combination with ineffectiveness of physical restraint to reduce self-harm lead to the conclusion that restraints ought not be used in intubated patients. Many of the risks associated with physical restraint can be mitigated through improved care and there is a need for further research into strategies that minimize the use of physical restraint as well as a better understanding of how widespread its negative consequences are. Although there exist inconsistencies in policy and adherence, general guidelines are still to minimize use of physical restraint and we recommend that if even considering physical restraint, care teams should first fully understand self-extubation and have educated themselves and staff on other prevention strategies. We further advocate for research that seeks better management of agitation and prevention of factors leading to unplanned device removal.
Poster Presentations
POSTER PRESENTATIONS

CLINICAL RESEARCH POSTERS

1. Infective Endocarditis as the Presenting Sign of an Underlying Immunodeficiency in a 3-year-old Male. Aisha Shakoor, MD; Ahmed Elisa, MD; Elizabeth Kinsella; Ryan Halas, MD; Andrey Leonov, MD

2. An Atypical Case of Varicella-Zoster Meningitis Presenting as Chest Pain, Impaired Memory and Seizure. An Nguyen; David King, MD; Ramya Venigalla, DO; Laura Bauler, PhD; Joshua Mastenbrook, MD

3. Gelfoam Embolization of Cystic Artery Pseudoaneurysm in the Setting of Cholecystoenteric Fistulas and Emphysematous Cystitis. Benjamin Roush; Michelle Knapp; Andrew Forsyth, MD; Matthew Smetts, MD; Jonathan Olsen, MD

4. Fecal Impaction with Stercoral Colitis Complicated by Emphysematous Cystitis: A Case Report. Benjamin Roush; J. Erik Winterholler; Melissa Olken, MD

5. A Case of Adult Onset Pyloric Stenosis. Cayleigh Blumrick, MD; Jayne Barr, MD

6. Simultaneous Presentation of Thyroid Storm and Diabetic Ketoacidosis in a Previously Healthy 21-year-old Male. David Wallington; Mark Schauer, MD; Laura Bauler, PhD

7. Osseous Sarcoidosis: a Peculiar Presentation of a Familiar Disease. Jon Vaux, DO; Guston Zervoudakis; Anne Rose, PA-C; Joel Post, DO

8. PDE4 Subtypes in Cancer. Guston Zervoudakis; Samuel Lai; Kelly Quesnelle, PhD (Basic Sciences Research)

9. Rates and Risk Factors of Ventral Incisional Hernia Following Hepatobiliary and Pancreatic Surgery. Jairo Espinosa, MD; Peter White; Nathaniel Balmert; Sydney Spitler; Richa Khatri, MD; Alyssa Woodwyk, MS; Gitonga Munene, MD

10. A Quality Improvement Project to Evaluate the Impact of a Pharmacist-Driven Stewardship Initiative to Utilize Procalcitonin Levels to Discontinue Antibiotics in a Community Teaching Hospital. James Vaillant, MD; Tracey Mersfelder, PharmD; Anandbir Bath, MD; Tooba Tariq, MD; Guramrinder Thind, MD; Kevin Kavanaugh, MD; Rebecca Maynard, PharmD

11. A Case of Malarial Hepatitis. Jasreen Kaur, MD; Katherine Bolton, DO; Anandbir Bath, MD, Natascha Tuznik, DO

12. Total Endovascular Iliocaval Reconstruction Using Polytetrafluoroethylene Stent-Graft Placement for the Treatment of Inferior Vena Cava Resection. Jordan Fenlon, BS; Kyle Cooper, MD; Jeffrey Chick, MD; Charles Brewerton, BS
POSTER PRESENTATIONS (cont.)

13. A Case Report: Candida Albicans Endocarditis in a Native Aortic Valve. Joshua Fainsod, MD; Lauren Vocke, DO; Kristi VanDerKolk, MD


15. Successful Intubation of a Difficult Airway Using a suction Yankauer. Keshav Patel; Aaron Pfeifer, MD; Joshua Mastenbrook, MD; Laura Bauler, PhD

16. Pontine Infarct Presents as Hematemesis and Vertigo with Unilateral Facial Nerve Palsy. Kyle VanDommelen; Mauli Shah, DO; Joshua Mastenbrook, MD; Laura Bauler, PhD

17. Homicidal Abuse by Neglect in Cerebral Palsy. Mariyam Sheidu; Joseph A. Prahlow, MD

18. Pseudo-CPM (Central Pontine Myelinolysis). Matthew Rumschlag; Amanda Fisher-Hubbard, MD; Rudolph Castellani, MD; Joseph A. Prahlow, MD

19. Beneficial Effects of Volunteering in a Student Run Clinic on Cultural Awareness and Preparation for Clinical Rotations. Michael Chavarria; Raphael M. Szymanski, MS; Gina Bravata; Joshua Vandeburgh; Kristina Le; Joaquin Peralta; Cheryl Dickson, MD

20. Blind After Bingeing: Purtscher-Like Retinopathy in Acute Alcoholic Pancreatitis. Michael Reaume, MD; Andrew Selles; Mark Schauer, MD

21. Candida Endocarditis: A Diagnostic Challenge with a Fatal Outcome. Michael Reaume, MD; Anita Shallal, MD; Pimpawan Boapimp, MD

22. A Case of Flecainide Induced Cardiac Arrhythmia Due to Polypharmacy. Mohamed Mortagy, MD; Lokesh Yadav, MD

23. A Unique Presentation of Papillary Renal Cell Cancer. Muhammad Danish Saleem, MD; Muhammad Hameed, MD

24. Choking on Cocaine: A Rare Case of Cocaine Induced Angioedema. Muhammad Danish Saleem, MD; Mark Schauer, MD

25. Dapsone Induced Aplastic Anemia with Early Signs of Response to Treatment with Eltrombopag. Muhammad Danish Saleem, MD; Samuel Lai; Don Park, MD PhD; Mark Schauer, MD

26. Death Related to Acute Esophageal Necrosis ('Black Esophagus'). Ola Jandali; Joseph A. Prahlow, MD

27. Fighting Diagnostic Confirmation Bias: ABPA, CF, or Both? Patricia Choi; Myrtha Gregoire-Bottex, MD; Jesse Duranceau, MD
POSTER PRESENTATIONS (cont.)

28. **Familial Idiopathic Cardiac Hemopericardium with Tamponade Physiology.** Patrick Staso, MD; Anna Jain, MD

29. **Littoral Cell Angioma - A Case Report.** Philip Byström; Jairo Epinosa, MD; Gitonga Munene, MD

30. **Primary Hepatic Sarcomatoid Carcinoma - A Case Report.** Philip Byström; Jairo Epinosa, MD; Gitonga Munene, MD

31. **Colorectal Cancer Screening Among Hospitalized Patients in US Hospitals: Missed Opportunities.** Ransome Eke, MD PhD, Tooba Tariq, MD; Tong Li; Irfan Furqan, MD PhD

32. **Exudative Pleural Effusion with Negative Cytology: A Case of Malignant Mesothelioma.** Rheanne Maravelas, MD; Anmol Hans; Mark Schauer, MD

33. **Retroperitoneal Mass.** Rheanne Maravelas, MD; Anna Hoekstra, MD

34. **Cryptococcosis in a Non-Immunocompromised Woman.** Sandra Koehn, DO; Thomas Flynn, MD

35. **Novel Use of Sternal Zip Ties Secondary to Metal Allergy.** Shivan Saith, MS; Jerry Pratt, MD

36. **Forensic Radiology in Medicolegal Autopsy Practice.** Thomas Duong; Ray-Young Tsao; Sheila Spotswood, MD; Carolyn Isaac, PhD; Jered Cornelison, PhD; Joseph A. Prahlow, MD

37. **Intraosseous Administration of Hydroxocobalamin (Cyanokit®) after Enclosed Structure Fire Smoke Exposure and Cardiac Arrest: A Case Report.** Thomas Olsen, MD; Nathan Brunken, MD; Joshua Mastenbrook, MD

38. **Branched Retinal Vein Occlusion in the Context of Primary Sclerosing Cholangitis: A Case Report.** Thu Nguyen; Jeff Johnson; Carrie Sandborn, DO

39. **Crime Scene Analysis Using DNA Testing of Dog Feces--A Case Report.** Vishal Somnay; Thomas Duong; Ray-Young Tsao; Joseph A. Prahlow, MD

40. **Asymptomatic Ecchordosis Physaliphora Tumor, A Case Report and Review of Literature.** Yoad Porat; Amanda Fisher-Hubbard, MD; Rudolph Castellani, MD; Joseph A. Prahlow, MD

41. **A Rare Case of Abdominal Wall Recurrence of Cervical Cancer.** Jesse Chou; Anna Hoekstra, MD

42. **Pyoderma Gangrenosum: A Case of a Rapidly Enlarging Ulcer.** Aydin Tavakoli, MD; Satya Dalavayi; Steven M. Pollens, MD; Pimpawan Boapimp, MD
POSTER PRESENTATIONS (cont.)

43. **Ehrlichiosis Presenting with Syncope: A Diagnostic Dilemma.** Anita Shallal, MD; Jasreen Kaur, MD; Pimpawan Boapimp, MD

QUALITY IMPROVEMENT POSTERS

44. **Getting with the Guidelines: A Quality Improvement Project to Improve Rates of Code Blue Debriefing.** Anita Shallal, MD; Chris Jacob, DO; Prashant Patel, DO; Russell Van Maele, DO; Amar Jaswa, DO; Richard Roach, MD

45. **Improving Office-Based Procedures in an Academic Family Medicine Residency: A Quality Improvement Project.** Aydin Tavakoli, MD; Steven M. Pollens, MD; Glenn V. Dregansky, DO; Kristi VanDerKolk, MD

46. **Should I Stay or Should I Go: The Community Patient’s Decision-Making Process for Hepato-Pancreato-Biliary Surgery.** Jesse Chou; Gitonga Munene, MD

47. **Battling the Opioid Epidemic: Minimizing Risk with Naloxone Intranasal Spray.** Carleigh Zahn, DO; Susan Bannon, MD; Lauren Lamie, DO; Jasreen Kaur, MD; David Lee; Wylie DeVera, MD; Amber Fausneaucht, DO; Shanna Cole, PharmD

48. **Elder Abuse Identification and Reporting in the Emergency Department.** Janani Ahmed; John Becker; Conner Holthaus; Kyle VanDommelen; Yoad Porat; Duncan Vos, MS; Richard Brandt, BS; Samantha Mix, MD; Cheryl Dickson, MD; Catherine L. Kothari, PhD

49. **Using Informatics Approaches to Understand and Visualize National Cybersecurity Threats Affecting Healthcare Providers.** Tong Li; Abigail Wen-Yu Cheng; Alex Paschke; Tyler Ulrich; Jay G. Ronquillo, MD

50. **Effectiveness of Root Cause Analysis in an Interprofessional 'Improv for Education' Event Taught by Medical Students.** Amy Rechenberg; Stephanie Van Alsten; Mark Schauer, MD; Cheryl Dickson, MD; Duncan Vos, MS; Richard Brandt, BS

COMMUNITY RESEARCH POSTERS

51. **Deserts, Swamps, Mirages, and Oases: Reconciling the Spectrum of Food Environments.** David Lee; Cheryl Dickson, MD

52. **Cocaine Abuse, Complications and Deaths as Depicted Through a Case Series.** Jennifer RaeeNielsen; Joseph A. Prahlow, MD

53. **The Impact of a Group Intervention on Adult Survivors of Childhood Trauma Using a Psychoeducational Model.** Jennifer Foster, PhD; Kenneth Schmidt, PhD; Whitney Decamp, PhD
POSTER PRESENTATIONS (cont.)

EDUCATION RESEARCH POSTERS

54. **Increasing Cultural Competency and Reducing Victim-Blaming Through Antiracism Workshops.** Fernando Ospina, MA; Eric Hall, PhD

55. **Facilitating Peer Collaboration with PA Students in Patient Centered Care Using an Integrated TBL: A Medical Student Driven Experience in Interdisciplinary Engagement.** Gisella Newbery; Wendy Lackey-Cornelison, PhD

56. **Pediatric Emergency Simulation Lab Performance using Preparatory Education.** Glenn Ekblad, DO; Mark Kerschner, MD; Natalie Reynolds, DO; Rick Griffith, DO; Mark Radigan, MD; Kurt Schelling, DO; Jorge Morales, DO; Ben Litman, DO; Daniel Piedmonte, MD; Cyle Rogotzke, MD; Michael Patlajan, MD

57. **Orthopaedic Resident Experience with Hand Surgery Consultations at a Level 1 Trauma Center: Data Collection to Improve Education.** Christine Bowman, MD; Tyler Snoap, MD; Patrick Albright; Joseph Walbridge; Keith Kenter, MD

BASIC SCIENCES RESEARCH POSTERS

58. **The Relationship Between Neurotrauma and Proteinopathy in Former Military Service Members.** Arushi Tripathy; Kristi Bailey, HTL; Abigail Grande, MPH; Joanne Catania, MPA; Joyce de Jong, DO; Rudolph Castellani, MD

59. **Deregulated Cell Proliferation is a Key Feature of Two Different Mouse Models of Polycystic Kidney Disease.** Conner Halthaus; Matthew Rumschlag; Erik Larson, PhD; Greg Vanden Heuvel, PhD

60. **The Need for Fast, Accurate and Broad Spectrum Opioid Drug Screening to Combat the Opioid Crisis.** Francisca Coughlin, BS; Paul Moorman, TC-NRCC MS; Greg Cavey, BS; Prentiss Jones, PhD

61. **Postmortem Drug Screening in Medical Examiner Casework using High-Resolution Mass Spectrometry (nanoUPLC-MSE-TOF).** Greg Cavey, BS; Francisca Coughlin, BS; Paul Moorman, TC-NRCC MS; Prentiss Jones, PhD

62. **Levels of Persistent Organic Pollutants in Breast Milk Samples Representing Finnish and Danish boys with and without Hypospadias.** Marie Tysman; Helena E. Virtanen, MD PhD; Katharina M. Main, MD PhD; Anika Adamsson, PhD; Christine Wohlfahrt-Veje, MD PhD; Jean-Philippe Antignac, PhD; Bruno Le Bizec, PhD; Niels Erik Skakkebæk, MD PhD; Jorma Toppari, MD PhD

63. **Microglial Response Patterns Following Various Forms of Olfactory Bulb Damage in Zebrafish.** Susanna Var, BS; Christine Byrd-Jacobs, PhD
POSTER PRESENTATIONS (cont.)

64. **Differential Response of Zebrafish Olfactory Sensory Neuron Subtypes After Intranasal Infusion with Detergent.** Tara Maser, BS; Christine Byrd-Jacobs, PhD

TOP AWARDED POSTERS

65. **Impact of Knot Configuration on Suture Performance: Experiments and Numerical Models.** Arz Qwam Alden, MS; Andrew Geeslin, MD; Peter Gustafson, PhD

66. **A Case of Agammaglobulinemia Associated with a Novel BTK Mutation of Unknown Significance.** Ahmed Elisa, MD; Aisha Shakoor, MD; Jasmine Alsukhon, MD; Ryan Halas, DO; Elizabeth Kinsella; Andrey Leonov, MD

67. **The Non-Dichotomy Between Malignant Catatonia and NMS: A Case Presentation.** Anish Desai, MD; Jay Patel, MD; Matthew LaCasse, DO; Peter Longstreet, MD
Poster
Presentation
Abstracts
INFECTIVE ENDOCARDITIS AS THE PRESENTING SIGN OF AN UNDERLYING IMMUNODEFICIENCY IN A 3-YEAR-OLD MALE

Aisha Shakoor, MD; Ahmed Elisa, MD; Elizabeth Kinsella; Ryan Halas, MD; Andrey Leonov, MD

Western Michigan University Homer Stryker M.D. School of Medicine, Department of Family and Community Medicine; Western Michigan University Homer Stryker M.D. School of Medicine, Department of Pediatric and Adolescent Medicine; Western Michigan University Homer Stryker M.D. School of Medicine, MD Class of 2019; Western Michigan University Homer Stryker M.D. School of Medicine, Department of Medicine-Pediatrics; Western Michigan University Homer Stryker M.D. School of Medicine, Department of Pediatric and Adolescent Medicine

Infective endocarditis (IE) results from bacterial or fungal infection and is associated with significant morbidity and mortality. Several known risk factors exist for endocarditis and 90% of pediatric cases have an underlying structural or congenital heart disease or prosthetic heart valve. Primary antibody deficiency (PAD) can present as heightened susceptibility to infections and common infections include recurrent pneumonia, meningitis, septic arthritis and otitis media. Our case presents a 3-year-old male with a unique presentation of infective endocarditis. His lack of structural and congenital risk factors for endocarditis prompted further workup and labs were consistent with insufficient immunoglobins suggesting a primary immunodeficiency. Our case emphasizes the potential need for further investigation into PAD in a young patient with no known risk factors who develops an uncommon infection such as IE.
AN ATYPICAL CASE OF VARICELLA-ZOSTER MENINGITIS PRESENTING AS CHEST PAIN, IMPAIRED MEMORY, AND SEIZURE

An Nguyen; David King, MD; Ramya Venigalla, DO; Laura Bauler, PhD; Joshua Mastenbrook, MD

Western Michigan University Homer Stryker M.D. School of Medicine, MD Class of 2020; Western Michigan University Homer Stryker M.D. School of Medicine, Department of Emergency Medicine; Western Michigan University Homer Stryker M.D. School of Medicine, Department of Emergency Medicine; Western Michigan University Homer Stryker M.D. School of Medicine; Division of Epidemiology & Biostatistics; Western Michigan University Homer Stryker M.D. School of Medicine, Department of Emergency Medicine

INTRODUCTION: Neurological complications of varicella-zoster virus (VZV) reactivation can be associated with considerable mortality and morbidity if not recognized early in the disease process. Aseptic meningitis associated with VZV infection is rare with an incidence of 0.5% in immunocompetent individuals. One third of VZV-related neurologic disease occurs without the classic herpes zoster exanthema, making early recognition more difficult. We describe a case of an atypical presentation of varicella-zoster meningitis in an immunocompetent man.

CASE: A 61-year-old male presented to the emergency department (ED) with chest pain and impaired memory. His cardiac evaluation in the ED was unremarkable. While in the ED, he suffered a seizure in the absence of hypoglycemia, significant electrolyte disturbances, or trauma. He displayed no classical symptoms of meningitis. Head computed tomography was negative for acute findings. The patient was admitted to the intensive care unit and was found to have VZV meningitis based on results from a lumbar puncture. He was placed on acyclovir and was discharged from the hospital five days after admission.

DISCUSSION: The typical presentation of a VZV central nervous system infection involves a sudden onset of illness with fever, headache, nuchal rigidity, focal neurological signs, cerebral spinal fluid pleocytosis, and focal abnormalities which may be seen on electroencephalogram, computed tomography and/or magnetic resonance imaging. While our patient had an atypical presentation, we suspect that his impaired memory and subsequent seizure were manifestations of the developing VZV meningitis. A retrospective review demonstrated that seizures are encountered in 11% of VZV central nervous system infection cases. While in the intensive care unit, the patient was found to have a vesicular rash on his chest wall, perhaps explaining his chest pain. Awareness of alternative presentations for herpes zoster and meningitis is important in cases without classic symptoms to enable diagnosis and prevent delays in treatment.
GELFOAM EMBOLIZATION OF CYSTIC ARTERY PSEUDOANEURYSM IN THE SETTING OF CHOLECYSTOENTERIC FISTULAS AND EMPHYSEMATOUS CYSTITIS

Benjamin Roush; Michelle Knapp; Andrew Forsyth, MD; Matthew Smetts, MD; Jonathan Olsen, MD

Western Michigan University Homer Stryker M.D. School of Medicine, MD Class of 2019; Western Michigan University Homer Stryker M.D. School of Medicine, Class of 2019; Bronson Methodist Hospital, Department of Radiology; Bronson Methodist Hospital, Department of Radiology

INTRODUCTION: Cystic artery pseudoaneurysm (CAP) is a rare complication of cholecystitis that has been reported in the literature fewer than 40 cases, with a small minority being both of a non-iatrogenic etiology and discovered preoperatively. Other rare complications of acute and chronic cholecystitis are cholecystoenteric fistulas, which has only been reported concomitantly with CAP twice worldwide, this being only the third instance reported.

CASE DESCRIPTION: This is a case report of a patient who presented with chronic cholecystitis.

RESULTS: A 63-year-old male presented to the ER with a chief complaint of emesis, pallor, & shortness of breath. Presentation & physical exam were suspicious for cholecystitis; CT with contrast showed a distended gallbladder with wall thickening, possible cholecystoenteric fistulas, emphysematous change, & an enhancing lesion in the gallbladder fossa consistent with pseudoaneurysm. IR was consulted for percutaneous transhepatic cholangiography (PTC) tube placement, but this procedure was deferred due to the high risk of rupturing the existing aneurysm. A three-phase CT was completed, but was inconclusive for the origin of the aneurysm. The patient was hemodynamically unstable with hypotension after 2 large maroon colored stools & hemoglobin was found to be 6.7. He was given 4 units of PRBCs & fluid resuscitated. Day 2, IR was again consulted and subsequently completed a celiac arteriogram which demonstrated a cystic artery pseudoaneurysm. Due to the proximal origin of the pseudoaneurysm and tortuous nature of the cystic artery, it was not possible to subselectively bypass cystic artery branches not feeding into the CAP. After intraoperative discussion with the surgical team, the cystic artery was successfully embolized using Gelfoam in anticipation of the patient's upcoming cholecystectomy. The patient received 4 more units of PRBCs and was thereafter hemodynamically stable. Day 3, GI performed an EGD & noted a fistula in D2 with an impacted 1cm gallstone to the gallbladder. The final operative decision by surgical oncology was to remove the gallbladder and diseased portion of the duodenum.

CONCLUSIONS: CAP is a rare complication of cholecystitis that may benefit from preoperative embolization.
FECAL IMPACTION WITH STERCORAL COLITIS COMPLICATED BY EMPHYSEMATOUS: A CASE REPORT

Benjamin Roush; J. Erik Winterholler; Melissa Olken, MD

Western Michigan University Homer Stryker M.D. School of Medicine, MD Class of 2019; Western Michigan University Homer Stryker M.D. School of Medicine, MD Class of 2020; Western Michigan University Homer Stryker M.D. School of Medicine, Department of Family and Community Medicine

INTRODUCTION: Stercoral colitis is a rare complication of chronic constipation leading to ischemic pressure necrosis and eventually perforation. This is common in bedridden patients. There have been approximately 180 cases in the literature since it was discovered in 1894. Emphysematous Cystitis is a rare disease in which gas is in the bladder wall and lumen. Diabetes mellitus is the primary risk factor. The combination of the stercoral colitis and emphysematous cystitis have been encountered in the literature only twice.

CASE DESCRIPTION: Patient was a 82 year old female who presented to the hospital with a fever, constipation, abdominal distension and pain. Patient was aphasic and bedridden from a previous stroke, G-tube feeding dependent with a history of poorly controlled diabetes. After admission hematuria was noted, with hypoactive bowel sounds and a difficult exam because of altered mental status. The patient’s blood sugar level was 512 while her Hgb A1c was 9.1. Urine culture showed pansensitive E. Coli & E. Fecalis for which the patient was given Augmentin. Abdominal & Pelvic CT was ordered which showed emphysematous cystitis & stercoral colitis with a large fecal impaction of 130 mm by 65 mm in its greatest dimensions. Case was discussed with urology, who recommended foley placement. Multiple enemas and laxatives were given for fecal impaction. The patient responded well to antibiotics, enemas and laxatives. The fecal impaction resolved. Tube feeds were initially held due to impaction and were later restarted. Patient had resolution of symptoms within a week.
A CASE OF ADULT ONSET PYLORIC STENOSIS

Cayleigh Blumrick, MD; Jayne Barr, MD

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Pyloric Stenosis is a common differential diagnosis in the case of an infant with intractable vomiting. It is significantly less common in the adult population. We present a case of rare acquired pyloric stenosis in a 24 year old African American male with repeated admissions to the hospital for intractable vomiting. Imaging studies showed no acute process and overall normal exam. At upper endoscopy, pangastritis and significantly stenotic pyloric channel were observed.
SIMULTANEOUS PRESENTATION OF THYROID STORM AND DIABETIC KETOACIDOSIS IN A 21-YEAR-OLD MALE

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Thyroid storm and diabetic ketoacidosis (DKA) are rare but serious conditions that can be fatal if not quickly recognized and appropriately treated. Though the underlying etiologies are variable, one common cause of both is autoimmunity. Patients with autoimmune pancreatic or thyroid disease are at risk for DKA or thyroid storm, respectively. Additionally, patients with established autoimmunity against either the thyroid or pancreas are at increased risk of developing autoimmunity in the other location. Due to interplay between DKA and thyroid storm, these syndromes are capable of provoking or exacerbating each other. Most cases of DKA or thyroid storm due to autoimmune dysfunction present in individuals with known thyroid disease or diabetes, often due to poor adherence to medication. However, acute presentation of either disease in the hospital can also be the first manifestation of disease. Here we present the case of a previously healthy 21-year-old male who arrived at the emergency department in DKA and thyroid storm. These were the first manifestations of what would be identified as type 1 diabetes and Graves disease. Diagnosis of the disorders was complicated by aspects of the presentation such as a history of weight loss, tachycardia, tachypnea, and hyperglycemia, which are seen in both disorders. In addition, the lack of fever that is normally characteristic of thyroid storm made its diagnosis more challenging. It is important for physicians to be aware of the diagnosis and treatment of both DKA and thyroid storm individually, as well as their potential relationship. As in the case with our patient, individuals with no relevant medical history can present with both disorders simultaneously, and rapid treatment is essential to prevent morbidity and mortality.
PRIMARY OSSEOUS SARCOIDOSIS PRESENTING AS METASTATIC CARCINOMA

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In medicine, things are not always as they appear and a quick misdiagnosis may result in unnecessary fiscal, physical, and emotional damage to a patient. Because of this, it is necessary to apply a systematic approach to the workup and diagnosis of even the most seemingly straight-forward of cases. Osseous sarcoidosis is an example of a particularly rare manifestation of an uncommon disease and highlights the importance of a complete differential and methodical workup for every patient.

A 36-year-old female without prior history of malignancy presented to the orthopaedic oncology clinic as a referral for multiple lytic lesions of bilateral femurs. These lesions were further characterized by MR imaging after being found incidentally on routine follow-up imaging for a right patellar fracture that had occurred traumatically three months prior. On presentation, the patient was asymptomatic aside from mid-thoracic pain attributed to overuse of crutches. Review of systems was notably negative for constitutional symptoms of fever, chills, sweats, or weight loss. Family and medical history were otherwise noncontributory. Physical exam was negative for any masses, deformities, erythema, or overlying skin changes in either lower extremity with full range of motion and neurovascular capacity.

Staging studies including serums laboratory studies, CT chest, abdomen and pelvis nuclear medicine total body scan revealed scattered lesions throughout the axial and appendicular skeleton most consistent with metastatic disease. Breast mammography was also performed and revealed grouped linearly oriented microcalcifications in the lateral left breast which was further biopsied and characteristic of ductal carcinoma in situ. Open bone biopsy of the right ischium was then performed for further characterization of the osseous lesions. Ischial biopsy demonstrated non-necrotizing granulomas in a background of normal bone marrow components most consistent with osseous sarcoidosis. After initiating systemic treatment of methotrexate, plaquenil, and folic acid she remains clinically asymptomatic at two-year follow up with near full radiographic resolution of her previous osseous lesions.
PDE4 SUBTYPES IN CANCER

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BACKGROUND: Phosphodiesterase 4 (PDE4) has four known subtypes (PDE4A-D), all of which are involved in a variety of cellular functions via the hydrolysis of cyclic adenosine monophosphate (cAMP). Non-specific PDE4 inhibitors were developed in the mid-1990s for neurologic indications, but their emetogenic adverse effects halted progress in clinical trials. Now, subtype-specific PDE4 inhibitors are successfully being developed for age-associated memory impairment. The therapeutic window of these inhibitors is expanded by targeting specific PDE4 subtypes, making these drugs plausible for clinical use. Concurrent with this pharmacologic advancement, studies suggesting a role for PDE4 in tumorigenesis and cancer progression are expanding.

OBJECTIVE: The goal of this study is to conduct a comprehensive review of current literature pertaining to the four subtypes of PDE4 and their individual roles in cancer. This study will inform whether subtype specific inhibitors may have utility as anticancer agents in the future.

METHODS: We searched MEDLINE via PubMed for studies that mentioned PDE4 and cancer. Advanced search terms included: “PDE4 and Cancer” OR “PDE4A and Cancer” OR “PDE4B and Cancer” OR “PDE4C and Cancer” OR “PDE4D and Cancer”. Resulting studies were then reviewed by two investigators and sorted into the following categories: PDE4A, PDE4B, PDE4C, PDE4D, Unspecified, and Not Relevant.

RESULTS: Our search produced 252 papers as of December 1, 2017. 180 were classified into either Unspecified (n=84) if they did not cite a specific subtype or Not Relevant (n=96) if they examined PDE4 outside the context of cancer. For the purposes of constructing a meaningful data analysis, papers from categories with two unique PDE subtypes were added to the individual subtype categories producing the following category totals: PDE4A (n=15), PDE4B (n=32), PDE4C (n=7), and PDE4D (n=33).

DISCUSSION: The majority of evidence supports a role for PDE4 in cancer progression. PDE4 expression is increased across many types of cancers, including: CNS tumors (PDE4A), hematologic malignancies (PDE4A/B/D), lung cancer (PDE4A/B/D), colon cancer (PDE4B), prostate cancer (PDE4D), head and neck cancer (PDE4D), and breast cancer (PDE4D). Interestingly, lower expression of PDE4A and PDE4B was linked to poorer outcomes in breast and prostate cancer, respectively, suggesting that the role of PDE4 in cancer is both subtype specific and cancer type specific. A number of PDE4 pathways were also identified as potential mechanisms of pathogenesis including a PDE4A-AIP interaction in CNS tumors, PDE4A and VEGF in lung cancer, PDE4B and the PI3K/AKT pathway in hematologic malignancies, and PDE4B and KRAS pathway in colon cancer.

CONCLUSIONS: Our study highlights many areas for further investigation of PDE4 inhibitors as anticancer agents. Specifically, PDE4B may be a strong target for inhibition in hematologic malignancies and colon cancer. PDE4D may also be a plausible target in several different solid tumor types.
RATES AND RISK FACTORS OF VENTRAL INCISIONAL HERNIA FOLLOWING HEPATOBILIARY AND PANCREATIC SURGERY

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INTRODUCTION: Improving outcomes following hepatobiliary and pancreatic (HPB) surgery have increased the emphasis on survivorship. Development of ventral incisional hernia (VIH) is associated with decreased quality of life and increased healthcare costs. The aim of this study was to determine rates and risk factors of VIH formation after HPB surgery.

METHODS: Patients who underwent HPB surgery at a single academic institution during a 24-month period were included in the study. Primary outcome was postoperative VIH seen on exam and/or CT. The CT was reviewed by a surgeon and radiologist. Risk factors associated with VIH development were determined using a preliminary log rank test followed by a Cox proportional hazards model.

RESULTS: 119 patients at a median follow up of 6.1 months were included in the study, 54% and 46% underwent hepatobiliary and pancreatic surgery respectively. Median age was 59 yrs. and 24% of patients had a cancer diagnosis. Probability of hernia development at 1 yr. was 45.72% and there was no difference in rates between hepatobiliary and pancreatic surgery. Cancer, no chemotherapy and major morbidity were associated with VIH (p<0.05). In hepatic surgery EBL>800ml was associated with increased VIH; HR 3.701 (95% CI 1.124-12.180). In pancreas surgery receipt of chemotherapy was associated with HR 0.282 (95% 0.083-0.960).
A QUALITY IMPROVEMENT PROJECT TO EVALUATE THE IMPACT OF A PHARMACIST-DRIVEN STEWARDSHIP INITIATIVE TO UTILIZE PROCALCITONIN LEVELS TO DISCONTINUE ANTIBIOTICS IN A COMMUNITY TEACHING HOSPITAL

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Procalcitonin (PCT) is becoming an increasingly used biomarker to differentiate bacterial infection in sepsis, pneumonia, and COPD from non-bacterial infections or inflammatory responses\(^1\),\(^2\). PCT has mixed sensitivity and specificity across clinical trials as marker for bacterial infection\(^3\),\(^4\), however multiple randomized controlled trials and meta-analyses have determined that antibiotic stewardship initiatives that use PCT threshold levels to direct antibiotic therapy are safe and cost-effective methods to reduce the total antibiotic use\(^5\)–\(^10\).

The objective of our study is to 1) characterize the antibiotic prescribing behavior of providers within a community hospital for patients with initial low PCT levels (<0.25 ng/mL), and 2) determine whether a pharmacist-driven intervention has a significant reduction on antibiotic use in patients with initial low PCT levels. To accomplish this, we evaluated the number of antibiotic treatment days received by adult inpatients who had low serum PCT levels (<0.25 ng/mL) and investigated covariation between antibiotic treatment duration and several other variables including age, diagnosis, WBC, and T\(^{\text{max}}\) within 24 hrs of measuring serum PCT. In the prospective phase of the study, we will compare whether a shared decision-making approach between pharmacist and provider reduces the total number of antibiotic treatment days when serum PCT levels result <0.25 ng/mL.

The retrospective phase included 86 patients, 50% male and 50% female. Age ranged from 18 to 96 years old with mean of 67 years. All patients had serum PCT levels <0.25 ng/mL, and in 80% of cases, serum PCT was measured within 1 day of admission. However, 59% of patients were initiated on antibiotic therapy. Antibiotic treatment duration ranged from 1 to 21 days with a median of 4 days. Length of hospital admission ranged from 1 to 35 days with median of 5 days.

There was no difference in the duration of antibiotic therapy for PCT levels between 0.1–0.25 and <0.1 ng/mL. Similarly, antibiotic treatment duration did not correlate with a patient’s age, WBC, or temperature at the time of serum PCT measurement, nor was it associated with the admitting diagnosis or indication for checking serum PCT. The results of the first phase of our study show that despite a low serum PCT, antibiotics continue to be prescribed for an average of two additional days beyond a negative result. Furthermore, the lack of association between duration of antibiotic therapy and age, WBC, T\(^{\text{max}}\), or admission diagnosis suggests that antibiotic treatment decisions continued to be based upon clinical gestalt rather than evidence-based methodology for clinical decision making. In the prospective phase of our study, we will investigate whether a pharmacist-based protocolized intervention for the use of PCT levels reduces the total number of antibiotic treatment-days resulting in decreased antibiotic exposure and more cost-effective treatment for patients.
A CASE OF MALARIAL HEPATITIS

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INTRODUCTION: Mild elevation in liver enzymes (up to 3 times of normal) is commonly observed in Plasmodium falciparum malaria but involvement of liver leading to acute hepatitis [alanine transaminase (ALT) > 10 times of normal level] is a rare complication which is associated with a higher incidence of cerebral malaria, shock and acute respiratory distress syndrome (ARDS).

CASE DESCRIPTION: A 22-year-old African man, who had recently returned from Burundi, Africa, presented with acute onset fever, headache, epigastric pain, vomiting, dark colored urine and cough. Labs were significant for aspartate transaminase of 73 U/L, ALT 65 U/L, total bilirubin 6.6 mg/dL and platelets 63,000/microliter. Patient was found to have P. falciparum on blood smear with 2.3% parasitemia. With initiation of IV quinidine and IV doxycycline, parasitemia improved to 0.1% however his liver enzymes continued to trend upwards and his respiratory status worsened. On day three of hospitalization, ALT had increased to 437 U/L, he developed ARDS and required intubation. Other causes for elevated transaminases, including Hepatitis A, B and C, were ruled out and CT was negative for any related pathology. With continued anti-malarial treatment, ALT then slowly trended down. He was successfully extubated on day six and discharged home.

CONCLUSION: Liver function tests should be performed at the time of diagnosis of P. falciparum malarial, as well as repeated at regular intervals, to ensure the early recognition of malarial hepatitis as these patients need close monitoring due to the high risk of complications.
TOTAL ENDOVASCULAR ILIOCAVAL RECONSTRUCTION USING POLYTETRAFLUROETHYLENE STENT-GRAFT PLACEMENT FOR THE TREATMENT OF INFERIOR VENA CAVA RESECTION

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Endovascular iliocaval reconstruction has been described for the treatment of symptomatic venous occlusive disease and for the management of inferior vena cava (IVC) filter-bearing iliocaval thrombosis. Briefly, the lesion in the IVC is accessed via an endovascular approach, the lesion is cannulated, and a functional lumen is restored and stented. High technical success rates and good midterm patency rates have been described.

IVC ligation is a surgical technique used for damage-control in IVC injury or tumor debulking. Ligation is associated with significant morbidity and mortality. Venous insufficiency has been reported following IVC ligation, manifesting as an acute perioperative complication with edema or elevated compartment pressures in the lower extremities, or as chronic venous insufficiency with sustained lower extremity edema.

This single case report describes endovascular iliocaval reconstruction in a patient with prior IVC resection. Fluoroscopic-guided AMPLATZER vascular plug (AVP) targeting was used to perform sharp recanalization of the resected IVC. The IVC and iliac veins were subsequently reconstructed using conformable TAG (cTAG) stent-grafts and Wallstents. Although additional studies are needed to validate this technique, fluoroscopically-guided AVP targeting and endovascular iliocaval stent-graft reconstruction offers a minimally invasive treatment option for surgically resected and ligated inferior vena cava.
A CASE REPORT: CANDIDA ALBICANS ENDOCARDITIS IN A NATIVE AORTIC VALVE

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Fungal endocarditis is the rarest etiology of infective endocarditis (IE), representing only 1-4% of cases. Risk is highest in patients with prosthetic valves and a history of IV drug use. Along with being exceedingly rare, this also tends to be the etiology of IE with the highest mortality often due to indolent nature of onset as well as high rate of recurrence due to being difficult to treat. This as well tends to be seen mostly in people with prosthetic valves and indwelling lines. IV drug use is another common risk factor, typically associated with tricuspid valve endocarditis. Of the fungal infections that cause this condition, Candida albicans tends to be the most common (Candida albicans 24%, non-albicans Candida 28%, aspergillus species 24%, Histoplasma capsulatum 6%, other 17%)

Here we present at case of a 46 year old male former IV drug user without other immunosuppression who was admitted to the hospital with recurrent right wrist pain cellulitis, fevers, chills, new onset murmur, nail splinter hemorrhages, and Osler nodules. Of note, he had been admitted approximately 6 weeks earlier with a right upper extremity abscess, positive for Candida albicans on wound culture following incision and drainage. Aerobic blood cultures during this initial admission were negative. During his second hospitalization, patient was noted to have Candida albicans bacteremia and ultimately endocarditis of his native aortic valve. He was diagnosed based on clinical features, TTE with subsequent TEE, and persistent candidemia on blood culture. He was treated with anidulafungin and underwent aortic valve replacement with a bioprosthetic valve. He subsequently passed away 2 weeks after surgery secondary to unrelated causes. This is an unusual case of rare fungal endocarditis, that while in a known IV drug user, affected the left-sided aortic valve as opposed to the typically affected right-sided tricuspid valve. Tricuspid infective endocarditis is the most common at 50%, aortic infective endocarditis occurs 20% of the time. Multiple valve involvement is common. Additionally, fungal endocarditis can often present much more subtly than other forms of endocarditis, resulting in delay of diagnosis and overall poorer prognostic outcomes. Pathognomonic signs like splinter hemorrhages and Osler nodes, while present in this patient, are less common in fungal endocarditis than other causes. There is evidence to show that earlier detection and treatment can be associated with lower mortality rate. Therefore being vigilant of this possible diagnosis becomes critical in order to obtain the best possible outcome for our patients.
A CASE OF RIGHT ATRIAL THROMBUS “IN-SITU” DURING PATENT FORAMEN OVALE CLOSURE: A CLINICAL DILEMMA

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INTRODUCTION: Recently, the RESPECT trial has shown that closure of a patent foramen ovale (PFO) is beneficial in reducing recurrent strokes in patients with a history of cryptogenic stroke. Here we discuss a case about a patient who underwent a PFO closure due to a previous cryptogenic stroke, which was complicated by the development of a right atrial thrombus in-situ during the procedure.

CASE REPORT: A 72-year-old female with a history of cardiovascular disease, patent foramen ovale (PFO), and cryptogenic stroke was referred to interventional cardiology for percutaneous closure of a PFO. The patient was on warfarin 2 mg/day and aspirin 81 mg/day for prevention of recurrent strokes. Our patient wished to fix the PFO due to the dietary restrictions, frequent INR checks, and risk of bleeding associated with long term warfarin use. Transesophageal echo (TEE) showed a PFO with left to right shunt.

Patient was given heparin as per standard protocol prior to the procedure. The right atrium was accessed via the right femoral vein, where an intracardiac echocardiogram and a J-wire were positioned. After the J-wire was situated to intervene through the atrial septal defect, an echocardiogram showed a mobile clot on the J-wire. A clinical dilemma developed. If the wire was removed or the sheath was advanced the thrombus could embolize. Similarly, if tissue plasminogen activator was given, the clot could also embolize. The only options were to involve cardiothoracic surgery to openly remove the thrombus or to remove the thrombus percutaneously, which was chosen. A catheter was inserted through the left femoral vein to the right atrium, and the thrombus was successfully aspirated. PFO closure resumed and the patient tolerated the procedure well.

DISCUSSION: Percutaneous PFO closure reported complication rates are 10%, with vascular complications comprising 3%. Literature regarding aspiration thrombectomy in cardiac thrombi is limited. A pooled analysis of the management of floating right heart thrombi demonstrated that percutaneous intervention, whether thrombolytic or mechanical aspiration, were scant. Although not perfectly analogous, a similar case involved a paradoxical embolism in-situ during workup of a pulmonary embolism. In this case, the authors ruled against the use of thrombolytic therapy due to risk of systemic embolization. However, surgical thrombectomy was decided upon, which would have been our second option.

CONCLUSION: This case suggests that percutaneous aspiration thrombectomy can be a tool that is well tolerated in the treatment of cardiac thrombi, especially in cases where thrombi develop in-situ.
SUCCESSFUL INTUBATION OF A DIFFICULT AIRWAY USING A SUCTION YANKAUER

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BACKGROUND: Endotracheal Intubation (ETI) is used to effectively manage a patient’s airway. Failure of ETI may lead to ineffective ventilation or oxygenation, potentially causing organ damage and eventually death. As many as 8% of ETIs are difficult and approximately 1% of ETIs are unsuccessful. Tools and techniques that can be used to successfully obtain airway access are essential.

CASE STUDY: A patient with COPD presented to the emergency department in acute respiratory distress. Both CPAP and BiPAP were unsuccessful in improving the patient’s tidal volumes and work of breathing. The patient was unable to be properly intubated due to a mass obstructing the view of her vocal cords. A cricothyrotomy could not be performed due to distorted anatomy. After multiple intubation attempts from several different physicians, the patient was successfully intubated using a suction yankauer to move the mass peripherally and further served as a conduit through which a bougie was passed.

DISCUSSION: The risk for complications rises with each intubation attempt. Use of intubation difficulty prediction tools and algorithms, such as LEMON, can help to identify the best initial method of intubation. While there are a variety of tools and aids that can be utilized to assist in difficult intubations, rapid airway access is essential, and common tools do not always work. We hope that knowledge of this novel, yet simple and effective technique will help physicians successfully intubate patients with distorted oropharyngeal anatomy who can not be intubated using conventional methods.
PONTINE INFARCT PRESENTS AS HEMATEMESIS AND VERTIGO WITH UNILATERAL FACIAL NERVE PALSY

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INTRODUCTION: Bell’s palsy is typically a temporary and self-limiting unilateral facial paralysis secondary to injury of the facial nerve affecting as many as 40,000 individuals in the United States each year. Bell’s palsy is the most common diagnosis of a facial nerve paralysis, comprising approximately 72% of cases. Although thought to be the result of a viral infection, the cause of Bell’s palsy remains idiopathic. It is of utmost importance to exclude all mimics of unilateral facial paralysis prior to the diagnosis of Bell’s palsy.

CASE: The patient is a 40-year-old female who presented to the emergency department with a chief complaint of sudden onset vertigo, hematemesis, and subjective left sided numbness upon waking. She was found to have right sided facial paralysis, initially unnoticed prior to arrival in the emergency department. She was previously healthy with no history of hypertension, hyperlipidemia, diabetes, atrial fibrillation, or clotting disorders. She was a non-smoker on oral contraceptive therapy. Her presentation prompted further neurological work-up and magnetic resonance imaging identified a small punctate infarct in the pons, involving the right facial colliculus.

DISCUSSION: Physicians rely on history and physical exam skills to help distinguish a true Bell’s palsy from other causes of facial nerve paralysis such as infection, stroke, Lyme disease, Ramsay Hunt syndrome, sarcoidosis, Todd’s paralysis, and intracranial mass lesions. Stroke becomes higher on the differential diagnosis when patients have multiple risk factors, including increased age, hypertension, hyperlipidemia, previous stroke, and diabetes, or additional neurologic signs and symptoms. In this case, a young, otherwise healthy female presented with a pontine stroke with subsequent damage to the facial colliculus which mimicked Bell’s palsy with complete unilateral facial paralysis. Vascular pontine lesions are a rare occurrence representing only 7% of all ischemic strokes and 1% of facial nerve palsies. In this case, her clinical presentation with vertigo and subjective left body numbness prompted further neurological workup. Thus history, physical exam, and clinical picture are key in preventing anchoring bias. Furthermore, historical data, particularly of less thought of stroke risk factors including illicit drug use, oral contraceptive use, and lifestyle, should be elicited as evidenced in this patient whom was on oral contraceptive therapy, increasing her risk of stroke.

In general, Bell’s palsy should be held as a diagnosis of exclusion following a through
HOMICIDAL ABUSE BY NEGLECT IN CEREBRAL PALSY

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INTRODUCTION: A disability is a limitation that challenges one’s normal way of life (1). Traditionally, the term “disabled” encompasses those who have either a physical or mental impairment (1). Chronically disabled persons may be disabled as a result of underlying natural disease processes, or as a result of some form of trauma. The disabled are a population that is vulnerable to harm, because their physical and/or mental limitations make them more susceptible to various mechanisms of injury and death (2).

MATERIAL: The case is selected from the files of one of the authors (JP).

CASE REPORT: We present the case of a 22-year old Hispanic male, with a history of severe cerebral palsy (CP) and seizure disorder, who was under the care of his family at home. He was essentially bedridden and relied on care providers for all activities of daily life. Although he had limited capabilities to place items in his mouth, his feedings took place via a gastric tube. He experienced respiratory arrest coinciding with a seizure while his diaper was being changed. Emergency medical services were called, but all resuscitative efforts failed. Because of the condition of his body, the case was referred for medicolegal autopsy. The decedent appeared extremely cachectic and malnourished at autopsy, with numerous decubitus ulcers visible on the skin. The cause of death was due to CP with a seizure disorder, with a contributing factor of severe malnutrition. The manner of death was considered a homicide by the forensic pathologist given both the circumstances and findings which suggested the individual was a victim of deliberate starvation by his caretakers.

DISCUSSION: In this case study we review the findings at autopsy that support the ruling of homicide, and discuss the implications of disability on health outcome overall. Ultimately, disability may predispose one to poor health outcomes and may make one vulnerable to harm by various means. This case highlights how an incident of abuse by neglect might be overlooked in a population that is already susceptible to injury, namely the disabled population.
PSEUDO-CPM (CENTRAL PONTINE MYELINOLYSIS)

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INTRODUCTION: Central Pontine Myelinolysis (CPM), first described in 1959, occurs in association with rapid correction of serum sodium concentration following a period of hyponatremia. In CPM cases, this is characterized pathologically by lesions of the central pons, appearing as a dark central abnormality. In the forensic pathology setting, CPM may be found at autopsy and can be considered a potential cause/mechanism of death; such cases typically occur in the setting of chronic alcoholics. In this case report, we present two autopsy cases where gross examination of the pons revealed a lesion suggestive of CPM; however, subsequent microscopic analysis indicated otherwise.

MATERIALS: The cases were selected from the files of one of the authors (JP).

CASE REPORTS: Case 1: A 30-year-old African American female with a past medical history significant for drug abuse and hypertension, was admitted to the Emergency Department (ED) for a complaint of anxiety, cough, dyspnea, and chest tightness. The patient was subsequently found with altered mental status and with her purse open and an empty bottle of pills in her lap. She was administered Narcan with immediate response. She was admitted to the intensive care unit. The patient subsequently experienced an aspiration event, developed Acute Respiratory Distress Syndrome, and died 20 days after presentation. The case was reported to the medical examiner for investigation. At autopsy, intracranial exam revealed a 0.8 cm area of dark tan discoloration involving the central pons which had an appearance similar to CPM; however, microscopic examination revealed that the lesion was characterized by an aggregate of neurons, with no evidence of necrosis, consistent with a diagnosis of neuronal heterotopia.

Case 2: A 47-year-old white male with a history of chronic alcoholism was found deceased outdoors. He was transported to the medical examiner’s office for autopsy. Brain examination revealed the presence of pink-red discoloration of the central pons, suggesting the possibility of CPM; however, microscopically, the pons lesion was consistent with capillary telangiectasia.

In both cases, the pontine lesions were considered incidental findings, unrelated to the cause of death.

DISCUSSION: The classical case of CPM involves a rapid switch from hyponatremia to hypernatremia. The brain adapts to the state of hyponatremia to compensate for osmotic swelling. This adaptation hampers the brain in its ability to correct for subsequent rapid correction of serum sodium and damage occurs due to osmotic shrinking. The result is generally pontine and/or extrapontine damage. Clinically, patients classically show an initial phase of neurologic disruption due to the hyponatremia that is ameliorated by rapid correction of the serum sodium. However, this is followed approximately 2-8 days later by demyelination and may include symptoms of dysarthria, dysphagia, and potentially quadriplegia. At autopsy, CPM can present with a dark central lesion of the pons. Histologically, there is destruction of myelin sheaths, with unaffected vasculature and normal neuronal cell bodies remaining, and there is a notable lack of inflammation. In older lesions, degenerative changes may be seen.

CONCLUSION: Initial impression at autopsy for each of the cases presented suggested CPM as a possible cause/mechanism of death. Although the decedent in Case 1 was not a chronic alcoholic, she was a chronic drug user and she had been hospitalized, creating a possible at-risk situation for sodium disturbances. Her pons showed a pseudo-CPM lesion at autopsy. The decedent presented in Case 2 was a chronic alcoholic, so on initial exam, it seemed plausible that he could have died from CPM as well. These cases reiterate the importance of the histologic exam at autopsy.
BENEFICIAL EFFECTS OF VOLUNTEERING IN A STUDENT RUN CLINIC ON CULTURAL AWARENESS AND PREPARATION FOR CLINICAL ROTATIONS

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BACKGROUND/INTRODUCTION: Medical education is divided between preclinical and clinical years. Traditionally, medical students still in their preclinical years have little to no opportunities to work directly with patients. Many medical schools incorporate medical student run clinics to provide direct patient contact at an early point in students’ training. At Homer Stryker M.D. School of Medicine, students have had the opportunity to volunteer at the Holy Family Health pediatrics clinic in Hartford, Michigan. This clinic predominantly serves a Latino migrant worker population. Studies examining medical student engagement in clinical settings during their initial two preclinical years have reported that medical students perceive these as beneficial to their medical education. Medical students who participate in early clinical experiences have reported increased confidence entering their clinical clerkship years, increased motivation to study, and a development of their non-analytical reasoning skills. Notably, students who engage in early clinical settings serving minority populations have shown improved cultural awareness and increased tolerance when working with diverse patient demographic groups.

OBJECTIVE/PURPOSE/RATIONALE: To determine the effect of volunteering in a student run clinic that serves migrant health workers on students’ cultural awareness. We present findings that evaluate benefits of participation on cultural awareness and clinical development. In addition to asking what students gained in terms of cultural awareness and communication during their clinical encounters.

MATERIALS AND METHODS: The study includes a preliminary survey to determine students assessments of the benefits to volunteering at HFH and writing a formal IRB that will be administered to volunteers to qualify the effects of volunteering on cultural awareness and development.

RESULTS AND DISCUSSION: Preliminary findings are positive. We had twenty-nine responses from a pool of forty-seven volunteers. 93% of first and second year students felt that volunteering was great preparation for clinical years. 50% of third and fourth year students also felt it was good preparation and other responses qualified that it was less helpful if the student had already had their pediatrics or family medicine rotation.

CONCLUSION: As medical schools add more diversity and cultural sensitivity education to curricula we wanted to demonstrate the importance of additional practical opportunities to learn in addition to didactics. We feel that creating and volunteering at student run clinics are excellent opportunities for students to engage with what they learn in the classroom and give back to the community. Based on our preliminary survey 69% of respondents agreed or strongly agreed that these experiences helped prepare for clinical rotations and helped during clerkships. This development of cultural awareness will be further investigated with continued results and IRB questions. It will be important in the future to conduct a cohort study with negative controls to be able to better quantify the impact of participation.
BLIND AFTER BINGEING: PURTSCHER-LIKE RETINOPATHY IN ACUTE ALCOHOLIC PANCREATITIS

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Purtscher retinopathy is an occlusive microvasculopathy, often associated with trauma, that causes sudden onset vision loss of varying severity. It is labelled as Purtscher-like when caused by non-traumatic conditions. While prognosis is variable and some patients experience spontaneous resolution, this is a vision-threatening condition. It can be seen in acute pancreatitis as a rare complication that is often associated with a fatal outcome. We present a case of Purtscher-like retinopathy in acute alcoholic pancreatitis.

A 37-year-old woman presented to the emergency department (ED) with two days of nausea, vomiting and abdominal pain. She reported heavy alcohol use and similar symptoms intermittently over the past year, with this episode being the most severe. In the ED, initial labs were notable for an elevated lipase, confirming the diagnosis of acute alcoholic pancreatitis. Supportive care measures were initiated including fluid resuscitation, analgesia, and anti-emetics. She had no evidence of organ failure. On the first day of hospitalization, the patient complained of visual hallucinations as well as diminished visual acuity. It was suspected that her visual disturbance was likely related to alcohol withdrawal. With appropriate treatment of withdrawal, her vital signs normalized and tremors resolved, however her visual disturbance persisted. Testing revealed 20/100 right sided and 20/200 left sided visual acuity to both near and far vision respectively. Ophthalmology was consulted and a dilated fundoscopic exam demonstrated multiple retinal cotton wool spots bilaterally and significant macular edema. The patient was diagnosed with Purtscher-like retinopathy in the setting of acute pancreatitis. While the prognosis for her vision was guarded given the ischemic nature of the insult, she had subjective improvement in visual acuity during the remainder of the hospital course, and was to follow with ophthalmology.

Acute alcoholic pancreatitis is a common, potentially lethal condition with a myriad of possible complications. Physicians should be alert to Purtscher-like retinopathy as a rare complication of this disease. It is a vision-threatening condition that is important to recognize for several reasons. First, as in this case, visual disturbance is common with alcohol withdrawal, so the retinopathy can be misdiagnosed as a withdrawal symptom. Secondly, it is associated with an overall poorer prognosis, and may be a useful prognostic indicator in acute pancreatitis. Finally, given the rarity of the condition, there are no evidence based therapies for Purtscher-like retinopathy. Therefore, increased recognition may allow for different therapies to be investigated.
CANDIDA ENDOCARDITIS: A DIAGNOSTIC CHALLENGE WITH A FATAL OUTCOME

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Fungal endocarditis is a rare and fatal condition. It can be extremely difficult to diagnose, and often is only identified postmortem. We present a fatal case of candida endocarditis and highlight the challenges in diagnosis.

A 46-year-old male with a history of IVDU was sent into the ED by his PCP with fevers, chills, and a new murmur. In the prior four months, the patient had been seen for culture-negative lumbar spondylodiscitis, recurrent forearm cellulitis with abscess, and more recently an erythematous, painful index finger lesion. On this admission, echocardiogram demonstrated an aortic valve vegetation and his blood cultures grew candida albicans. Antifungal therapy was initiated and he underwent aortic valve replacement. He was discharged on anidulafungin and warfarin. Two days after discharge, he was found unresponsive and a CT scan showed intraparenchymal hemorrhage with hydrocephalus and cerebellar tonsillar herniation. The patient died shortly after withdrawal of care.

This case highlights the difficulty in achieving a diagnosis of fungal endocarditis. The patient had multiple contacts with the healthcare system over several months for what in hindsight were septic embolic events. Given the negative culture data, endocarditis was not suspected until he eventually developed clear systemic symptoms and a new murmur. Physicians should maintain a high suspicion for fungal endocarditis in patients with risk factors and findings that raise suspicion for septic embolic phenomenon. In these instances, there should be a low threshold to obtain echocardiography. Candida forms large, dense vegetations that are almost always identifiable on transthoracic echocardiogram.
A CASE OF FLECAINIDE INDUCED CARDIAC ARRHYTHMIA DUE TO POLYPHARMACY

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INTRODUCTION: Flecainide is a class IC anti-arrhythmic agent recommended for maintenance of sinus rhythm in Afib and/or SVT without structural heart disease. Flecainide is well known to be pro-arrhythmic as well.

CASE DESCRIPTION: A 52 year-old female was found unresponsive at her house. Patient was recently started on flecainide by her cardiologist for inappropriate sinus tachycardia despite being on amitriptyline and bupropion for depression. In the ED, patient was intubated for hypoxemia, norepinephrine infusion was started for hypotension and patient was transferred to the ICU. On examination, patient had regular rate and rhythm with no murmurs, rubs or gallops. EKG showed prolonged QTc. Troponins were normal. CT head showed no acute abnormality. EEG showed no evidence of seizures. Echocardiography was unremarkable with normal EF. Next day, Patient was taken off norepinephrine and sedation was stopped. One day later, patient was fully conscious with no evidence of focal neurological deficits and was discharged home.

DISCUSSION: The patient most likely had an undocumented cardiac arrhythmia secondary to recently started flecainide and polypharmacy. Bupropion decreases the metabolism of flecainide. Amitriptyline and flecainide both prolong QTc. The rate of flecainide’s pro-arrhythmic effect is 3.5 – 5%. It is highly associated with VTach and Vfib. This effect is rare in patients without structural heart disease.

CONCLUSION: Despite its efficacy, flecainide should be avoided or used with caution for its high risk profile for developing cardiac arrhythmias. Patient’s medication list should be carefully reviewed before prescribing such a high risk drug for any possible drug-drug interactions.
A UNIQUE PRESENTATION OF PAPILLARY RENAL CELL CANCER

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INTRODUCTION: Papillary Renal cell carcinoma is a relatively rare adult solid cancer. Most cases of PRCC start with a renal primary and spread fast to the adjoining organs. The present study reports the case of a patient who presented with a large, right paratracheal mediastinal mass; however, retroperitoneal node biopsy confirmed the diagnosis of Papillary RCC.

CASE: Our case describes a 62-year-old male who presented with a persistent nonproductive cough ongoing for a few months. On examination he had normal breath sounds w/o rales or rhonchi. Initial x ray showed a large paratracheal mass with tracheal deviation to the left. A subsequent Chest CT scan with contrast chest demonstrated a large 10x6. 5x6 cm necrotic, nodulating mass in the right paratracheal region with suspicious mediastinal lymph nodes. An Abdomino-pelvis Ct scan with contrast demonstrated a retroperitoneal LAD, a conglomerulated aortocaval mass (9x4 cm) and a 21x18mm renal enhancing mass which seemed an unlikely primary. A ct guided core biopsy of the retroperitoneal lymph node demonstrated metastatic cancer which was suggestive of papillary cancer as confirmed by second opinion from Mayo clinic. Immunostains were positive for CK7, racemase, PAX-8, vimentin, CEA IX and focally with androgen receptor, all indicative of papillary renal cell cancer. A Pet scan survey showed results consistent with malignancy and a left medullary sponge kidney. The patient was started on palliative external beam radiation therapy to the chest followed by systemic palliative therapy with sunitinib.

DISCUSSION AND CONCLUSIONS: Papillary renal cell carcinoma (PRCC) constitutes about 10-15% of all Renal cell cancers. The prognosis of patients with metastatic RCC remains poor, since a key prognostic factor in RCC is the clinical stage of the disease. Almost all cases of renal cell carcinoma start with a renal primary and spread fast to the adjoining organs. They are more likely to be organ confined tumors with less metastasis when compared to their clear cell counterparts. This is an unusual presentation where the primary lesion is only 2 cm but the metastasis were much larger in size and a chest mass with ongoing cough was the only presenting symptom.

In conclusion, despite the occurrence of RCC being rare, it should be considered in the differential diagnosis, particularly when a mass located in the kidneys presents with metastases to the mediastinal lymph nodes and elevated NSE serum levels, even if there is no involvement of the abdominal lymph nodes and the primary lesion is of a small size.
CHOKING ON COCAINE: A RARE CASE OF COCAINE INDUCED ANGIOEDEMA

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INTRODUCTION: Angioedema is a condition mostly related to drug allergies. The hereditary variant is due to c1 esterase inhibitor deficiency. Most cases presenting to the ED are mild with facial swelling that resolve with epinephrine or steroids and only severe cases requires airway protection with intubation or cricothyrotomy with subsequent admission to the Medical ICU.

CASE DESCRIPTION: Our patient is a 34 year old female who presented to the ED with complains of acute onset dyspnea and swelling of her lips and throat. On physical exam, she was in respiratory distress and had a massive swelling of both of her lips and the uvula. There was an audible stridor with wheezes on auscultation but no rashes. She was given epinephrine and methylprednisolone without resolution of her symptoms leading to intubation. C4 and C1 esterase inhibitor and C1Q binding serum levels were normal. Her UDS was positive for cocaine and the patient admitted to inhaling cocaine prior to the episode. Patient was kept in the ICU for another day before being extubated. Her swelling had resolved by that time.

DISCUSSION: Cocaine induced angioedema and bronchospasm are rare findings and have been reported after both nasal insufflation and inhalation of cocaine. The exact mechanism is unknown but most likely is an immunoallergic reaction or increased α-adrenergic tone. Regardless of the proposed mechanisms, these apparently allergic manifestations of cocaine are exceptionally uncommon. Treatment is similar to other causes of angioedema with reducing swelling and providing airway support.
DAPSONE INDUCED APLASTIC ANEMIA WITH EARLY SIGNS OF RESPONSE TO TREATMENT WITH ELTROMBOPAG

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Aplastic anemia is a rare adverse effect associated with Dapsone. The pathogenesis and optimal treatment of this uncommon toxicity remains unknown, but is thought to be directed towards immune mediated bone marrow suppression rather than cell destruction. We present a case of a 71-year-old female with pancytopenia after three weeks of Dapsone treatment for systemic lupus.

She presented with increasing bruises and bleeding gums and was found to have pancytopenia with profound thrombocytopenia (platelet count 7,000/mcL), compared to the other hematopoietic lineages. She was initially treated for acute immune thrombocytopenic purpura. Platelets increased to 73,000/mcL after one transfusion without further significant drop, suggesting that the pancytopenia resulted from under-regeneration caused by Dapsone induced bone marrow suppression. Bone marrow biopsy revealed 10% hypocellularity without dyspoiesis or myelofibrosis. Four weeks after discontinuation of Dapsone, there was no improvement in all three lineages despite platelet and PRBC transfusions. Other treatments considered included immunosuppressive therapy (IST) such as antithymocyte globulin, cyclosporine, and methylprednisolone. However, considering her profound thrombocytopenia and recent evidence of the effectiveness of treating aplastic anemia with thrombopoietin receptor agonist, she was given oral Eltrombopag. Within two weeks, the patient showed increases in neutrophil and platelet counts, suggesting that thrombomimetics can be used in Dapsone induced aplastic anemia along with other IST. The relative lack of side effects with thrombomimetics may favor its use over IST. Furthermore, improvements in each lineage suggest a pathophysiology related to hematopoietic stem cell suppression that is treatable with thrombomimetics.
DEATH RELATED TO ACUTE ESOPHAGEAL NECROSIS (“BLACK ESOPHAGUS”)

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INTRODUCTION: Chronic alcoholism is a major cause of morbidity and mortality, with numerous organ systems at-risk for dysfunction and toxic injury. A common manifestation of chronic alcoholism within the gastrointestinal (GI) system is upper GI hemorrhage, classically occurring from bleeding esophageal varices in a cirrhotic alcoholic. Despite this classic association, other causes of upper GI bleeding also occur in chronic alcoholics, including gastritis and peptic ulcer disease. We present a case of fatal massive upper GI hemorrhage in an alcoholic without cirrhosis, where the source of the hemorrhage was acute esophageal necrosis.

MATERIALS: This case was selected from the case files of one of the authors (JP).

CASE REPORT: A 57-year-old alcoholic male was found dead in his unlocked apartment with evidence of blunt force injuries, including scalp lacerations. His neighbors heard him fall down the stairs earlier, and there was evidence that the decedent had attempted to clean-up the blood from his injuries. At medicolegal autopsy, the esophageal mucosa demonstrated a markedly black/hemorrhagic appearance, with an abrupt discontinuation of this appearance at the esophagogastric junction. His stomach was distended with greater than 2 L of bloody fluid, and the gastric mucosa had no erosions or ulcers. Head exam revealed subscalpular hemorrhage associated with the scalp lacerations, and a thin layer of subdural hemorrhage, but no brain contusions. Microscopically, the esophagus demonstrated acute inflammation, necrosis, and hemorrhage. Toxicology testing revealed a postmortem blood ethanol level of 14 mg/dL. The cause of death was acute and chronic alcoholism, with associated upper gastrointestinal tract hemorrhage, related to erosive esophagitis/acute esophageal necrosis, with contributing factors of blunt force head injuries.

DISCUSSION: Acute Esophageal Necrosis (AEN), or “black esophagus,” is circumferential black discoloration of the distal esophagus that can extend proximally but abruptly halts distally at the esophagogastric junction. Most AEN patients present with upper gastrointestinal hemorrhage. The cause of AEN is likely multifactorial from ischemia, gastric reflux injury, and compromised mucosal defenses. There are a variety of risk factors, including alcohol abuse and malnutrition. Alcohol irritates the GI mucosa, damages GI mucosa microcirculation, stimulates gastric secretions, increases the risk for gastric reflux, disrupts GI motility and pH, and increases the likelihood of malnutrition. AEN typically afflicts older males having multiple medical comorbidities, although it has been diagnosed in alcoholics as young as 40 years old. AEN may be diagnosed by endoscopy. The mortality rate is around 30%, often due to other underlying comorbidities, but is believed to be less than 10% for AEN alone. There is no standard treatment, but recommendations include IV fluids, packed red blood cells as needed, IV insulin if hyperglycemic, proton pump inhibitors, and nil per os with total parenteral nutrition. Complications include perforation, stricture formation, mediastinitis, microbial superimposed infection, and death.

CONCLUSION: It is important to include AEN in the differential whenever a critically ill older person or alcoholic of any age presents with an upper GI bleed. The condition has a characteristic gross appearance, with marked black discoloration of the distal esophageal mucosa. Early diagnosis allows for prompt treatment initiation, and follow-up is important to prevent potential AEN complications, such as perforation, strictures, and death.
FIGHTING DIAGNOSTIC CONFIRMATION BIAS: ABPA, CF, OR BOTH?
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Allergic bronchopulmonary aspergillosis (ABPA) often complicates CF and other chronic lung diseases. It is often indistinguishable from cystic fibrosis (CF), especially in adults who often have “mild” presentation. A high index of suspicion is critical for early diagnosis.

A 58-year-old female was diagnosed with asthma as a child. With bronchiectasis and growth of *Aspergillus fumigata* (*AF*), ABPA was diagnosed in her 40’s. Right upper lobectomy was done secondary to “eosinophilic granuloma.” She progressed to frequent exacerbations and hemoptysis. Precipitins for *AF* were positive, and IgE was 711 IU/L. Relevant history include two bowel perforations, pancreatitis, asthma, malnutrition, and baseline FEV1 of 35%. Sweat chloride test revealed 40 mmol/L initially, then 22 mmol/L later. Standard 32-mutation panel for CF transmembrane conductance regulator (CFTR) was positive for 394delTT (CF-causing variant). Patient was labelled CF carrier. Four years later, due to clinical deterioration, full CFTR gene sequencing was performed, revealing an additional variant of varying clinical consequence (p.Leu967Ser). After starting proper CF treatment, her FEV1 is now 58%.

This case illustrates how anchoring of ABPA diagnosis without proper CF work-up (i.e. completing the full CFTR gene sequencing) can lead to unnecessary hospitalizations, lung function deterioration, and delayed treatment. CF patients diagnosed as adults often have an atypical presentation. Although their mutation can confer some CFTR function, there is no correlation with lung disease severity. The CF foundation has published new guidelines for diagnosing CF in non-screened population with emphasis on the need to refer to a CF care center when diagnosis is unclear.
FAMILIAL IDIOPATHIC HEMOPERICARDIUM WITH TAMPONADE PHYSIOLOGY

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Pericardial tamponade is a possible life threatening condition where excessive and abnormal amounts of fluid build within the pericardial sac. Without prompt diagnosis and treatment, equalization of cardiac pressures may lead to loss of life. Though many different etiologies exist, there are few causes which are associated in a familial or inheritable manner. This case represents a familial inheritance with no clear etiology.

A 17-year-old female with a past medical history of iron deficiency presented to the Emergency Department with 3 days of nausea, repeated vomiting, and shortness of breath. She had a prior upper respiratory infection with known sick contacts, including an influenza positive father. She also complained of epigastric abdominal pain which was dull and radiated to her upper left shoulder. The patient has not been on any medications. The patient has a family history of lupus in a maternal grandmother. Interestingly enough, a brother had a similar situation 2 years prior at the age of 18, where he was found to have 700 cc of sanguineous fluid within the pericardium where no clear cause was delineated. Physical exam in this case showed JVD and distant heart sounds. EKG showed low voltage throughout all leads. CT of the chest showed a large pericardial effusion. Labs were consistent with inflammation with an ESR of 122 and a CRP of 51. A TTE was obtained which showed large pericardial effusion and RV collapse consistent with cardiac tamponade. TSH was elevated with positive thyroid peroxidase antibody. ANA was weakly positive at 1:160 with a normal C3 and C4. PCR respiratory panel was positive for Coronavirus. Pericardiocentesis was performed which collected 1200 cc of sanguineous fluid. R sided chest tube was placed for pleural effusion which revealed clear fluid. PCR based myocarditis panel of the fluid was positive for Coxsackie B in moderate titer levels which represents subacute exposure. The patient was discharged after resolution of clinical course with follow up in endocrinology, rheumatology, and cardiology.

This case should be further discussed as the patient has 2 younger siblings, aged 11 and 4. Few causes of familial pericarditis, which is often an inciting condition, exist and the ones tested in this patient were negative. With further research and reported cases, the ability to prevent this condition, and possible mortality, exist and should be explored.
LITTORAL CELL ANGIOMA – A CASE REPORT

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INTRODUCTION: Littoral cell angioma (LCA) is a rare primary splenic neoplasm arising from the cells that line the sinuses of the red pulp. Tumor cells express both histiocyte and endothelial cell markers and on histological examination form sinus-like structures with sloughed epithelial cells filling the lumen. Although this tumor is benign, it is associated with the coexistence of other visceral malignancies and thus a thorough clinical evaluation is warranted. Herein we present a case of littoral cell angioma which was managed with splenectomy.

CASE PRESENTATION: A 51-year-old female presented with eight months of sharp left-sided abdominal pain. Her history was significant for morbid obesity, hyperlipidemia, and migraine headaches. An ultrasound was performed which revealed multiple splenic lesions and gallstones. The splenic lesions were further evaluated using MRI but the results were inconclusive, and the differential diagnosis at this time remained broad and included an infectious etiology, a benign neoplasm, and lymphoma. The patient underwent a splenectomy and subsequent pathology showed angiomatous proliferation of variably sized vascular sinuses lined by sloughing plump endothelial and histiocytoid cells consistent with littoral cell angioma. Post operative course was unremarkable and the patient was discharged home four days later.

CONCLUSION: Littoral cell angioma is an uncommon primary splenic neoplasm. Although it in itself is a benign tumor, it is associated with concomitant extrasplicic visceral malignancy. Our patient was treated with a splenectomy in accordance with the current standard of care and is expected to have a favorable post-operative outcome without recurrence.
PRIMARY HEPATIC SARCOMATOID CARCINOMA – A CASE REPORT

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INTRODUCTION: Primary hepatic sarcomatoid carcinoma (PHSC) is an aggressive neoplasm that has both epithelial and mesenchymal characteristics on histology. It is extremely uncommon and accounts for less than 0.2% of primary hepatic malignancies. Herein we present a case of metastatic PHSC which was managed with surgical resection and lymph node dissection.

CASE PRESENTATION: A 59-year-old male presented with right upper quadrant abdominal pain. His history was significant for melanoma that was resected five years ago with negative margins. CT scan revealed a heterogeneous mass in the anterior segment of the right lobe of the liver measuring 8.8cm x 6cm x 4cm with porta hepatis lymphadenopathy and a lesion in the left external iliac lymph nodes. Ultrasound-guided biopsy of the liver lesion was performed and pathology was consistent with an undifferentiated sarcoma. Patient underwent an extended right hepatectomy and pathological review of the resected tissue revealed a high-grade sarcomatoid carcinoma that was CK8/18, cytokeratin OSCAR, and cytokeratin AE1/AE3 positive. Biopsy of the left external iliac lymph node showed a similar cytology and prompted a left external iliac lymph node dissection. Genetic testing is underway to determine if the malignancy is susceptible to targeted immunotherapy. If there is no targetable mutation the patient will be given the option to enroll in a clinical trial of Nivolumab/ipilumab.

CONCLUSION: Sarcomatoid carcinoma is an uncommon and highly aggressive primary liver malignancy. With less than 100 reports of PHSC in the English literature there is no clear consensus on the best approach to managing this rare tumor. Nevertheless, there is some evidence that patients may benefit from early surgical intervention.
COLORECTAL CANCER SCREENING AMONG HOSPITALIZED PATIENTS IN US HOSPITALS: MISSED OPPORTUNITIES.

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OBJECTIVES: Colorectal cancer is the third most common cancer in the United States. Approximately 100,000 new cases of colon cancer and 40,000 cases of rectal cancer were diagnosed in 2017 in the US. Colorectal cancer screening for eligible individual is recommended for early detection. This population based study sought to quantify the extent of colorectal cancer screening among hospitalized patients in US hospitals.

METHODS: This retrospective study examined three years pooled data, 2012 to 2014, from the National Inpatient Sample (NIS) database. Admitted patients with average risk of colon cancer according to the American Cancer Society guidelines were included. Hospitalizations that resulted in colorectal cancer screening were identified using the ICD-9-CM codes V76.51 and V76.41. Rates of screening per 100,000 admissions were estimated. Univariate and multivariate analyses were performed to examine the predictors of inpatient colorectal screening.

RESULTS: An estimated weighted total of 681,670,765 eligible hospitalizations were recorded nationwide. The annual CRC screening rate ranged from 35 per 100,000 admissions in 2012 to 36.4/100,000 admissions in 2014. Compared to age group 50 to 59 years, subjects ages 80 years or older have a three-fold higher likelihood having inpatient colorectal cancer screening (AOR, 3.35; 95% C.I., 2.89-3.89). There was a significant disparity in CRC screening between urban and rural hospitals (p-values < 0.05). Charlson comorbidity index was not a significant predictor of CRC screening.

CONCLUSION: Colorectal cancer screening among hospitalized patients in US hospitals were infrequent. Our findings suggest a missed opportunity for reducing incidence of colorectal cancer and mortality.
EXUDATIVE EFFUSION WITH NEGATIVE CYTOLOGY: MALIGNANT MESOTHELIOMA

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CASE PRESENTATION: 72 year-old woman with a history of dementia, hypothyroidism, osteopenia, osteoarthritis, and right humerus fracture two weeks prior to admission presented to the ED with heart rate of 120 and systolic blood pressure in the 90s. A right pleural effusion one month prior was exudative with negative cytology. CT PE protocol at the time of admission showed no pulmonary emboli or discrete masses. There was nodular thickening of the pleura and recurrent right pleural effusion. Inpatient work-up again revealed exudative pulmonary effusion with negative cytology. Rheumatoid factor, anti-CCP, tuberculosis testing, cultures, and cytology were negative. Ultimately, pleural biopsy established the diagnosis of pleural mesothelioma. She had worked in earthquake disaster relief but had no other exposures to asbestos.

DISCUSSION: This case highlights the importance and limitations of pleural fluid analysis as well as the diagnosis and prognosis of pleural mesothelioma. Exudative pleural effusions are typically defined by Light’s criteria, but the false positive rate is substantial and transudative effusions are more common. Exudative pleural effusions are most commonly caused by malignancy or infections, but there are numerous other causes. Pleural fluid cytology has about 65% sensitivity for malignancy with a single sample and up to 90% sensitivity after three samples, but the sensitivity for mesothelioma is 33%. Diagnosis of mesothelioma often relies on direct tissue biopsy, although work is in progress investigating biomarkers. Mesothelioma is a rare cancer, and asbestos exposure is the greatest risk factor. Fewer women than men with mesothelioma have a known asbestos exposure.
RETROPERITONEAL MASS

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CASE PRESENTATION: The patient is a 50 year-old woman with a history of COPD, hypertension, chronic back pain, stage IIIB squamous cervical carcinoma treated with chemoradiation one and a half years prior, and gallstones s/p cholecystectomy who presented to the emergency department with nausea, vomiting, and early satiety. She had 15 pounds of weight loss, jaundice, light stools, and dark urine. Lab work-up revealed conjugated hyperbilirubinemia. Imaging revealed obstructive right hydronephrosis and a retroperitoneal mass near the pancreas causing biliary and duodenal obstruction. ERCP with stent relieved her biliary obstruction, and biopsy of the pancreatic mass provided a diagnosis of the mass as metastatic recurrence of her cervical cancer. She required bilateral ureteral stents to relieve the ureteral obstruction as well as gastrojejunostomy to bypass the duodenal obstruction. These measures enabled her to eat in preparation for chemotherapy and radiation treatment for the cancer.

DISCUSSION: This case demonstrates an uncommon presentation of recurrent, metastatic cervical cancer that led to simultaneous biliary, ureteral, and duodenal obstructions. Her original presentation with cervical cancer included the typical risk factors of smoking, history of cervical dysphasia, and failure of follow up screening Pap tests. She had symptoms of irregular and post-coital vaginal bleeding and altered vaginal discharge. The original diagnosis was with stage IIIB squamous cervical cancer, which was treated with chemotherapy and radiation according to guidelines. She received all recommended screening for recurrence after her treatment, including repeat gynecologic exams with cytology and chest x-ray imaging. The finding of hyperbilirubinemia in the absence of viral hepatitis, autoimmune liver disease, or gallstone obstruction led to further imaging and biopsy that revealed the diagnosis. Relevant imaging and pathology results from the case will be reviewed, as well as the treatment and work-up for each of her obstructions.
CRYPTOCOCCOSIS IN A NON-IMMUNOCOMPROMISED WOMAN

Sandra Koehn, DO; Thomas Flynn, MD

Cryptococcosis is an opportunistic fungal infection usually affecting the respiratory or nervous system of immunocompromised hosts. Lymph nodes as solitary foci are unusual sites of infection. Here we present a case of suppurative lymphadenitis due to Cryptococcus neoformans in an immunocompetent pregnant female.

A 33-year-old G1P20 female at 28-weeks gestation presents with two weeks of fevers, chills, myalgias, dyspnea, chest pain, and dry cough. Symptoms began 1-2 weeks after she cleaned out gutters containing a bird nest. She was treated for community acquired pneumonia but when symptoms persisted, chest CT was performed, revealing marked mediastinal and hilar adenopathy with normal lung parenchyma. Physical exam revealed normal vitals, normal heart and lungs, tender cervical lymphadenopathy, and a gravid abdomen. Labs showed leukocytosis with left shift, anemia, and thrombocytosis. She underwent extensive workup which ruled out bacterial infection, tuberculosis, HIV, toxoplasmosis, endemic mycoses, and Bartonella. CSF studies were negative. Fine needle aspiration of lymph node tissue showed necrotizing suppurative lymphadenitis and budding yeast without granulomas. Histoplasma, Candida, and Blastomyces were ruled out based on histologic appearance and the presence of capsules with mucicarmine stain. She began treatment for Cryptococcus necrotizing lymphadenitis with amphotericin B for probable disseminated infection in pregnancy. Steroids were begun for fetal lung maturation in case of preterm delivery.

This is an atypical case of cryptococcosis due to lack of pulmonary or CNS involvement and infection in an immunocompetent host. Readers should be aware of atypical forms of cryptococcal disease to aid in recognition and early treatment of infection.
NOVEL USE OF STERNAL ZIP TIES SECONDARY TO METAL ALLERGY

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Amongst the various methods to reapproximate a median sternotomy, wire closure remains the predominant technique. Alternatives include plates, cables, and clip-like devices, with the plastic tie bands utilized a recent addition to the list. Here we report an uncomplicated case of coronary artery bypass grafting for correction of multivessel coronary artery disease closed by plastic tie bands due to the patient’s allergy to all metals besides gold. This novel use of plastic zip ties in eschewal of any metals may avoid the relatively common complaint of persistent chest wall pain, perhaps due to prevalent metal allergies, after open-heart surgery.

An 81-year-old woman presented with increasing dyspnea and non-radiating substernal angina upon exertion. Her relevant medical history included hypertension and peripheral artery disease. She was found to have triple-vessel coronary artery disease by way of cardiac catheterization. The patient chose to proceed with surgical correction by coronary artery bypass grafting (CABG). This was complicated by an allergy to all metals except gold, as they had historically caused rash and facial swelling. An uncomplicated four-vessel CABG was performed under electrocautery and Harmonic scalpel, with the body of the sternum similarly closed with four ZipFix™ tie bands as opposed to the customary wire closure. She progressed as expected and denied dyspnea or angina on exertion at both her one-month and two-month follow-ups. At her five-month postoperative follow-up, she had had no reaction to the sternal ties, and denied angina, soreness, and sternal motion or click.

ZipFix™ (ZF) tie bands are composed of plastic poly-ether-ether-ketone (PEEK) attached to a blunted stainless-steel needle akin to a cable zip tie. Despite over a million sternotomy operations performed annually worldwide, the ideal sternal closure conditions have yet to have been met. This, compounded with the fact that the most prevalent as well as all but one of its alternatives for sternal closure involve metals, further complicates things for the less than 0.1% with allergic symptoms induced by metal implant. Here we document a case in which metal allergies made ZF tie bands the ideal alternative to steel wire closure and propose their future use in such instances where prior metal allergies are made known before cardiothoracic procedures requiring median sternotomy. The exact extent to which this proposition might benefit is unknown, considering the high prevalence of metal sensitivity in the general population, and the oft idiopathic persistent poststernotomy pain syndromes experienced by patients.
FORENSIC RADIOLOGY IN MEDICOLEGAL AUTOPSY PRACTICE

Thomas Duong; Ray-Young Tsao; Sheila Spotswood, MD; Carolyn Isaac, PhD; Jered Cornelison, PhD; Joseph A. Prahlow, MD

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INTRODUCTION: Forensic radiology is the acquisition, interpretation, and reporting of radiographic images to aid in medicolegal investigations including, but not limited to, cases presented in a court of law. In the context of death investigation, forensic radiology is a critical component in the evaluation of certain case types. However, deficiencies exist within the forensic community, as there are currently no set training standards for forensic imagers in the U.S. and there is variability in radiology services available at different forensic autopsy centers. To better address these deficiencies, those performing forensic radiologic studies should have a broad understanding of case types in which postmortem radiography is useful. Here we present an overview of the utility of postmortem radiology including common findings which can provide useful, and sometimes essential, medicolegal information.

While postmortem computed tomography (PMCT) and postmortem magnetic resonance imaging (PMMRI) have been gaining interest in the forensic community, this review will focus on postmortem radiography (i.e. x-ray), as it is the most readily available and widely used modality by forensic pathologists.

MATERIALS: Cases were taken from the files of the authors, Joseph Prahlow, MD, Sheila Spotswood, MD, and Jered Cornelison, PhD.

RESULTS: One of the primary uses of forensic radiography is to identify decedents whose bodies have decomposed or been badly injured. In such cases, positive identification can be made by matching ante- and postmortem images of uniquely-shaped anatomical structures such as the frontal and maxillary sinuses, vertebrae, and teeth. In cases of skeletal trauma, bone shape, density, and other distinct radiographic features can be used to differentiate acute vs. healing fractures and to identify or rule out child abuse. Additionally, other forms of trauma, such as hemothorax and air embolism, are easily distinguished on x-ray. Radiography also provides valuable information in cases involving gunshot wounds, as different weapons and types of ammunition produce distinct radiographic findings (e.g. “lead snowstorms” with high-velocity hunting ammunition or Foster-type shotgun slugs fragmenting into “comma”-shaped pieces). X-ray is also useful in cases of sharp force injuries to ascertain the depth and direction of wounds as well as to identify possible weapon fragments still embedded within the body. Radiography can also aid in cases of fire injury (e.g. identification of projectiles not visible on gross examination) and blast injury (e.g. non-detonated ordnances in cases of bomb/explosion deaths).

DISCUSSION: Not every forensic autopsy requires postmortem radiologic imaging, but in some case types forensic radiology is essential. The NAME Autopsy Standards state that x-rays must be taken in cases involving infants, explosion victims, gunshot victims, charred remains, and those in which decomposition causes loss of identifying features and/or evidence of trauma. Other case types which may benefit from forensic radiography include those of suspected child abuse, air embolism, sharp force injuries, cases with implanted medical devices, and others. This overview of forensic radiology better enables the forensic pathology community to recognize classic radiographic findings, to develop more appropriate standards, and to address the deficiencies that currently exist within the medical examiner community.
INTRAOSSEOUS ADMINISTRATION OF HYDROXOCOBALAMIN (CYANOKIT®) AFTER ENCLOSED STRUCTURE FIRE SMOKE EXPOSURE AND CARDIAC ARREST: A CASE REPORT

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BACKGROUND: Hydrogen cyanide is one of many toxic byproducts formed from incomplete combustion of household synthetics. Smoke inhalation is the most common cause of acute cyanide poisoning in the developed world. Cyanide binds to the mitochondrial cytochrome C oxidase, arresting the electron transport chain, thereby inhibiting cellular respiration, which can ultimately lead to death. Hydroxocobalamin (Cyanokit®) is an approved antidote for cyanide poisoning. Animal studies have shown similar bioavailability profiles of hydroxocobalamin when administered via the intravenous (IV) or intraosseous (IO) route. There is a paucity of human research evaluating IO administered antidotes with only one known published case abstract of IO hydroxocobalamin. We present a case report of IO Cyanokit® administration in an adult smoke inhalation victim.

CASE: A 53-year-old female was found inside her manufactured home in cardiac arrest. Upon entry into the home, fire fighters found heavy smoke conditions and a burning cushion in the living room. The patient was located and rapidly extricated within four minutes of initial fire department entry. She was noted to have soot and superficial burns on her face. Cardiopulmonary resuscitation was initiated and return of spontaneous circulation was achieved within 20 minutes. The patient was intubated and a CyanoKit® was administered via the IO route due to unsuccessful IV access. The patient was transferred to the emergency department and was found to have an arterial pH of 7.05, a pCO2 of 89mmHg, and a pO2 of 218mmHg. She had a lactic acid level of 8.5 mmol/L. Her carboxyhemoglobin level was 4.9%. Urinalysis revealed red urine. The patient was admitted to the trauma intensive care unit and underwent bronchoscopy which demonstrated carbonaceous sputum. On day two of admission, the patient was found to have diffuse cerebral edema. The family elected to pursue organ donation given her poor prognosis for recovery, and she was extubated and expired on hospital day four.

DISCUSSION: Testing upon hospital admission suggested evidence of systemic absorption of the IO hydroxocobalamin, as urinalysis revealed red urine, without hematuria. A red hue to the urine is a reported side effect of hydroxocobalamin. Our patient had no other potential etiologies for the red urine. The IO route should be considered for hydroxocobalamin administration in cases of suspected cyanide poisoning when standard intravenous access is not readily attainable. Conclusion: Hydroxocobalamin appears to adequately flow into the marrow cavity via the IO route with just the reconstituted noncompressible glass CyanoKit® vial and vented tubing. IO administered hydroxocobalamin appears to enter the central circulation. Based on our literature review, this appears to be only the second reported case of IO administered hydroxocobalamin in a human.
BRANCHED RETINAL VEIN OCCLUSION IN THE CONTEXT OF PRIMARY SCLEROSING CHOLANGITIS: A CASE REPORT

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INTRODUCTION: Branch Retinal Vein Occlusion (BRVO) is one of the leading conditions to cause vision loss. Retinal vein occlusion (RVO) is the second most common cause of vision loss following diabetic retinopathy. There are two main types of retinal vein occlusion depending upon which vein becomes occluded; blockage in the main vein is called central retinal vein occlusion (CRVO) and blockage in a smaller vein is called branch vein occlusion (BRVO). BRVO has very similar clinical symptoms of painless vision loss. BRVO onset is typically sudden and 50% of cases are associated with systemic disorders. Risk factors for BRVO include hypertension, hyperlipidemia, atherosclerosis, and clotting disorders including certain salient autoimmune disease such as anti-phospholipid syndrome. Due to the multiplicity of causes of BRVO, identification of the underlying cause is essential for preventing additional complications for patients.

CASE REPORT: We present a case study of a 30-year-old male that presented to the emergency department with sudden vision loss. The ophthalmologist confirmed the vision loss to be from BRVO. The patient was later diagnosed with the underlying autoimmune disorder Primary Sclerosing Cholangitis. With a prevalence of 4.15 per 100,000 and an incidence of .45 for men and .37 for women per 100,000, PSC is a rare disease.

DISCUSSION: The current guidelines for identifying causes of BRVO are limited, thus for many patients the cause is never identified or treated. This case emphasizes the importance of identifying underlying causes for BRVO, to properly and accurately treats patients, and illustrates that with testing and persistence, it is possible to identify the underlying cause of BRVO. Additional differentials and diagnostic workup for providers are suggested when approaching a case of elevated liver function testing in the context of retinal vein occlusion. An extensive literature review yielded no associative findings between PSC and BRVO. Yet, other autoimmune diseases have a consistent association with BRVO; as they are known to create a hypercoagulable state.
CRIME SCENE ANALYSIS USING DNA TESTING OF DOG FECES—A CASE REPORT

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INTRODUCTION: Numerous studies have demonstrated the efficacy of DNA testing using bodily fluids such as blood, sweat, semen, and saliva to aid in crime scene investigations. However, sources for confirming DNA samples may not always be obvious, as evidenced by the Brown’s chicken massacre, in which investigators sampled critical DNA from a half-eaten chicken wing, which later implicated a suspect to the crime1. In this case, we present a triple homicide in which a suspect was linked to a crime using canine fecal DNA found at the crime scene. This case illustrates how stool-sample DNA testing may help to elucidate critical evidence in homicide investigations.

MATERIALS: Materials for this case report were obtained from the files of one of the authors (JP).

CASE PRESENTATION: A construction worker arrived at a pole-barn on an upscale property to find his three male co-workers dead – each face down on the floor with their wrists duct-taped behind their backs and appearing to have been shot in the head “execution-style”. The homeowners had been on vacation with the house secured by alarm. Evidence from the crime scene included ballistics, fingerprints, trace evidence, and footwear impressions, all of which were inconclusive. However, detectives also discovered a fresh pile of dog feces with a shoeprint on the front walkway. A call was then received from a teenage female who had “freaked out” and claimed to be an accomplice to the crime when informed of the incident while at work. Questioning of the teen provided law enforcement with the names and location of four suspects, one of whom wore a shoe containing traces of feces. Samples from the shoe and crime scene were sent for testing. DNA from both samples were identical for 11 canine-specific microsatellite DNA markers. Statistical analysis concluded that only 1 in 1.16 billion dogs would match. With this evidence, subsequent prosecution resulted in the conviction of all four suspects.

Discussion: In this case, DNA testing of dog feces provided invaluable information which linked suspects to a crime and eventually led to multiple convictions. In addition to demonstrating the utility of fecal samples in forensic investigations, this case emphasizes the need for law enforcement officials and forensic pathologists to adopt forward-thinking strategies. Such strategies include thorough examination of all details of a crime scene, even those for which the value is not immediately apparent, and promptly conducting necessary tests. When performing DNA testing, choosing the most appropriate evidence requires proper foresight and reasoning; however, this approach may not always yield positive results. Regardless, positive results obtained from DNA testing can be crucial in providing adjunct evidence or, as we show, evidence that is critical toward the outcome of a case.
ASYMPTOMATIC ECCHORDOSIS PHYSALIPHORA TUMOR, A CASE REPORT AND REVIEW OF LITERATURE

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INTRODUCTION: Ecchordosis physaliphora (EP) is a benign hamartoma derived from notochord remnants, and can develop anywhere from the skull base to sacrum1. Although not well represented in the literature, EP is a somewhat common finding; discovered in 2% of the cases during autopsies1. The ability to recognize EP is important in differentiating between benign and more malignant tumors such as chordoma2. The objective of the case report is to present high quality findings of both gross and microscopic EP that we believe is lacking and provide a review of EP in the literature.

MATERIALS: This case was selected from the files of one of the authors; Joseph Prahlow MD.

CASE REPORT: The first patient is a 51 years old white female with a history of chronic pain who passed away from the toxic effects of methadone. During the autopsy a 1.5 cm multi-lobed translucent, mucoid mass adherent to the basilar artery overlying the pons with no mass effect was found. The rest of the autopsy was unremarkable. Histopathology examination showed loosely packed eosinophilic cells with large vacuoles, with small nuclei. No mitotic activity was noted. Second patient is a 50 years old white male who passed away from the combined toxic effects of multiple. During autopsy, a 1cm cystic-like, white-tan mass was found immediately anterior to the pons, in the midline. All three tumors were consistent with ecchordosis physaliphora. Remainder of autopsy was unremarkable.

DISCUSSION: The notochord forms after the third gestational week in development, during embryogenesis the notochord regresses and eventually disappears and is replaced by the nucleus pulposus3. Rarely, notochordal cells remain after embryogenesis along the vertebral column and can give rise to benign notochordal cell tumor, ecchordosis physaliphora, or aggressive tumors such as chordoma4. Thus, it is important to distinguish between a benign EP and tumors of more malignant pattern. Ecchordosis physaliphora are mostly of benign nature, due to their small size and slow growth rate. however, rare cases of symptomatic ecchordosis physaliphora have been reported5. The cases presented here should provide exposure and an introduction to students and residents alike who might come across EP in their career and will need to differentiate it from other notochord derived tumors.
A RARE CASE OF ABDOMINAL WALL RECURRENTENCE OF CERVICAL CANCER

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There are over 13,000 new cases of cervical cancer diagnosed each year. Even after aggressive treatment with either surgery or chemoradiation, a portion of patients will recur. In 2015, a 46-year-old woman underwent a modified radical hysterectomy and pelvic lymph node resection for stage 1B squamous cell carcinoma of the cervix. No adjuvant treatment was recommended.

Eighteen months after diagnosis, she presented with abdominopelvic pain and a palpable subcutaneous mass in her lower abdominal wall associated with abdominal wall erythema and warmth to touch. A CT scan revealed a 9.5 x 11 cm lobulated mass in the anterior lower abdominal wall, encompassing the width of the lower rectus muscles, invading the small bowel and the bladder. There was superimposed infection leading to a visible abdominal wall cellulitis. She was treated with intravenous antibiotics and given neoadjuvant chemotherapy with plans for surgical debulking after shrinkage with chemotherapy. Most recurrences of cervical cancer occur at the top of the vagina or in the pelvic lymph nodes. Distant metastases can also occur via hematogenous or lymphatic spread. Abdominal wall recurrence invading the rectus muscle and bladder is an unusual location and spread pattern for squamous cell carcinoma of the cervix.
PYODERMA GANGRENOSUM: A CASE OF A RAPIDLY ENLARGING ULCER

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In a rapidly expanding wound evolving into a large painful ulcer with no systemic symptoms or fevers, Pyoderma Gangrenosum (PG) should be included in the differential diagnosis.

PG is commonly mistaken for an infection; as such a delay in the diagnosis and treatment is not uncommon. First line therapies include wound care, topical and/or systemic steroids with calcineurin inhibitors.

Our case is of a 60-year-old female immigrant, whom recently emigrated from Congo 6-months prior to presenting to the ED with a large painful ulcer of the right lower leg. The wound started out as a small painless nodule at her ankle. Within 3 weeks, it progressed rapidly, involving almost her entire lower leg. There were no systemic symptoms such as fever, chills, night sweats, weight loss, or other lesions elsewhere. Blood tests ruled out hematologic disorder, hepatitis, and vasculitis. Tissue culture grew gram-negative bacteria, this was thought to be a superimposed infection. Fungal and AFB culture were negative. A punch biopsy characterized: an epidermal ulceration with acute and chronic inflammatory cells, occasional eosinophils, and lobular proliferation of small capillaries. She was treated with a short course of antibiotics but she did not improve. A diagnosis of PG was made with 2 major and 2 minor criteria. Oral prednisolone was started, she then was switched to topical tacrolimus ointment when available with marked improvement clinically.

The differential diagnosis for a rapidly enlarging ulcer on an extremity includes pathologies that require significantly different treatment regimens. Recognition and adequate workup is imperative to appropriate management. In our case, an appropriate history, and recognition of this non-infectious etiology promoted optimal wound care. PG is usually associated with underlying systemic disease but we have not found any yet in our patient.
EHRlichiosis PRESENTING WITH SYNCOPE: A DIAGNOSTIC DILEMMA

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Ehrlichiosis is a tick-borne illness that is increasing in incidence across the United States. The presenting symptoms of the disease are frequently vague with malaise, weakness, and fever. The disease is associated with a mortality rate of 5%, and a delay in diagnosis is associated with significant morbidity, including prolonged hospitalizations as well as intensive care unit treatment. We present a case of ehrlichiosis which presented with a syncopal event.

A 79-year-old male with a past medical history of prostate cancer (status post radical prostatectomy and urinary sphincter implant) presented to the emergency department after loss of consciousness. His review of systems was positive for fatigue, generalized weakness, malaise, fevers, chills, loose stools, and intermittent dysuria. In ED, his vital signs were remarkable for tachycardia and a temperature of 103°F. CBC was notable for thrombocytopenia, leukopenia with a left shift, and CMP was notable for elevated transaminases. A urinalysis was positive for ketones and protein. EKG showed sinus tachycardia. He underwent a CT head and MRI head which were negative for acute process. An echocardiogram was remarkable for hyperdynamic ejection fraction of 75% without valvular disease. He was admitted to the hospital and antibiotic therapy with ceftriaxone for suspected urinary tract infection was started. A few days into hospital admission, his vitals became unstable, and he developed hypoxic respiratory failure requiring oxygen therapy. A chest x-ray showed interstitial infiltrates concerning for infectious process. Antibiotics were switched to broad spectrum (vancomycin and piperacillin/tazobactam) for hospital acquired pneumonia coverage, but he remained febrile. Hematology, urology, and neurology services were all consulted during his hospital stay. His mental status began to decline and he was transferred to a tertiary hospital for infectious disease consultation. With thorough history, the patient admitted to returning from a trip to rural Kentucky three weeks prior, where he spent an afternoon in the woods. A serum PCR panel for tick-borne illnesses was positive for *Ehrlichia chaffeensis*. He was prescribed a 7-day course of doxycycline and discharged home on hospital day 8. He subsequently made a complete recovery.

Tick-borne illnesses frequently present a diagnostic dilemma for physicians and healthcare providers. Our patient presented with a syncopal event, a scenario that, due to his age and past medical history, was concerning for numerous etiologies. Syncope is an atypical presentation for tick-borne illnesses that is not frequently reported in the literature. However, his laboratory work up and other symptoms demonstrated classic features of tick borne illnesses. Physicians should be aware of both classic and atypical presentations for tick-borne illnesses, and be mindful of travel history as a diagnostic clue. A thorough history could have prevented this patient’s prolonged hospital course, multiple diagnostic tests, as well as consultations to other services.
GETTING WITH THE GUIDELINES: A QUALITY IMPROVEMENT PROJECT TO IMPROVE RATES OF CODE BLUE DEBRIEFING

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INTRODUCTION: Debriefing is a purposeful discussion following a resuscitation to improve future performance. Results have shown better neurological outcomes, and reduced time delay to first compression. The authors designed this quality improvement project to improve debriefing after cardiopulmonary arrests.

METHODS: A prospective study at Borgess Medical Center (BMC) included all staff participating in all code blue calls. Emergency department providers were excluded. WMED IRB approved the study October 2017. Authors sent an emailed pre-intervention survey to participants December 2017. Responses were protected and anonymous. The implementation began January 2018. Post-survey data was collected February 2018.

RESULTS:

Pre-Intervention Survey:

Pre-intervention survey yielded 64 responses of the possible 195 (32.8%) of resident physicians, nurse practitioners or physician assistants, registered nurses, and respiratory therapists. Of all codes at BMC in the last one year, 70% were not debriefed. 67% of respondents participated in > 5 code blues. The most commonly cited factors for ineffective code blue calls were communication (59%), and leadership (45%). 14% in the pre-intervention survey disagreed or strongly disagreed with the conduction of code blues.

Preliminary Post-Intervention Survey:

Post-intervention survey yielded 9 of 10 responses from resident physicians. Factors identified as negatively influenced effective codes included communication (33%) and leadership (55%). Interestingly, 0% of participants disagreed or strongly disagreed with the conduction of code blues. 78% agreed or strongly agreed that debriefing after a code blue was important.

DISCUSSION: Leadership and communication were the important factors for effective codes in both pre- and post-intervention surveys. The majority of our respondents agreed or strongly agreed that debriefing after a code blue was important. Given the marked reduction in respondents who disagreed with the conduction of code blues, debriefing following the code may have facilitated understanding of the operation of the code blue.

As our study continues over the next several months, we will identify trends in comfort level surrounding code blues, specifically with regards to ACLS knowledge, the role of the team member, and the importance of opinions during the code blue.

In-hospital cardiac arrests are important for the patient, their family, and to all members of the healthcare team. Debriefing facilitates cognitive reflection and lifelong learning, as well as improved patient outcomes.
IMPROVING OFFICE-BASED PROCEDURES IN AN ACADEMIC FAMILY MEDICINE RESIDENCY: A QUALITY IMPROVEMENT PROJECT.

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CONTEXT: The Western Michigan Homer Stryker M.D. (WMed) Family Medicine (FM) program clinic is based out of a Federally Qualified Health Center entitled the Family Health Center (FHC). Physicians and Medical Assistants (MAs) collaborate in the delivery of patient care. Historically, performance of office-based procedures at the FHC has caused frustration for both physicians and MAs. Issues with MAs stems from lack of knowledge and direction in appropriate set-up of various procedures. On the other hand, physician frustration stems from incomplete procedure set-up, which lengthens procedural time due to interruptions.

OBJECTIVES: This project aims to create a system that

1. Increases MA comfort and proficiency in setting up for common in-office procedures in an FM clinic.
2. Improves physician satisfaction with procedure set-up in the FHC FM clinic.

STUDY DESIGN: Surveys were developed for distribution to MAs and physicians that regularly work in the WMed FM clinic at the FHC. Physician satisfaction and MA comfort with procedure set-up will be assessed both before and after the intervention using simple questionnaires. MA surveys evaluated comfort with setting up for common in-office procedures and also asked them to appropriately identify several instruments from a multiple-choice list. Physician surveys evaluated their satisfaction with procedure set-up in the clinic, including the frequency with which they need to pause mid-procedure to obtain further supplies. Also, they were questioned about their overall comfort with performing several common FM procedures. All questions regarding comfort and satisfaction were asked on a 10-point Likert scale, with 1 being not comfortable/satisfied at all and 10 being extremely comfortable/satisfied. After initial results were obtained, the planned intervention entailed production and dissemination of equipment lists with pictures of complete equipment sets for select office-based procedures. Information binders were made available with this information in various high need locations throughout our clinic. Follow-up surveys have yet to be disseminated.

RESULTS: Initial survey results were acquired from 33 physicians, the vast majority of the FM team. Physicians reported an overall mean of 4.81 on the 10-point Likert scale for satisfaction performing procedures at the FHC, and a mean of 4.56 in satisfaction with overall procedure set-up. They reported having to leave the room to obtain supplies an average of over 60% of the time. Comfort with performance of individual procedures ranged from a mean of 3.55-8.64. The lowest comfort levels were noted with cervical polypectomy and colposcopy while the highest comfort levels were in Papanicolaou smears and incision and drainage of abscess. Doctor satisfaction with how well the procedure trays are prepared is marginally significantly correlated with the satisfaction with the process of performing core procedures (r=.32, p=.0711).

Initial MA survey results, of which 6 were acquired, showed that the majority of MAs were comfortable setting up common procedures inquired about, with an overall mean of 7.5 on the 10-point Likert. With individual procedure comfort, the lowest mean scores were for set-up for cervical polypectomy and colposcopy, at 4.5 and 7.83, respectively. For all other procedures, MAs reported a comfort level mean of 8 or higher. With instrument identification, 83% correctly identified a cervical sound and non-toothed forceps, however, only half were able to correctly identify a No. 11 blade scalpel and just one-third were able to correctly identify a needle driver.

CONCLUSIONS: The FM physicians at the FHC were uniformly only moderately comfortable with overall procedure performance and only moderately satisfied with procedure set-up. Physicians leave the room mid-procedure over half of the time to obtain more supplies. MAs overall reported comfort with set-up of most procedures, this however, did not correlate with their overall ability to correctly identify instruments. Interestingly, MAs and physician’s lowest discomfort scores are for the same procedures (and probably the procedures done the least commonly). Hopefully, this intervention will improve MA knowledge and physician satisfaction with procedure set-up. Our intervention did not directly address physician comfort with performing procedures, however, results indicate that much can be done to improve in this area as well.
SHOULD I STAY OR SHOULD I GO: THE COMMUNITY PATIENT’S DECISION-MAKING PROCESS FOR HEPATO-PANCREATO-BILIARY SURGERY

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OBJECTIVE: Numerous factors go into the decision of where to have a complex surgery. The relationship between hospital volume and perioperative outcomes is particularly pronounced in hepatobiliary and pancreatic surgery cases. This phenomenon, regionalization, has not been thoroughly examined from the patient perspective and can grant greater insight into the relationship between public reporting and patient choice.

METHODS: A prospectively maintained database of all pancreatic and hepatobiliary surgeries were reviewed over the first 24 months of a recently established hepatopancreaticobiliary (HPB) program. All procedures were performed at one of two community based teaching hospitals affiliated with the WMU surgery residency, either Bronson Methodist Hospital (BMH) or Borgess Medical Center (BMC). Patient surveys, assessing awareness of the volume-outcome relationship and other factors, were completed during post-operative clinic or by mail.

RESULTS*: Between October 2015 and January 2018, 58 patients underwent pancreatic and/or hepatobiliary surgeries.

CONCLUSION: The patients’ attitudes towards the volume-outcome relationship can affect whether they must travel to have their surgery, which can have significant psychological and financial impact on the patient and their family. Social barriers may or may not be considered when deciding where the surgery should be performed.

*Results are pending data analysis which is subsequent to an IRB approval that will be reviewed late February.
TITLE: BATTLING THE OPIOID EPIDEMIC: MINIMIZING RISK WITH NALOXONE INTRANASAL SPRAY A QUALITY IMPROVEMENT PROJECT

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INTRODUCTION OF TOPIC: Opioid overdoses have become endemic in our country. With any opioid use there is risk for overdose, accidental or intentional. Over the past 2 decades, medical providers have increased opioid prescribing for non-cancer pain as this now represents half of the opioids dispensed in the United States. During this time, opioid overdose has surpassed motor vehicle accidents as the primary cause of accidental injury/death in United States. Naloxone, an opioid antagonist that displaces mu receptor agonists, counters respiratory depression brought on by opioid overdose. It is an especially promising tool as it can be administered intranasally by family, friends, or bystanders providing reversal of most opioid overdoses.

METHODS: The objective of this QI project is to make naloxone available to patients on chronic opioids as part of a new clinic standard of practice. We will be providing naloxone intranasal spray prescriptions with opioid overdose information via a mailed packet to patients in the WMEd Internal Medicine and Medicine/Pediatrics resident clinic on chronic opioid regimens with a signed pain contract. This will be a multi-year process monitoring change of patient perception and clinic policies with the implementation of a new standard of clinic practice.

All WMEd patients 18 years of age or older on chronic opioid therapy, as defined by a patient who is receiving and utilizing opioids most days of the month for greater than 3 months duration. These patients were identified via review of our electronic medical record. Pregnant patients, those on hospice, or those who are actively being treated for malignancy were excluded.

A patient letter was developed explaining the purpose of the quality improvement project and the importance of having an accessible opioid reversal agent. We also included information on whom to contact should patients have questions, comments, or concerns regarding the information and naloxone prescription they received. After obtaining written permission from Adapt Pharma, we also obtained rights to distribute the “Narcan intranasal quick guide” information sheet. This one-page pamphlet teaches patients how to identify opioid overdose, how to administer the spray itself, and dosing instructions. This was included in the informational packet for patients.

The materials for the patient packets have been completed and written exemption has been obtained from the Western Michigan University Homer Stryker M.D. School of Medicine IRB review committee.

RESULTS: Materials are currently being sent to patients. The next step will be to answer any questions or concerns patients may have. We plan in the future to send a follow up survey regarding patient perceptions, their actual use of naloxone prescription, and if the patient inquiries about refills of the prescription. There will be a multi-year plan to follow up the possible change of patient perception and clinic policies regarding the implementation of this new standard of clinic practice.

CONCLUSION: Studies contend that naloxone opioid overdose rescue kits have been effective in reducing opioid overdose rates. With reassurance from such studies, widespread efforts to “saturate” at-risk communities with naloxone access have accelerated. As a result, we feel implementing an opioid reversal standard in clinic is important to protect our patients. By sending an informational packet and providing a reversal agent that is present on our electronic medical record, we implement a new standard for our clinic.
ELDER ABUSE IDENTIFICATION AND REPORTING IN THE EMERGENCY DEPARTMENT

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Elder abuse is a widespread and under reported problem in the United States with studies reporting that as many as 1/10 elders experience some form of abuse or neglect each year (Acierno et al. 2010). Of those elders experiencing abuse, 80% had at least one emergency department visit in the last year, and at many of these visits, elder abuse is not reported (Ahmad, Lachs 2002), (Evans et al. 2017). Taken together, these studies indicate that mandatory reporters in the emergency department are not effective at identifying and reporting elder abuse. Given that providers in the emergency department spend different amounts of time with patients and undergo various types of training and continuing education, we hypothesize that there may exist differences in knowledge, attitudes and practice on identification and reporting of elder abuse between physicians and non-physician mandatory reporters.

OBJECTIVES: Our study goal was to characterize the perceptions and practices of mandatory reporters of elder abuse within the Bronson Methodist Hospital Emergency Department

METHODS: This observational study utilized a cross-sectional prospective design. A voluntary survey of the knowledge, attitudes, and practices of emergency medicine providers in elder abuse recognition and reporting was distributed through REDcap Response scale was a 5-point Likert scale. The final study sample consisted of 49 providers within Bronson Methodist Hospital in Kalamazoo MI, 28 who were physicians and 18 who were non-physicians. Kendalls’ tau-b test was used for statistical comparisons by provider type.

RESULTS:

Knowledge: Only 51% of emergency department providers were able to correctly identify the required reporting process when a case of elder abuse is suspected. 75.5% of providers were able to correctly identify the age a patient must be to have a report of elder abuse made.

Attitude: Confidence in identifying physical and sexual elder abuse varied between physicians and non-physician mandatory reporters, with non-physicians more likely to report they felt confident with identification of signs of abuse: 60.7% of physicians felt confident identifying physical abuse compared with 88.9% of non-physician mandatory reporters (T_{b}=-2.835, p=0.005). Only 14.3% of physicians reported confidence in identifying signs of sexual elder abuse compared with 61.1% of non-physician mandatory reporters (T_{b}=-3.270, p=0.001). There were not significant differences in the confidence levels between levels of provider in identifying financial exploitation and neglect.

Practices: Of the 49 respondents only 10.2% reported they had ever used a screening tool to detect elder abuse in the emergency department. 42.9% of respondents reported they had not reported a case of elder abuse in the last year, with 51.0% reporting 1-2 cases in the last year.

DISCUSSION: Our results demonstrate that there exist gaps in knowledge in the reporting of elder abuse in the emergency department as well as differences in comfort among providers in identifying types of abuse. This highlights the potential need for additional training on identifying elder abuse and more streamlined protocols to ensure that every mandatory reporter is able to swiftly report suspected abuse.

CONCLUSIONS: Our findings have the potential to direct the implementation of measures in the emergency department, including future education, training, and elder abuse protocol implementation. We hope to utilize these results to generate education programs in conjunction with the Kalamazoo Area Agency on Agency to better inform emergency department care providers regarding the identification of elder abuse and the required reporting procedures.
USING INFORMATICS APPROACHES TO UNDERSTAND AND VISUALIZE NATIONAL CYBERSECURITY THREATS AFFECTING HEALTHCARE PROVIDERS

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INTRODUCTION: Data breaches are a growing concern for healthcare providers, with large academic hospitals at particular risk of breaches of protected health information. While the hacking of electronic medical records (EMRs) is increasingly reported in the media, there is a paucity of published data describing related patterns and trends. Biomedical informatics approaches, including data visualization techniques used effectively in public health, can play a role in better identifying and understanding the national implications of these cybersecurity threats.

METHODS: We performed a cross sectional study of all reported data breaches involving healthcare providers (affecting >500 patients) from 2012-2017, as reported on the U.S. Department of Health and Human Services breach portal website. Per capita breach characteristics were calculated by dividing state-level totals for 1) number of breaches or 2) records affected by 2017 state population estimates from the U.S. Census Bureau. An informatics pipeline was developed in Python and R to identify, aggregate, and summarize EMR and hacking-related breaches by state, with geographic differences further visualized using choropleth maps.

RESULTS: Between 2012-2017, EMR breaches affected healthcare providers in 29 states, while hacking-related breaches affected healthcare providers in 41 states and the District of Columbia (DC). The top 10 states (including DC) by number of hacking breaches per million were: Wyoming (1.73), District of Columbia (1.44), New Mexico (1.44), Oregon (1.21), South Dakota (1.15), Indiana (1.05), Oklahoma (1.02), Arkansas (1.00), Montana (0.95), and Colorado (0.89). The top 10 states by number of hacked patient records per million were: California (135,919), Arizona (134,150), Indiana (48,790), Oregon (38,953), Ohio (29,304), District of Columbia (25,937), Utah (23,872), Mississippi (21,945), Texas (20,797), and Kentucky (19,348). Hacking (A) and EMR (B) breaches affecting healthcare providers by state are shown in the figure below (darker colors correspond to larger numbers).

CONCLUSION: Cybersecurity breaches, particularly from hacking or involving EMRs, are widespread and can have a major impact on healthcare providers and organizations. Improving the quality of patient care will require dramatic improvements to the quality, safety, and security of all types of health information technology systems.
EFFECTIVENESS OF ROOT CAUSE ANALYSIS IN AN INTERPROFESSIONAL “IMPROV FOR EDUCATION” EVENT TAUGHT BY MEDICAL STUDENTS

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Root Cause Analysis (RCA) holds an important place in the identification of system flaws in healthcare, however RCA has not traditionally been part of the medical school curriculum. With RCA education, students could be more effective at handling quality improvement issues that arise during their careers as physicians. Some programs have begun to incorporate RCA into their curricula, but the idea of medical students teaching RCA to other medical students is novel. Additionally, interprofessionalism continues to grow as a theme in healthcare, yet interprofessional learning events are held inconsistently during medical education. Ultimately, our goal was to determine the feasibility and effectiveness of medical students teaching fellow medical students and the benefit of interprofessional education in learning about Root Cause Analysis. WMed Institute for Healthcare Improvement (IHI) Open School Chapter students presented a descriptive powerpoint explanation of Root Cause Analysis, followed by a simulated RCA led by hospital patient safety experts. Medical students from the WMU Homer Stryker MD School of Medicine and nursing students from the WMU Bronson School of Nursing role-played characters in the unscripted RCA. The event concluded with group discussions. To assess the students’ knowledge of RCA and opinions regarding this teaching format, pre- and post-event surveys consisting of Likert-type scale, yes-no, multiple choice, and open response questions were completed by the medical and nursing students. Effectiveness of teaching will be measured by 2 sample t-test of the percentage correct on the pre- and post- event surveys. Statistical analysis is currently pending, and conclusions will be reported at the time of final submission of this project.
DESERTS, SWAMPS, MIRAGES, AND OASES: RECONCILING THE SPECTRUM OF FOOD ENVIRONMENTS

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INTRODUCTION: A community's ability to access quality food is inextricably linked to the well-being of its people. Benefits include: Optimal academic performance potential, Decreased malnutrition and developmental difficulties, Reduced incidence of chronic disease. Individual challenges to equity in access: >43.1 million Americans live in poverty, >12 percent of American households are food-insecure, Chronic reliance on food-assistance programs as primary sources of food. Infrastructure challenges to equity in access: Lack of geographic or financial access to nutritious foods, Lack of transportation (private car, bus, or other), Excess of cheap, fast, high-calorie, low-nutrition foods

As these situations are studied, researchers have established various classifications for the food environments their target populations reside in: Food deserts, Food swamps, Food mirages, Food oases

While each food environment has been individually characterized, the definitions vary largely, and there are no centralized resource that enables comparison of each environment's varied interpretations

METHODS: PubMed, Scopus, and Google Scholar were searched for primary and review articles that included definitions and characterizations of different food environments. In total, 40 sources were identified for inclusion.

RESULTS: The total number of interpretations for food environments are as follows: Food Desert: 19 interpretations, Food Swamp: 6 interpretations, Food Mirage: 6 interpretations, Food Oasis: 3 interpretations

DISCUSSION: The creation terms to describe food environments is essential for understanding and addressing these conditions. Benefits include: Elucidation of unique deficits and characteristics, Focused advocacy and policy, More effective execution of ground-level interventions.

Risks of not establishing standardized definitions: Potential for subsequent mischaracterizations, Generate conclusions in error, Misappropriation of resources, manpower, and opportunities for improvement

Food security, diversity, and accessibility impact community well-being. Furthermore, food access is multi-dimensional and includes but is not limited to availability, accessibility, affordability, accommodation, and acceptability. Few studies have examined impacts from the perspective of the latter three, much less all five together.

Omitting consideration of the unique geographical, financial, and social attributes of each individual, risks painting an over-simplified representation of challenges people must overcome to access food

It is incumbent upon those providing for the under-served to understand the difficulties faced by individuals in their respective communities in order to devise sustainable solutions that meet the needs of the community.
COCAINE ABUSE, COMPLICATIONS AND DEATHS AS DEPICTED THROUGH A CASE SERIES.

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INTRODUCTION: Drug-related deaths have steadily increased in number every year to date for nearly the past two decades. Recently this increase has been most notable in heroin and other illicit opioids, but is also appreciated in methamphetamine and cocaine. Michigan is one of twenty-one states that has statistically higher drug-related overdoses at 20.4 per 100,000 compared to the national average. The increase in drug use and related deaths has been increasing in every ethnic group and is most prominent in the 45 – 54, 35 – 44, and 25 – 34 year old age groups, in decreasing order. Of note, the majority of drug-related deaths involve more than one drug; for cocaine, 66.1% of cases include at least one other drug. Overall, cocaine has accounted for 12.9% of drug-related deaths, totaling 6,784 in 2015. In this presentation, the author present a case series of cocaine-related deaths. The cases are selected to create a representative picture of the spectrum of cocaine’s complications. In addition, a presentation of death certification related to drug-involved cases is presented/reviewed.

MATERIALS: Case examples are selected from the files of one of the authors (JP).

RESULTS: In this case series, the authors present multiple examples of situations where cocaine plays a role in death. Case types involve deaths related to the acute toxic effects of cocaine, including those related to cardiac dysrhythmias, hypertensive complications, such as intracerebral hemorrhage and vascular dissection, and excited delirium. Deaths related to chronic cocaine use include hypertrophic and dilated cardiomyopathy. Different scenarios of cocaine-related deaths are also presented, with a discussion of proper death certification procedures.

DISCUSSION: Cocaine is derived from the leaves of the coca plant, Erythroxylan cocoa, which is native to the Andes Mountains in South America. Cocaine binds to dopamine reuptake transporters to inhibit their action, increasing the amount of serotonin, norepinephrine, and dopamine in the brain. This has psychomotor stimulatory effects with the greatest effects being on the cardiovascular and central nervous systems. Additionally, its effect on dopaminergic pathway increases abuse potentially because its mechanism overlaps with the reward pathway.

There are a variety of forms of cocaine, as well as methods of abuse, and situations of acute intoxication. Insufflation (snorting) powdered cocaine hydrochloride is a favored method, but other methods exist, including intravenous injection of cocaine hydrochloride. Smoking the free-base alkaloid of cocaine, or alkaloidal cocaine (crack) are other popular methods of abuse. The typical cocaine-related death occurs in the setting of recreational drug abuse; however, other situations occur as well, including accidental ingestion (typically by a minor), and massive overdose occurring in two distinct scenarios: body stuffing and body packing.

Cocaine affects most of the systems in the human body, with both chronic and acute issues. Deaths from cocaine intoxication may occur at any drug level. Deaths associated with cocaine use are primarily derived from acute and chronic cardiovascular complications, while cerebrovascular, respiratory and metabolic causes play a much more minor role. One of the larger concerns is acute intoxication which may trigger cardiac arrhythmias which may lead to sudden cardiac death and myocardial infarctions. Acute cocaine-related increase in blood pressure can lead to complications related to hemorrhagic complications. Another acute manifestation of cocaine intoxication is hyperthermia/excited delirium, which can also induce renal failure from rhabdomyolysis. In addition, cocaine can contribute to many chronic disorders of the cardiovascular system, such as significant vasoconstriction and hypercoagulability which can lead to hypertension, increased atherosclerosis, thrombosis and cardiomyopathy.

In this case series, the authors have presented examples of situations where cocaine plays a role in death. The different ways these might present to providers are presented to highlight the variability and likelihood of seeing this in practice. This case series is timely, emphasizing that cocaine is of concern even in the wake of the opioid epidemic.
THE IMPACT OF A GROUP INTERVENTION ON ADULT SURVIVORS OF CHILDHOOD TRAUMA USING A PSYCHOEDUCATIONAL MODEL

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The experience of childhood trauma can be long reaching, impacting one’s physical, emotional, mental, spiritual and relational wellbeing into adulthood. The Trauma Recovery Program assists survivors of childhood trauma by offering a psychoeducational group. This study examined the effectiveness of the group intervention through pre and post measures and long-term follow-up. This presentation will discuss statistically significant changes in the participants’ (N = 116) mental health, trauma symptomology, spiritual wellbeing, and ability to forgive. Gains were maintained at the one-year follow-up. Treatment recommendations for adult survivors of adverse childhood experiences will be discussed.
INCREASING CULTURAL COMPETENCY AND REDUCING VICTIM-BLAMING THROUGH ANTIRACISM WORKSHOPS

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BACKGROUND: According to the CDC (see Meyer et al., 2013 for a summary), People of Color, as compared to whites, have higher rates of numerous negative mental and physical health outcomes. The World Health Organization (WHO, 2017) has outlined various social determinants of health (e.g., living conditions, social systems) to explain why these disparities exist. The WHO suggests that these determinants must be addressed in order to effectively reduce health disparities (e.g., Novilla, et al., 2011). At the individual level, research has demonstrated the effectiveness of cultural competence training in improving skills, attitudes, and knowledge among healthcare professionals, while also increasing patient satisfaction (see Beach et. al., 2005 for a review).

PURPOSE: This study seeks to examine the effectiveness of an educational intervention to address health disparities.

METHODOLOGY: Participants were recruited from one-day health equity workshops conducted by Eliminating Racism and Creating/Celebrating Equity. The workshop was offered three times over a seven-month period to 84 participants. Participants completed anonymous survey measures before and then immediately after the workshop. Surveys included established measures of cultural competence, just-world beliefs, beliefs about the causes of health disparities, and beliefs about the social construction of race, among others. Changes in scores from pre- to posttest were assessed using related-samples t tests.

RESULTS: Fifty-eight participants completed the pretest while 43 completed both pre- and posttests. After the workshop (as compared to before), participants were significantly more likely to agree that race is a social construct ($M_s = 5.59$ & $4.64$, respectively, $p = .004$). Participants reported significantly greater awareness of obstacles faced by groups of color in seeking access to care in Kalamazoo County after ($M = 5.47$) as compared to before ($M = 4.95$) the workshop, $p = .031$. The ratio of average endorsement of external over internal causes increased significantly after the workshop ($M = 1.54$) as compared to before ($M = 1.41$), $p = .009$, suggesting that people move away from blaming clients for health disparities and toward understanding the importance of external factors. Finally, after the workshop ($M = 3.16$) participants reported significantly less difficulty seeing things from a different point of view when having conversations about race, as compared to before the workshop ($M = 3.85$), $p = .03$.

CONCLUSION: These workshops were effective at increasing beliefs about race as a social, as opposed to a biological, construct. They seemed to increase perspective-taking, increase awareness of obstacles faced by groups of color, and reduce client-blaming while simultaneously increasing understanding of external factors related to health disparities. The sample was limited to self-selecting workshop participants. As such, workshop effects can only be generalized to individuals who have already been primed or are already interested in addressing racial health disparities.
FACILITATING PEER COLLABORATION WITH PA STUDENTS IN PATIENT CENTERED CARE USING AN INTEGRATED TBL: A MEDICAL STUDENT DrIVEN EXPERIENCE IN INTERDISCIPLINARY ENGAGEMENT

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BACKGROUND: The Interdisciplinary Interest Group (IIG) is a joint venture between medical students at Western Michigan University Homer Stryker MD School of Medicine (WMed) and allied health professional students at Western Michigan University (WMU). The program is a student run group whose goal is to establish effective collaborative practices between allied health professional students. Team Based Learning (TBL) provides a valuable tool for such cooperation.

DESCRIPTION: TBL, alongside professional discussions and hands on workshops, provide important opportunities for developing teamwork and enhancing IIG events. The TBL created for the IIG required integration of several disciplines in order to care for the “patient”. The practice of creating, implementing, and working through the application exercise provided an ideal avenue for collaboration between students. This focus session will describe how students developed and led an interdisciplinary TBL application exercise appropriate for students in allied health professions. The benefits and challenges of student driven TBL will also be described with suggestions for implementation.

RESULTS: Medical students at WMed created a TBL application exercise, which was completed by students in PA and MD programs. A benefit of student creation and facilitation was that the event allowed for participation of those who were truly invested in the TBL and its ultimate goal of becoming a better healthcare professional by working effectively with their peers in different allied health programs. Challenges for implementation included the interdisciplinary nature of the group and varied schedules between campuses.

CONCLUSION: Student created and facilitated TBL application exercises enhance not only student motivation in participating in these types of events but also their understanding of the TBL process and its goals. Creating opportunities for students to develop and facilitate TBLs in allied health professions curricula benefits both students and faculty using TBL. These experiences provide valuable learning opportunities that cannot be attained from attending classes alone.
PEDIATRIC EMERGENCY SIMULATION LAB PERFORMANCE USING PREPARATORY EDUCATION

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BACKGROUND: As technology advances, simulation has become a ubiquitous component of residency training to help residents learn and practice how to handle a plethora of situations both common and uncommon in real world practice. Previous research regarding the subject of simulations has focused on the simulation performance rather than long term retention of the knowledge studied. The purpose of this study is to assess if providing residents with succinct but detailed information before a simulation will lead to a more successful simulation performance and increased long term knowledge retention. Pediatric simulation lab provides an excellent vehicle for study as sick children are not as common in clinical practice but require a physician to act fast and appropriately.

OBJECTIVE: The objective of this study is to determine if providing preparatory materials before the pediatric simulations leads to better performance on the simulations and ultimately increased knowledge retention one month after the simulation.

METHODS: Pediatric simulations are run almost every month at the Western Michigan University Homer Stryker School M.D. School of Medicine simulation lab involving Emergency Medicine Residents. Every other month the group of Emergency Medicine residents assigned to the pediatric simulation day will be designated into the experimental group (Team A) or the control group. The control group will follow the current standard of not being given any preparatory material and the experimental group will be given our newly devised preparatory material. The preparatory materials will be emailed out 7 days before the simulation. Both groups will undergo the same simulation cases. Study groups will be assessed by the currently used checklist that includes the expected critical actions. Upon completion of the simulations, the residents will receive a 10-question paper quiz pertaining to the case to be completed directly after the simulation and the same quiz 1 month after the simulation to assess knowledge retention. Expected maximum sample size for the current academic year will be 25 participants. Our first session is planned for Wednesday, February 7th, 2018.
ORTHOPAEDIC RESIDENT EXPERIENCE WITH HAND SURGERY CONSULTATIONS AT A LEVEL 1 TRAUMA CENTER: DATA COLLECTION TO IMPROVE EDUCATION

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BACKGROUND: There has been a recent growing emphasis on developing competency-based education programs for residents. Although the Accreditation Council for Graduate Medical Education (ACGME) and the American Board of Orthopaedic Surgery (ABOS) have developed nationally mandated milestone assessments of resident progress throughout training, there is still a need to identify the core procedural skills and knowledge necessary to achieve competency. Determining the most common diagnoses encountered by the orthopaedic resident may help guide the implementation of further educational assessments.

PURPOSE: To determine the most common hand surgery consultation diagnoses and associated procedures performed by orthopaedic residents at a Level 1 trauma center.

METHODS: All orthopaedic residents taking call at Bronson Methodist Hospital from July – September 2017 were asked to record information regarding each hand surgery consultation into a databank. Details logged included the resident’s PGY level, consult diagnosis, procedure and/or reduction performed, type of anesthetic, and total time required to complete the consultation. The data were then compiled and analyzed to determine the most common characteristics.

RESULTS: 177 hand consultations were performed in the 3 month study period. 66 (37.2%) of the cases involved a complex laceration, including nail bed injuries, tendon injuries, gun shot wounds, and partial or complete amputations. The second most common problem was infection of the hand or wrist, with 33 (18.6%) patients. Distal radius fractures comprised 15.8% of consults, followed by metacarpal and phalangeal fractures (14.7%) and radial/ulnar shaft fractures (5.6%). 147 procedures were performed, including 59 closed reductions of a fracture and/or dislocation, 34 laceration repairs (including 17 nail bed repairs), and 32 irrigation and debridements for infection treatment. The most time-consuming consults (requiring greater than 90 minutes) were the complex lacerations and infections.

CONCLUSIONS: The most commonly encountered hand surgery consultation diagnoses at a Level 1 trauma center were complex lacerations and infections. Currently there are no milestone evaluations or case log minimums for these problems. It is our recommendation that these diagnoses and associated procedures be specifically addressed within the orthopaedic residency curriculum and potentially included in formal assessments of resident competency. We plan to collaborate with other residency programs in future multi-institutional studies to enhance our understanding and obtain more generalizable data.

Level of Evidence: Level IV observational study.
THE RELATIONSHIP BETWEEN NEUROTRAUMA AND PROTEINOPATHY IN FORMER MILITARY SERVICE MEMBERS

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BACKGROUND: The risk for neurodegenerative proteinopathies such as Alzheimer’s disease (AD) associated with traumatic brain injury (TBI) is not clearly defined. Available evidence suggests little or no discernible risk for AD attributable to mild TBI, and a 2-fold to 4-fold increased risk of possible AD attributable to moderate and severe TBI. Neuropathological data, however, are lacking, including those studies suggesting an AD risk for moderate and severe TBI. No studies to date demonstrate a longitudinal progression from TBI to autopsy neuropathology, and current pathogenic paradigms are driven in large part by low evidence quality case studies in athletes whose neurotrauma exposure may be inapplicable to TBI sustained during military service. Absent from the literature is systematic neuropathological characterization of the brains of military service members, as a function of branch of service, presence or absence of TBI, apolipoprotein E (ApoE) genotype, and neurological, psychiatric, and social outcomes. Furthermore, brain tissue resources from military service members with and without TBI are limited, which in turn reflects the lack of coordinated efforts to approach retired military service members and their families for tissue donation.

METHODS: Western Michigan University School of Medicine has recently initiated a Veterans Brain Tissue Repository dedicated to research on TBI in former military service members. As a cross-sectional survey, the study is better equipped to address the question of prevalence. Given that the pathology department provides forensic services to 14 counties and a population base of approximately 1.5 million, there is direct interaction with death scene investigators, and the approach of next-of-kin for consent to donation is possible. Once consent is obtained, arrangements are made for brain procurement. The left hemibrain, hemi brainstem, and cerebellum are saved frozen at -80°C. The right half is fixed in formalin and processed for histopathology and immunohistochemistry.

RESULTS: Brain specimens from 15 former military services members have been examined to date. All were male, with a mean age of 69.3 years (range 37-94). 6 of the 15 suffered from psychiatric problems, including depression, bipolar disorder, schizophrenia, and post-traumatic stress disorder (PTSD). Two suffered from dementia. One had a history of blast exposure. Neuropathological examination demonstrated variable agerelated proteinopathy, ranging from Alzheimer disease neuropathologic change A0B1C0 to A2B3C3 by NIAAA 2012 consensus guidelines. No subjects had changes described in the literature for chronic traumatic encephalopathy (CTE) pathology, including the four subjects with a history of PTSD.

CONCLUSIONS: In our case series to date, we note a range of proteinopathy in former military service members with diverse psychiatric history. The findings do not support an association between military service and CTE pathology, or between PTSD and CTE pathology. The results instead indicate that long-term morbidity and mortality from TBI is most likely related to structural brain injury. Psychiatric disturbances in former military service members without structural brain injury are better regarded as functional psychiatric disorders, whereas protein deposits are either aging-related or related to known neurodegenerative diseases. No data at present support progressive Alzheimer’s disease-like proteinopathy precipitated by TBI.
DEREGULATED CELL PROLIFERATION IS A KEY FEATURE OF TWO DIFFERENT MOUSE MODELS OF POLYCYSTIC KIDNEY DISEASE

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Autosomal dominant polycystic kidney disease (ADPKD) is one of the most common potentially fatal single gene disorders, resulting from mutations in either the Pkd1 or Pkd2 gene. Renal pathologies found in ADPKD include cysts resulting from increased fluid secretion, cell proliferation, and apoptosis, with an altered differentiation of the epithelial cells lining the cysts. In humans, ADPKD is thought to result from an inherited mutation in the PKD1 gene, followed by a somatic “second hit” mutation in the normal allele. The mechanism of this second hit is not understood. Mice do not exhibit random somatic mutations in the Pkd1 gene, thus targeted deletion of both Pkd1 alleles are required to generate cysts. However, homozygous Pkd1 null mice are embryonically lethal. Therefore, we have generated mice carrying a kidney specific deletion of the Pkd1 gene, called Pkd1CD. These mice develop rapid cystic disease and die by 14 days of age. Another commonly studied mouse model of PKD is a mutation in the cystin gene (cpk mice), which is a mouse model of ARPKD. These mice have a complete loss of the cystin gene, however, they survive until about three weeks of age. To begin to determine the differences in disease progression between the Pkd1CD mice and the cpk mice, we evaluated cell proliferation in these two models of PKD. Because these mouse models differ significantly from human ADPKD, future studies will include replacing portions of the mouse PKD1 gene with the human PKD1 gene.
THE NEED FOR FAST, ACCURATE AND BROAD SPECTRUM OPIOID DRUG SCREENING TO COMBAT THE OPIOID CRISIS

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Understanding the opioid epidemic: From 2000 to 2014, the rate of drug overdose deaths increased by 200%. During this time period, the age adjusted rate of death involving natural and semisynthetic opioid pain relievers increased 9%, heroin deaths increased 26% and deaths cause by synthetic opioids other than methadone increased 80% between 2013 and 2014. The increase in synthetic opioids is believed to be due to the sudden increase in illegal fentanyl distribution, as seen in drug confiscations reported by law enforcement during the same time. Deaths related to opioids, including fentanyl, fentanyl analogs, and other opioid-like substances are reaching crisis levels in the USA, and the State of Michigan is no exception. An analytical method that provides a short reporting time for opioid test results could be an effective tool used to combat the emerging opioid crises.

The term “Opioids” refers to substances that act on opioid receptors in the brain to produce morphine-like effects. Fentanyl is a synthetic opioid pain reliever approved for use in anesthesia and for treating pain, such as that in advanced cancer patients. In addition to fentanyl, fentanyl analogs are also being detected. Fentanyl analogues are drugs chemically similar to fentanyl that have been designed to mimic the pharmacological effects of fentanyl, while having a slightly different chemical structure. There are over four hundred fentanyl analogs. This makes detection of the individual analogs very challenging and often they go undetected in routine drug screening. Illicit opioids such as methoxyacetyl fentanyl are typically mixed with heroin, cocaine, or other drugs to extend the amount of product and/or to increase its euphoric effect. Typically, this is without the buyer’s knowledge.

The CDC's recommendation to improve the detection of fentanyl outbreaks is to 1: develop an improved method for rapid detection of drug overdose outbreaks. 2: include fentanyl in routine testing for suspected drug overdose and 3: develop a collaborative effort with law enforcement in responding to these increased areas in overdose deaths to remove the illegally circulating fentanyls.

The Toxicology department of Western Michigan University Homer Stryker MD. School of Medicine (WMed) submitted a proposal and was awarded a grant from the Michigan Department of Health & Human Services to develop an analytical method capable of rapidly identifying various opioids, particularly fentanyl and some of the recent emergent synthetic opioids. Blood collected from deceased individuals at medical examiners offices across Michigan are being shipped to WMed for testing. Our laboratory developed and validated an analytical method for the analysis of 40 opioids in postmortem blood. Following a solid phase extraction, LC/MSMS technology was used to simultaneously identify 40 opioids from a single sample extract in a run time of less than 30 minutes per sample. Of the 40 opioids analyzed, at least 15 were natural or semisynthetic opioids, and more than 20 were synthetic opioids including fentanyl and fentanyl analogs. The method was specifically set to rapidly target opioids using multiple reaction monitoring at low concentration.

The intent of this project is to report opioid results within 24 to 72 hours of sample receipt, compared to the several weeks that it can currently take to obtain toxicology reports for opioid test results. Additionally, this project may provide an indication of the possible impact rapid test results may have on alerting healthcare providers of “real-time” drug usage trends and assisting law enforcement entities on “mapping” the path of these societal impactful drugs.
POSTMORTEM DRUG SCREENING IN MEDICAL EXAMINER CASEWORK USING HIGH-RESOLUTION MASS SPECTROMETRY (NANOUPLC-MS\textsuperscript{E}-TOF)

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Forensic toxicology labs provide important analytical data as evidence in medical examiner casework. Liquid chromatography coupled to tandem mass spectrometers (LC-MS/MS) is the most commonly used instrumentation for evaluating postmortem samples. LC-MS/MS has been used for this purpose and many others for decades due to its capacity to multiplex the analysis of dozens of compounds in a single sample. Additionally, LC-MS/MS exhibits high specificity, sensitivity for trace level compounds, and the ability to generate consistent quantitative data over a wide dynamic range of analyte concentration. Although LC-MS/MS excels at analyzing known compounds, an authentic standard of each analyte must be purchased and used to setup the analysis in a one-by-one fashion for each compound to be tested. Considering there are hundreds to low thousands of relevant compounds of interest this represents a bottleneck and a significant expense for implementing a comprehensive postmortem laboratory. Besides the impracticality of setting up hundreds of LC-MS/MS analyses there are so-called designer drugs including the potentially lethal fentanyl analogs for which there are few authentic standards. To address these logistic and analytical challenges, instrument manufacturers and forensic laboratories are increasingly using high resolution mass spectrometers as a screening tool in addition to LC-MS/MS. High resolution instruments generate accurate mass data that is used to search forensic toxicology databases containing over 1200 compounds. This state-of-the-art approach is being evaluated in the WMed Forensic Toxicology lab using a quadrupole time-of-flight (Qtof) mass spectrometer. A Waters Qtof Premier mass spectrometer was used to collect full mass spectrum (50-1000m/z) for both compound molecular ions and their fragments using a unique data acquisition method termed MS\textsuperscript{E}. Unlike LC-MS/MS that only collects data for compounds it is programmed to measure, MS\textsuperscript{E} collects all the data, all the time. In an alternating fashion throughout an analysis, MS\textsuperscript{E} low energy mode collects data for all compounds that ionize and give rise to a signal then MS\textsuperscript{E} high energy mode simultaneously fragments all compounds at once. Sophisticated software algorithms are used to assign fragment ions to their “parent” compound from a mixed pool of fragment ions, hence the term MS\textsuperscript{E}. In this way, low energy data is used for semi-quantification and to search toxicology databases and high energy fragment ion data further supports compound identification. Our laboratory is one of the first labs in the country to demo Waters Corp. instrument/MS\textsuperscript{E} specific software-workstation called Unifi for forensic toxicology screening. Unifi automates postmortem drug screening and provides a platform that is highly configurable including restricted access for regulated testing. Our nanoUPLC-MS\textsuperscript{E}-TOF postmortem drug screening efforts show a lower limit of detection of at least 0.5ng/mL and compares well with medical examiner postmortem casework data obtained from a certified forensic lab with established comprehensive postmortem analyses. These preliminary findings demonstrate the utility of high resolution mass spectrometry for routine screening and the potential for detection of untargeted analytes including detection of novel fentanyl analogs and other dangerous designer drugs.
LEVELS OF PERSISTENT ORGANIC POLLUTANTS IN BREAST MILK SAMPLES REPRESENTING FINNISH AND DANISH BOYS WITH AND WITHOUT HYPOSPADIAS

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Hypospadias is a congenital malformation for which the etiology is unknown in most cases. Exposure to persistent organic pollutants (POPs) may disrupt endocrine function during a critical window of development of male genitalia. In animal studies, POPs have been associated with disorders of male reproductive health, including hypospadias, but few studies have assessed this relationship in humans. The aim of this study was to investigate the association between levels of POPs in breast milk, as a proxy for prenatal exposure, and hypospadias in a prospective nested case-control study in Danish and Finnish mother-son pairs. Maternal breast milk samples were collected in 1997-2001 in several aliquots between 1-3 months post-partum, and they represent boys born with hypospadias [n=33 (n=22 Danish and n=11 Finnish)] and their 1:1 matched controls (matching criteria: parity, gestational age, maternal smoking, and maternal diabetes). Samples were analyzed for 7 classes of POPs (PCDDs (Dioxins), PCDFs (Furans), PCBs, PBDEs, PBBs, HBCDs, PFASs). Conditional logistic regression was used to analyze case-control differences within the chemical groups. In addition, a composite scoring system was created to explore the effect of the mixture of POPs. No statistically significant associations were observed between any chemical class and hypospadias in either country. The composite score was unable to detect differences between tertiles of POP exposure and hypospadias. This small study found no evidence for the association between hypospadias and exposure to POPs. Further developments of multi-exposure models are needed for assessing the potential mixture effect associated to extended chemical exposome.
MICROGLIAL/MACROPHAGE RESPONSE PATTERNS FOLLOWING VARIOUS FORMS OF OLFATORY BULB DAMAGE IN ZEBRAFISH

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INTRODUCTION: The constitutive neurogenesis of the zebrafish olfactory system makes it an ideal model for regeneration studies and for examining the immune cell response following injury. Microglia are the resident immune cells of the central nervous system that respond to damage by migrating to the site of injury and phagocytizing neuronal debris. Understanding the control of immune cell behavior could lead to development of novel recovery methods after neuronal damage. Our previous findings showed that microglial activation in the olfactory bulb (OB) following deafferentation resulted in activation of microglia and migration to the injury site within 4h after insult.

OBJECTIVE: Different deafferentation and injury models allow us to examine possible regeneration and recovery mechanisms of the adult OB. Our objective is to perform a time course and characterize the microglial/macrophage response patterns following different forms of damage to the OB in the whole fish and the isolated brain.

MATERIALS AND METHODS: Whole fish OBs were damaged by permanent deafferentation by cauterization of the right olfactory organ (n=35), temporary deafferentation by chemical ablation through intranasal irrigation with a detergent solution in the right olfactory organ (n=31), or a direct lesion into the right OB (n=32). Treated fish were examined up to 72h post-injury. In the isolated brain, complete removal of afferent input was performed by isolating and culturing the brain for up to 12h in oxygenated artificial fish cerebrospinal fluid after a direct lesion (n=20). Treated brains were examined up to 12h post-injury. Mouse monoclonal 4C4 antibody was used to label microglia/macrophages. Anti-keyhole limpet hemocyanin was used to label olfactory sensory neuron (OSN) axons in the OB. Sections were processed for diaminobenzidine labeling and visualized with a Nikon Eclipse 80i microscope.

RESULTS AND DISCUSSION: Permanent vs. temporary deafferentation of the olfactory bulb result in different microglial response profiles. Significant increases and decreases in amoeboid profiles between 4, 12, and 24h after permanent deafferentation compared to temporary deafferentation suggest temporal differences relative to severity of damage, which may play a role in the potential for regeneration. A reduction in OSN axons following temporary deafferentation corresponded with an increase in the proportion of amoeboid profiles at 12h, suggesting a significance in this timepoint after injury. Significant increases in activated microglial profiles following 1, 4, and 12h after direct lesioning of isolated brains suggest that microglia can respond to signals without afferent input or peripheral influence up to a certain time after injury.

CONCLUSION: This time course allowed us to observe notable timepoints of microglial activation and different response patterns between permanent vs. temporary—or recoverable—forms of deafferentation. Future studies could include examination of microglial migratory and proliferation patterns following damage, particularly at 12h. We also propose to control immune cell behavior by inhibiting microglia/macrophages to determine the potential role of microglia/macrophage in restoration of OSN axonal projections and functional recovery.
DIFFERENTIAL RESPONSE OF ZEBRAFISH OLFATORY SENSORY NEURON SUBTYPES AFTER INTRANASAL INFUSION WITH DETERGENT

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BACKGROUND: The Zebrafish has the natural ability to quickly regenerate olfactory sensory neurons (OSNs) after damage, making them an ideal model organism for studying vertebrate neural plasticity. Zebrafish have three main OSN subtypes (ciliated, microvillous, and crypt neurons) that are distinct in structure and behavior. Ciliated OSNs detect bile salts that are important for social behaviors, microvillous OSNs detect amino acids that mediate food sensing abilities, and crypt OSNs are important for detecting sexual cues. Previously, our lab has shown that chemical ablation of the sensory epithelium results in degeneration of ciliated sensory neurons and loss of bile salt detection; however, microvillous sensory neurons remain, as does the ability to detect amino acids.

RATIONALE: Our hypothesis is that neurons mediating reproductive and social behavior (ciliated OSNs) are more sensitive to damage while neurons required for food detection (microvillous OSNs) are more resistant. The purpose of this study is to show whether microvillous OSNs are more resistant to damage, or if they appear more resistant because of quicker regeneration or reduced surface area compared to ciliated OSNs.

METHODS: Adult zebrafish were intranasally infused with 0.7% Triton X-100 once or on two consecutive days and were allowed to recover for 1 day and 2 days post treatment. OSNs were identified using either anti-Hu (all OSNs), anti-Trpc2 (microvillous OSNs), anti-Gαsolf (ciliated OSNs), and anit-TrkA (crypt OSNs). Comparisons of the amount of label were made between the treated side and the internal control side as well as with untreated control tissue using optical density analysis and cell counts.

RESULTS: Anti-Gαsolf labeling of ciliated neurons was significantly reduced following both single and double exposure to the detergent. Anti-TrkA labeling of crypt neurons showed a slight decrease with detergent treatment, but additional analyses are necessary to determine if this is significant. Anti-Trpc2 labeling of microvillous neurons was not affected by a single dose of detergent, but there was a significant reduction in labeling after two consecutive detergent treatments. This suggests that microvillous OSNs are indeed susceptible to damage by detergent, but they may be protected from a single insult by the thick mat of cilia from the ciliated OSNs. Our prediction is that the first infusion with detergent kills the ciliated neurons and removes the protective covering, exposing the microvillous neurons and causing them to be susceptible to the second detergent infusion.

CONCLUSION: This study provides further support that OSNs display a differential response to injury, with microvillous sensory neurons showing resistance to chemical damage. This work has relevance to general neuroprotective mechanisms that ensure proper functioning of sensory input after toxic insult.
IMPACT OF KNOT CONFIGURATION ON SUTURE PERFORMANCE: EXPERIMENTS AND NUMERICAL MODELS

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INTRODUCTION: Suturing has been the most common form of repairing soft tissue injury for over 5 millennia [1]. High stress concentrations in knots can lead to suture failure and suture cutout is a common failure mode for soft tissue repair. The performance of a knot is one of several crucial factors that affect the strength of soft tissue repair. Small changes in the knot configuration may produce different apparent mechanical properties for the surgical construct. Biomechanical bench top experiments have attempted to identify the relation between the strength of the repair and type of suture, the tying technique, and the configuration of the suture loops. However, measures of performance such as the stress distribution of the knot cannot be established using traditional tensile testing (neither in vivo nor ex vivo). In addition, there exists a lack of numerical simulations describing the effect of knot configuration on the failure mechanism of surgical sutures and of soft tissue. Models of single throw monofilament suture knots were reported previously, however, multiple throws have not been reported and are present in the dominant clinical knots. Furthermore, to our knowledge, no finite element models using multifilament surgical suture have been reported.

PURPOSE: To implement finite element method and bench experimentation to examine the impact of knot configuration on the mechanical performance of the surgical suture. To discuss the potential clinical impact of the number of throws on failure risk in a surgical knot. The long term goal of this research is to apply knot modeling techniques to establish the biomechanics of the suture to soft tissue interface.

MATERIAL & METHODS: knotted suture was tested to failure in a laboratory setting and with corresponding finite element models of knots. Suture and material properties were held constant while knot configuration varied. Gross loads were compared when the knot reached a localized material yield stress in the model or when failure occurred in experiments.

RESULTS: In the knotted sutures experiments, failure occurred in close proximity to the knot. Experimentally, the strength of the single throw knotted of multifilament is lower than the strength of the non-knotted suture by approximately 40%. Similarly, the strength of the single throw knotted of monofilament is lower than the strength of the non-knotted suture by approximately 50%. The models quantified the stress concentrations at the knot due to bending, twisting, and friction.

CONCLUSIONS: Finite element simulations of multi-throw knots and their corresponding experiments were well correlated. Hence, the models describe the initial failure process leading to knot breakage. Numerically, no assessment has been completed of knot security (i.e., how likely the knot is to untie), therefore, clinical recommendations are premature. The validated model is a foundation for complex models of surgical suture. This may assist in evaluating the effect of surgical techniques and suture materials for soft tissue repairs.
A CASE OF AGAMMAGLOBULINEMIA ASSOCIATED WITH A NOVEL BTK MUTATION OF UNKNOWN SIGNIFICANCE

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Primary Immunodeficiency (PID) is a broad diagnosis characterized by B and/or T cell defects, inadequate or absent antibodies and, consequently, heightened susceptibility to infections. Various disorders within this category have been identified, including X-linked Agammaglobulinemia (XLA), Severe Combined Immunodeficiency (SCID), Common Variable Immunodeficiency (CVID), IgA Deficiency, and Autosomal Recessive Agammaglobulinemia (ARA).

XLA or Bruton’s agammaglobulinemia is a rare genetic disorder with a prevalence of 1 in every 190,00 male births in the United States. B cells formation is arrested due to a mutation in the BTK gene that alters the BTK protein involved in B cell differentiation. The BTK gene was identified in 1993 and since then numerous gene mutation sites have been identified.

We present a 3-year-old male with the clinical picture consistent with XLA (recurring and serious infections, agammaglobulinemia, lack of circulating B cells and decreased BTK expression) in whom BTK gene analysis identified a variant of uncertain significance (VUS), which has not been previously reported in literature. A further primary antibody deficiency genetic panel, while demonstrating one risk factor variant for common variable immunodeficiency (CVID), and a VUS in IGHM gene, failed to identify diagnostic mutations that may explain his clinical picture.

In light of his presentation and laboratory findings, it is plausible that the VUS mutation in BTK may be pathogenic, which to our knowledge would be a first report of this VUS to be associated with clinical presentation consistent with XLA. Further evaluation such as BTK mRNA analysis is being considered to prove pathogenicity.
THE NON-DICHOTOMY BETWEEN MALIGNANT CATATONIA AND NMS: A CASE PRESENTATION

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INTRODUCTION: Malignant Catatonia (MC) is a disease process associated with both psychiatric and medical conditions and can be fatal, necessitating immediate identification and treatment. Neuroleptic Malignant Syndrome (NMS) is also a potentially lethal disease process associated with the use of dopamine antagonist medications. MC and NMS share many signs and symptoms and can be difficult to distinguish clinically. Here we compare and contrast MC with NMS in a case involving both.

CASE PRESENTATION: A 22-year-old Caucasian male, with a past psychiatric history of major depression, social anxiety disorder, and a first psychotic break in April 2016 (treated with olanzapine, then lurasidone), developed worsening psychotic symptoms including staring blankly into space, having bizarre ideation, mumbling to himself, not sleeping, and becoming increasingly irritable and isolative. In the ER, he was given ziprasidone 40mg IM x2 and Ativan 1mg IM for agitation; he subsequently developed fever, hypotension, acute rhabdomyolysis, renal failure, and metabolic acidosis (Table 1). Psychotropics were held while he was stabilized with fluid resuscitation and dantrolene in the ICU. After being transferred to psychiatry, the patient displayed classic signs of psychosis and catatonia including catalepsy, waxy flexibility, posturing, blankly staring out the window, stupor, and mutism. Lorazepam 1mg po BID was initiated for acute catatonia and titrated to 7 mg/d over three days with near-complete resolution. After this time, aripiprazole was initiated with good response. Discharge diagnosis was catatonia associated with schizophreniform disorder.

DISCUSSION: Neuroleptic malignant syndrome and malignant catatonia can present similarly and may be considered as a single syndrome, though they are believed by many to be two separate conditions (Table 2). In our patient, both conditions appear to have been preceded by the use of neuroleptic agents. Further, he developed MC, which was then complicated by the development of NMS. As the NMS was successfully treated, the unrecognized underlying catatonia persisted. Typical criteria for catatonia are mentioned below (Table 3). After having received high doses of oral lorazepam, the catatonia resolved. Alternative first-line treatment option could have been ECT. It is found that neuroleptics can precipitate both NMS and MC and are contraindicated in both. However, as in our patient, treatment of ongoing psychosis with neuroleptics can be successful after resolution of NMS and MC. Though the pathophysiology is not fully understood, catatonia is believed to reflect abnormalities in the basal ganglia thalamocortical tracts, the anterior cingulate-medial orbitofrontal circuit, and the lateral orbitofrontal circuit. As these abnormalities can lead to a general hypodopaminergia, the addition of neuroleptics would be expected to worsen these conditions. GABA, dopamine, and glutamate dysregulation have been implicated.

CONCLUSION: Both NMS and MC can present with characteristic symptoms of hyperthermia, motor rigidity, stupor, and autonomic dysfunction, and can be distinguished clinically by a behavioral prodrome. Also, as the treatment of NMS consists of holding antipsychotics and giving supportive care, that of MC benefits from extended treatment with benzodiazepine or ECT.
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