



COLLEGE OF  
**MEDICINE**  
CENTRAL MICHIGAN UNIVERSITY

# 2024 Central Michigan University College of Medicine and CMU Medical Education Partners Research Symposium



# 2024 Central Michigan University College of Medicine and CMU Medical Education Partners Research Symposium

## WELCOME

Welcome to the 2024 Research Symposium sponsored by Central Michigan University College of Medicine and Central Michigan University Medical Education Partners. This is our ninth joint venture celebrating the research accomplishments of our faculty, residents, fellows, and students.

We have over 150 abstracts that were submitted for the symposium. This is the largest number of submissions thus far. A reviewing panel chose twelve of these for oral presentation, and 132 for poster presentation to be presented today April 26<sup>th</sup> at the Dow Event Center. The research spans diverse disciplines and includes research from both the Mount Pleasant, Saginaw and Detroit campuses, as well as from outside research institutions.

Our plenary speaker this year is Dr. Louis Saravolatz, former Governor of Michigan American College of Physicians and Chair of Medicine at Ascension St. John Hospital, Detroit who will be sharing his decades of experience with “Resident/Student Research How to make it happen!!” This should be of interest to all the attendees.

Immediately after Dr. Saravolatz’s lecture, please stay to recognize our awardees for oral as well as for poster presentations. The award recipients will be announced at 4:30pm. Financial support for this year’s symposium awardees was generously provided by the Saginaw County Medical Society Foundation.

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

**Beth Bailey, Ph.D.**

*Professor Foundational Sciences and Director of Health Services Research, Central Michigan University College of Medicine*

**Ghassan Hamadeh, M.D.**

*Professor Family Medicine, Medicine Discipline Chair, Chief Medical Informatics Officer, Central Michigan University Medical Education Partners, Central Michigan University College of Medicine*

**Nawar Hussin, M.D.**

*Assistant Professor, Director of Clinical Research, Central Michigan University College of Medicine*

**Edward McKee, Ph.D.**

*Professor, Biochemistry and Genetics, Central Michigan University College of Medicine*

**Karin Przyklenk, Ph.D.**, Interim AVP for Clinical Research, CMU, *Scientific Director, University Pediatricians Clinical Research Institute, Central Michigan University; Carman and Ann Adams Endowed Chair in Pediatric Research, Children’s Hospital of Michigan; Director, Professor of Pediatric Science, Central Michigan University College of Medicine*

**Neli Ragina, Ph.D.**

*Associate Professor Genetics and Director of Research, Central Michigan University College of Medicine*

**Sethu Reddy, M.D., M.B.A.**

*Senior Associate Dean of Research, Central Michigan University College of Medicine*

**Mary Jo Wagner, M.D.**

*Professor Surgical Sciences, Central Michigan University Medical Education Partners and CAO/Designated Institutional Official, Central Michigan University College of Medicine*

**Myra VanSyckle**

*Coordinator Research Administration, Central Michigan University College of Medicine*

# Central Michigan University College of Medicine and CMU Medical Education Partners Research Symposium

## Schedule of Events April 26, 2024

9:00 -11:00 am  
Presenter Set-Up, Open Registration

11:00 am-1:00 pm  
Poster Presentations and Judging

11:30 am-1:00 pm  
Lunch

1:00-1:10 pm  
Welcome  
Sethu Reddy M.D.,  
Mary Jo Wagner M.D. and  
George Kikano M.D.

1:10-2:10 pm  
Oral Presentations– Session 1  
Moderator- Neli Ragina Ph.D.

2:10-2:30 pm  
Break

2:30-3:30 pm  
Oral Presentations- Session 2  
Moderator – Beth Bailey Ph.D.

3:30-4:30 pm  
Plenary Speaker,  
Louis Saravolatz M.D.

4:30-4:45 pm  
Awards  
Edward McKee Ph.D. and  
Sethu Reddy M.D.

Closing Remarks  
Ghassan Hamadeh, M.D

*Note: Meeting organizers and poster authors have disclosed they have no relevant financial relationships with commercial interests.*

*\*Presenters and Poster Judges: Poster presenters may want time to review other posters and yet be available for discussion of their abstract with others. To facilitate this, we are requesting that if your poster falls under the category of Basic Translational, Clinical, and QI/Medical Education then be present at your poster from 11am-12pm. If you have a poster under the category of Case Report or Population Health then be present from 12-1pm. **It is not necessary for presenters to be at posters for judging but it is recommended.***



## Office of Continuing Medical Education

### Accreditation

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

Central Michigan University College of Medicine designates this live activity for a maximum of 5.0 *AMA PRA Category 1 Credit*<sup>™</sup>. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

To apply for CME credit, go to:

[med.cmich.edu/cmecert](http://med.cmich.edu/cmecert)

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

For further information regarding continuing medical education and CME credit(s), please contact Sheila Allen, CME Administrator, at [sheila.allen@cmich.edu](mailto:sheila.allen@cmich.edu), 989-746-7602 or Marie Wyman, CME Specialist at [bauma2mc@cmich.edu](mailto:bauma2mc@cmich.edu), 989-746-7655.

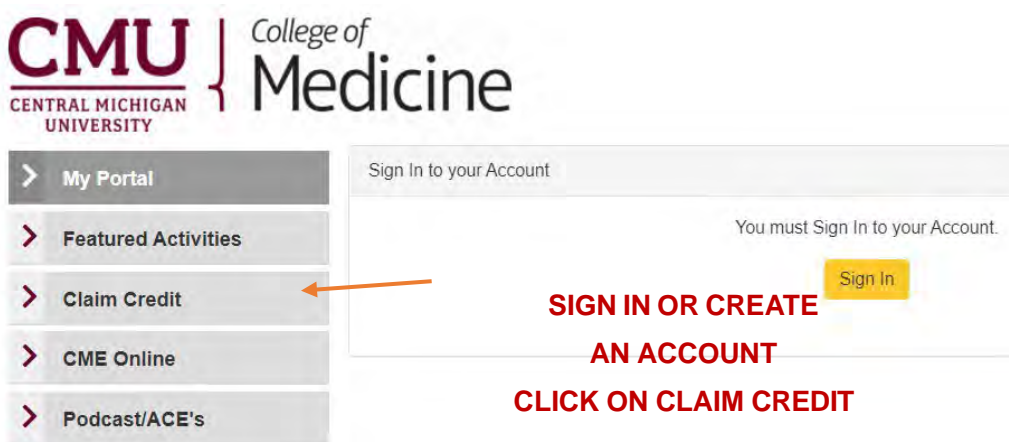
# 2024 UPDATE

## HOW TO OBTAIN CME/CE CREDIT

To claim CME credit for *AMA PRA Category 1 Credit™*, AOA Category 1-A or 1-B, Social Work or other credit, go to

[MED.CMICH.EDU/CMECERT](https://med.cmich.edu/cmecert)

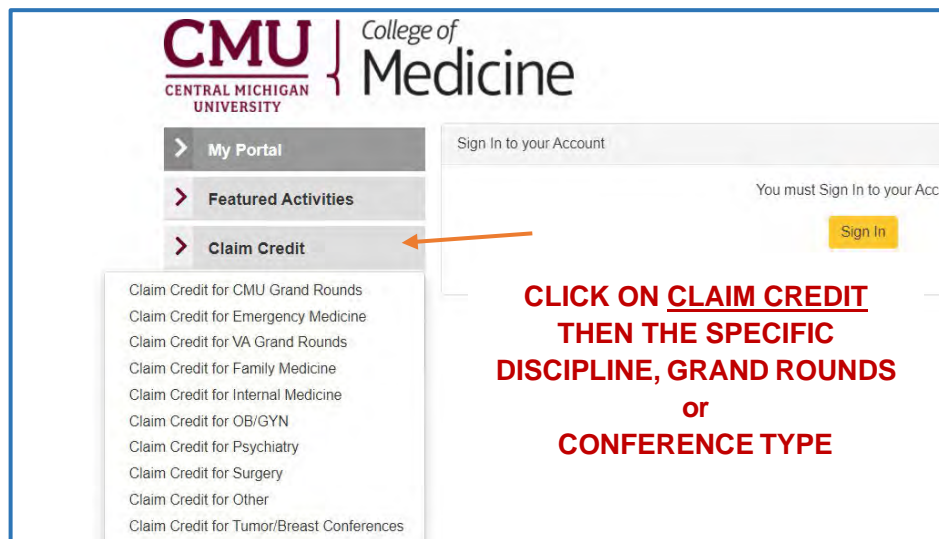
The new and updated CME Menu will appear:



The screenshot shows the CMU College of Medicine website. On the left is a vertical navigation menu with the following items: My Portal, Featured Activities, Claim Credit, CME Online, and Podcast/ACE's. An orange arrow points to the 'Claim Credit' item. On the right, there is a sign-in area with the text 'Sign In to your Account' and a yellow 'Sign In' button. Below this, a message reads 'You must Sign In to your Account.' In the center, red text says 'SIGN IN OR CREATE AN ACCOUNT' and 'CLICK ON CLAIM CREDIT'.

OR

CLICK **Claim Credit** on the LEFT BANNER



This screenshot shows the 'Claim Credit' dropdown menu from the previous image. The menu lists the following options: Claim Credit for CMU Grand Rounds, Claim Credit for Emergency Medicine, Claim Credit for VA Grand Rounds, Claim Credit for Family Medicine, Claim Credit for Internal Medicine, Claim Credit for OB/GYN, Claim Credit for Psychiatry, Claim Credit for Surgery, Claim Credit for Other, and Claim Credit for Tumor/Breast Conferences. An orange arrow points to the 'Claim Credit' item in the navigation menu. In the center, red text says 'CLICK ON CLAIM CREDIT THEN THE SPECIFIC DISCIPLINE, GRAND ROUNDS OR CONFERENCE TYPE'.

**NEW USERS must create a profile,  
then sign-in and follow-onscreen instructions.**

**Activities remain OPEN for 30 days.**

A Certificate is available immediately;  
the activity is added automatically to your transcript.

For CME or MOC / CE questions, please contact us at [CMEDCME@cmich.edu](mailto:CMEDCME@cmich.edu) or call  
989-746-7602 or 989-746-7555.

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# Central Michigan University College of Medicine and CMU Medical Education Partners Research Symposium

## A Thank you to:

### Judging Panelists

- **Oral presentations:**

**Andrew Bazakis, M.D.** Associate Professor of Emergency Medicine and Foundational Sciences, Central Michigan University College of Medicine

**Kathleen Cowling, D.O.**, Professor Chair, Director, Emergency Room Program Director, Central Michigan University Health, Central Michigan University Medical Education Partners

**Michael Eftman, Ph.D.**, Assistant Professor of Immunology and Infectious Disease, Central Michigan University College of Medicine

**Nicholas Haddad, M.D.** Central Michigan University Health Infectious Disease Specialist, Internal Medicine Program Director, Central Michigan University College of Medicine

**Robert B. Petersen, Ph.D.**, Professor of Neuroscience, Genetics, and Cell Biology, Central Michigan University College of Medicine

**Xia Wang, M.D., Ph.D.**, Central Michigan University Health Geneticist, Central Michigan University Medical Education Partners

- **Poster presentations:**

- ▶ **Faculty, staff and community educators from Central Michigan University College of Medicine:**

- Beth Bailey, Ph.D.
- Harold J. Bell, Ph.D.
- Wendy Biggs, M.D.
- Judy S. Blebea, M.D.
- Joydeep Chaudhuri, M.D.
- Michael D. Eftman, Ph.D.
- Asef Hoque
- Nawar Hussin, M.D.
- Kenneth Lewis, Ph.D.
- Richard McCabe, Ph.D.
- Edward E. McKee, Ph.D.
- Eric Petersen, Ph.D.
- Robert B. Petersen, Ph.D.
- Rosemary Poku, Ph.D.
- Neli Ragina, Ph.D.

- Sethu Reddy, M.D., MBA
- Mariana Rosca, M.D.
- Mildred Willy, M.D.
- Nicole Wright

► **Faculty, Residents and staff from Central Michigan University Medical Education Partners:**

- Ihsan Al-Sabbagh, M.D.
- Abishek Bala, M.D.
- Andrew Bazakis, M.D.
- Saad Chaudhry, M.D.
- Kathleen Cowling, D.O.
- Aman Dhaliwal, M.D.
- Rebecca Dimanche, M.D.
- Bethany Figg, DEdT
- Leslie Francke
- Alexis Hadaway
- Nicholas Haddad, M.D.
- Ghassan Hamadeh, M.D.
- Asif Khan, M.D.
- Veronika Kinaschuk, M.D.
- Cecilia Kraus-Horbal D.O.
- Garrett Llewelyn, M.D.
- Therese Mead, D.O.
- Kyleigh Pierson, DPM
- Rachel Rezmer, M.D.
- Nikita Roy, M.D.
- Dax Spencer, D.O.
- Delaney Trombley
- Leah Vreibel, D.O.
- Mary Jo Wagner, M.D.
- Xia Wang, M.D.

► **Physicians and staff from Children's Hospital of Michigan:**

- Tarek Husien, M.D.
- Andrew Prout, M.D.
- Ronald Thomas

► **Other affiliations:**

- Adam Dutkiewicz



## **Student volunteers from CMU College of Medicine, Mount Pleasant, Michigan**

- Natalie Aguilar, M.D. Candidate
- Julia Kwapiszewski, M.D. Candidate
- Mirando Manzo, M.D. Candidate
- Kaylynn Moschke, M.D. Candidate
- Jamie Van De Burg, M.D. Candidate
- Spencer Williams, M.D. Candidate

## **Staff volunteers**

- Alexis Hadaway
- Colleen Harke
- Delaney Trombley

## **The Dow Event Center**

- Kaitlynn O'Keefe
- Crystal Brookins



**The Saginaw County Medical Society Foundation  
is proud to sponsor awards for the  
Central Michigan University College of Medicine (CMED)  
& CMU Medical Educational Partners (CMEP)  
2024 Research Abstract Symposium  
Friday, April 26, 2024**

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

**WHAT IS THE PURPOSE OF THE FOUNDATION?**

- Provides low interest loans to medical students with ties to the Saginaw area, with a maximum of \$20,000 over four years.
  - All interest is forgiven if the student returns to Saginaw upon completion of a residency to practice.
  - If the loan recipient returns to Saginaw to practice upon completion of their residency and is a dues paying member of the SCMS/MSMS, 25 percent of the principal balance will be forgiven at the end of each year they are practicing in Saginaw County, with a maximum of \$5,000 per year forgiven.
- Assists the SCMS Alliance in awarding scholarships to Saginaw County nursing students.
- Awards scholarships to high school juniors and seniors interested in becoming a physician and practicing in Saginaw County.
- Provides scholarships and awards to medical students and residents for research projects.

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

**President**

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*Joan M. Cramer*

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- Awards scholarships to high school juniors and seniors interested in becoming a physician and practicing in Saginaw County.
- Provides scholarships and awards to medical students and residents for research projects.

**The Foundation relies on donations to continue and increase funding programs in order to assist as many students as possible.**

*If you would like to honor a colleague who is living or deceased, please contribute to the SCMS Foundation*

\*The SCMS Foundation is a 501(c)(3) nonprofit. Gifts have charitable tax benefits so please consult with your tax advisor for specifics. A tax receipt will be provided.

**PLEASE COMPLETE AND RETURN THE FOLLOWING WITH YOUR CHECK  
(We are unable to accept credit card payments)**

✂-----✂

Enclosed is my contribution made payable to the SCMS Foundation *(please designate amount)*:

\$1,000     \$500     \$250     \$100     \$50     Other \_\_\_\_\_

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My gift is:     in honor of     in memory of    Occasion/Person to be honored: \_\_\_\_\_

*Please send notice of my gift (without specifying amount) to:*

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**Checks should be made payable to the SCMS Foundation and mailed to the SCMS office at 350 St. Andrews Road, Suite 242, Saginaw, Michigan 48638-5988. Questions? Contact Joan Cramer, Executive Director at [jmcramer@saginawcountymys.com](mailto:jmcramer@saginawcountymys.com) or (989) 284-8884. Thank you!**

# 2024 Central Michigan University College of Medicine and CMU Medical Education Partners Research Symposium

Live Program

Friday, April 26, 2024, 11 a.m.– 5 p.m., Dow Event Center, Saginaw, Michigan

**11 a.m.–1 p.m.**

**Poster Presentations and Judging**

**1–1:10 p.m.**

**Opening Remarks:**

Sethu Reddy, M.D., M.B.A., *Senior Associate Dean of Research, Central Michigan University College of Medicine*

Mary Jo Wagner, M.D., FACEP, *Central Michigan University Medical Education Partners Chief Academic Officer, Designated Institutional Official, Professor of Emergency Medicine*

George Kikano, M.D., *Vice President Health Affairs, Dean College of Medicine, Central Michigan University*

**1:10 p.m.**

**Oral Presentations Session 1: *Each presenter will have 8 minutes to share their work and 2 minutes for questions from viewers.***

Moderator: Neli Ragina, Ph.D., *Associate Professor of Genetics and Director of Research, Central Michigan University College of Medicine*

**1:10–1:20 p.m.**

**Oral #1**

Caroline Cassidy, M-2 student

PI3K inhibitor (LY294002) attenuates enhanced proliferation, invasion and anchorage independent potential induced by Rac-1 P29S in A375 cell

**1:20–1:30 p.m.**

**Oral #2**

Nick Chiaramonti, M-2 student

Alteration of Bone Mechanical Properties Following Double Knockout of R-spondin-2 and R-spondin-3 in Osteoblasts

**1:30–1:40 p.m.**

**Oral #3**

Michelle Azar, M-3 student

Assessing Adverse Neonatal Outcomes Associated with Intrapartum Narcotic Administration

**1:40–1:50 p.m.**

**Oral #4**

Fatema Hammad, Fellow

Epstein Barr Virus (EBV) DNAemia and EBV Serology in Pediatric Solid Organ Transplant Recipients: A Single Center Study

**1:50–2:00 p.m.**

**Oral #5**

Mohammed Adil, Resident

Contemporary Nationwide Trends In Major Adverse Cardiac Events In Young Hospitalized Adults With Dependent Cannabis Use In Absence Of Concomitant Tobacco, Alcohol Or Cocaine Use Disorder, 2016-2019

**2:00-2:10 p.m.**

**Oral #6**

Jacob Surma, M-1 student

Drug-induced sleep endoscopy for targeted sleep surgery in pediatric patients

**2:10-2:30 p.m.**

**Break**

**2:30 p.m.**

**Oral Presentations Session 2: *Each presenter will have 8 minutes to share their work and 2 minutes for questions from viewers.***

Moderator: Beth Bailey, Ph.D., *Professor of Foundational Sciences and Director of Population Health Research, Central Michigan University College of Medicine*

**2:30–2:40 p.m.**

**Oral #7**

Kayleigh Crane, M-2 student

Identifying Risk Factors for Falls in Rural Aging Adults through Virtual Assessment

**2:40–2:50 p.m.**

**Oral #8**

Michelle Moufawad, M-2 student

Social media use and weight bias internalization: association moderated by age and weight perception.

**2:50–3 p.m.**

**Oral #9**

Alan Ross, M-2 student, and Deepti Sanku

The Impact of Medicaid Expansion on Life Expectancy in the Midwestern Region of the United States

**3–3:10 p.m.**

**Oral #10**

Nicholas Sirhan, M-3 student, Anthony Mufarreh, and Christopher Mishreky

Adverse Childhood Experiences in the post-COVID era: A Comparative Analysis of Youth Risk Behavioral Surveillance System Population Study between 2019 and 2021

**3:10–3:20 p.m.**

**Oral #11**

Merlin Kochunilathil, M-2 student

Usage of Reddit & Student Doctor Network in Medical Education Research

**3:20–3:30 p.m.**

**Oral #12**

Andrew Namespetra, Resident

Combatting Violence in the Emergency Department: A Quality Improvement Project

**3:30–4:30 p.m.**

**Plenary Speaker: Louis Saravolatz M.D.**

**4:30–4:45 p.m.**

**Award Announcements:**

Edward McKee, Ph.D., *Professor of Biochemistry and Genetics, Central Michigan University College of Medicine*

Sethu Reddy, M.D., M.B.A., *Senior Associate Dean of Research, Central Michigan University College of Medicine*

**Closing Remarks:**

Ghassan Hamadeh M.D., *Professor, Discipline Chair, Central Michigan University College of Medicine*

# 2024 Research Symposium Plenary Speaker



Dr. Louis Saravolatz, M.D., MACP

Dr. Saravolatz is the chair of Internal Medicine at Ascension-St. John Hospital in Detroit. He previously served as division chief and program director of Infectious Diseases at Henry Ford Hospital.

He has served numerous roles in the ACP, both at the state and national level, most recently completing his four-year term as governor of the Michigan ACP in. Dr. Saravolatz is continuing his research by studying the epidemiology of COVID-19 as well as leading a COVID-19 vaccine trial. He also is directing the development of the Thomas Mackey Center for Infectious Disease Research at Ascension-St. John Hospital.

Dr. Saravolatz has won numerous awards for his teaching, scholarly work and service, including the Michigan ACP Lifetime Achievement Award. He has a record of scholarly work in Infectious Diseases that has helped in understanding the epidemiology and treatment of numerous pathogens, including Legionella, methicillin-resistant Staphylococcus aureus and HIV. He also has served on numerous local, regional and national committees to help with advancing the knowledge in these and other infectious diseases. He is a recipient of Mastership in the American College of Physicians, which recognizes outstanding and extraordinary career accomplishments and notable contributions to medicine.

Dr. Saravolatz is the consummate physician, who in addition to giving back to the medical community, has also contributed to several mission trips to Paraguay and numerous shadowing opportunities for high school students interested in medicine.

CMU College of Medicine is particularly appreciative of Dr. Saravolatz and his family for initiating the Louis and Yvette Saravolatz Summer Scholarship Award for a worthy CMU medical student.

On behalf of the Research Group at CMU College of Medicine, thank you Dr. Saravolatz!

# **Louis and Yvette Saravolatz Summer Scholarship Award Winners:**

2024: To be announced at the Research Symposium

2023: Ryan Graff working with Julien Rossignol on a project titled “Delivery of CRISPR-Cas9 Gene Editing Tool to YAC128 Mice using PAMAM Dendrimers as a Potential Treatment of Huntington’s Disease”

2022: Chris Mishreky working with Ute Hochgeschwender on a project titled “Selective Control of Synaptically-Connected Circuit Elements in vivo”

2021: Maher Megaly mentored by Nicholas Haddad M.D. and Neli Ragina Ph.D., on a project titled “Thrombosis and d-dimer formation as risk assessment for COVID-19 patients’ mortality at CMU Health and Covenant HealthCare”



# 2024 Central Michigan University College of Medicine and CMU Medical Education Partners Research Symposium

## Oral Presenters

Submitter Last	Submitter First	Title	Category	Presentation #
Cassidy	Caroline	PI3K inhibitor (LY294002) attenuates enhanced proliferation, invasion and anchorage independent potential induced by Rac-1 P29S in A375 cell lines	Basic & Translational	Oral 1
Chiaromonti	Nick	Alteration of Bone Mechanical Properties Following Double Knockout of R-spondin-2 and R-spondin-3 in Osteoblasts	Basic & Translational	Oral 2
Azar	Michelle	Assessing Adverse Neonatal Outcomes Associated with Intrapartum Narcotic Administration	Clinical Health	Oral 3
Hammad	Fatema	Epstein Barr Virus (EBV) DNAemia and EBV Serology in Pediatric Solid Organ Transplant Recipients: A Single Center Study	Clinical Health	Oral 4
Mohammed	Adil	Contemporary Nationwide Trends In Major Adverse Cardiac Events In Young Hospitalized Adults With Dependent Cannabis Use In Absence Of Concomitant Tobacco, Alcohol Or Cocaine Use Disorder, 2016-2019	Clinical Health	Oral 5
Surma	Jacob	Drug-induced sleep endoscopy for targeted sleep surgery in pediatric patients	Clinical Health	Oral 6
Crane	Kayleigh	Identifying Risk Factors for Falls in Rural Aging Adults through Virtual Assessment	Population Health	Oral 7
Moufawad	Michelle	Social media use and weight bias internalization: association moderated by age and weight perception.	Population Health	Oral 8
Ross	Alan	The Impact of Medicaid Expansion on Life Expectancy in the Midwestern Region of the United States	Population Health	Oral 9
Sirhan	Nicholas	Adverse Childhood Experiences in the post-COVID era: A Comparative Analysis of Youth Risk Behavioral Surveillance System Population Study between 2019 and 2021	Population Health	Oral 10
Kochunilathil	Merlin	Usage of Reddit & Student Doctor Network in Medical Education Research	Quality Improvement/Medical Education	Oral 11
Namespetra	Andrew	Combatting Violence in the Emergency Department: A Quality Improvement Project	Quality Improvement/Medical Education	Oral 12

**Abstract Title:** PI3K inhibitor (LY294002) attenuates enhanced proliferation, invasion and anchorage independent potential induced by Rac-1 P29S in A375 cell lines

**Authors:** Caroline Cassidy, Harrison Loftus, Emily Hodge, Rosemary Poku

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Rosemary Poku Ph.D.

**Background:** Melanoma is the most common cause of skin cancer deaths in the United States. It also carries a significant metastatic risk that can be associated with a poor prognosis, even with treatment. Therefore, improving therapeutic options has become a necessity in medical research. Rac-1 is a protein in the Rho GTPase family, and mutations in such have been linked to driving several malignancies, including melanoma. Overactivation of the phosphatidylinositol 3-kinase (PI3K) pathway has been shown to play an important role in melanoma's initiation and resistance to therapy. For this reason, inhibitors targeting the PI3K-AKT pathway have garnered the attention of researchers.

**Objective:** This study investigated the hypothesis that that overexpression of mutant Rac-1 P29S would enhance cell proliferation, migration, invasion, and anchorage-independent growth and that treatment with a pan PI3K inhibitor (PI3Ki - LY294002) could decrease these phenotypes in A375 melanoma cells harboring the P29S Rac1 mutation.

**Methods:** We conducted MTT assay for proliferation, wound healing assay for migration, matrigel invasion assay and soft agar assay for anchorage-independent cell growth, and western blot for Rac-1 expression using A375 melanoma cell lines transfected with mutant Rac-1 P29S and Q61L.

**Results:** A375 cells expressing mutant Rac-1 P29S showed a significant increase in proliferation by day 4 compared to the wildtype and vector (V0). These effects were attenuated by daily treatment with the PI3Ki. P29S cells exhibited a 26.25% reduction and 36.79% reduction in cell proliferation for 0.1 and 0.2 uM concentrations of PI3Ki respectively, compared to a 26% (0.1uM) and 69% (0.2 uM) reduction in proliferation for the wildtype cells. The soft-agar assay to assess anchorage independent growth revealed that treatment with the PI3Ki lead to a 53% reduction in colony formation for the P29S cells, compared to the untreated. In the matrigel invasion assay, treated P29S cells were also seen to have decreased invasion compared to their untreated controls. P29S showed the greatest expression of Rac-1 in the western blot analysis, and treatment with a PI3Ki led to decreased Rac-1 expression in the P29S cells and the wildtype and V0 controls.

**Conclusion:** Our results suggest that treatment with a PI3K inhibitor leads to decreased cell proliferation, invasion, anchorage independent growth, and migration in A375 melanoma cells, as well as decreased expression of mutant Rac1. This represents a possible treatment in melanoma harboring these mutations.

**Significance:** These results warrant further discussion and research on how PI3K inhibitors can be used to treat melanoma, especially in those found to have Rac-1 P29S mutations.

**Abstract Title:** Alteration of Bone Mechanical Properties Following Double Knockout of R-spondin-2 and R-spondin-3 in Osteoblasts

**Authors:** Nick Chiaramonti, Kyle Maas, Noah Sinishtaj, Kurt Hankenson

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Kurt Hankenson Ph.D.

**BACKGROUND:** Wnt signaling is a well-recognized pathway that modulates the formation of bone, and it has been shown that activation of Wnt signaling can increase bone mass both in animal models and in humans. Wnt signaling can be stimulated by proteins in the R-spondin family, including R-spondin-2 (Rspo2) and R-spondin-3 (Rspo3). Our prior work has shown that, in mice, disruption of Rspo2 reduces peak bone mass and strength<sup>2</sup>, while Rspo3 disruption has been shown to decrease trabecular bone mass and vertebral bone strength<sup>3</sup>.

**OBJECTIVE:** Herein, we advance our understanding of Rspo2 and 3 in bone by concurrently disrupting both genes in osteoblasts constitutively. We hypothesized that genetic knockout of Rspo2 and Rspo3 together would impair bone mechanical properties.

**METHODS:** With animal care and use committee approval, to assess the roles of Rspo2 and Rspo3 in bone growth and development, Osteocalcin Cre positive (+) mice were crossed with Rspo2 floxed and Rspo3 floxed mice to obtain Cre- (wildtype) and Cre+ Rspo2 Rspo3 double floxed knockouts (DfKO). Male and female mice were double labeled with calcein and harvested at 1-, 3-, 6-, and 9-months-old. Femora were wrapped in saline soaked gauze, kept frozen at -20°C and MicroCT scans of each femur were obtained prior to mechanical testing. Femurs underwent 4-point bend mechanical testing to interrogate mechanical function.

**RESULTS:** Constitutive knockout of Rspo2 and Rspo3 in Osteocalcin Cre+ cells during mouse development (DfKO) leads to significant differences in several mechanical properties of female femurs at 3 and 6 months (Figure 1A-D), as well as male femurs at 6 months (Figure 1E and 1F). At 3 months, female DfKO femurs required significantly lower forces to reach the yield point than wild type femurs. At 6 months, female DfKO femurs displayed significantly lower femur stiffness and a greater displacement of the femur at the yield point than wildtype femurs. For 6-month-old male femurs lacking Rspo2/3 expression, there was a significantly lower yield load, ultimate load, and failure load as compared to wildtype male femurs. 6-month males lacking R-spondin expression also had significantly decreased femur stiffness compared to wildtype males.

**CONCLUSIONS:** From these data, we conclude that constitutive dual knockout of Rspo2 and Rspo3 during osteoblast differentiation results in significant differences in the mechanical properties of mouse femurs. These findings are congruent with previous work in our laboratory which established the capacity of Rspo2 to activate Wnt signaling and regulate osteoblast activity. Rspo3 also has a known role as a Wnt signaling agonist<sup>4</sup>, and previous studies have identified Rspo3 as a regulator of trabecular bone development and bone strength. As Wnt regulators, Rspo2 and Rspo3 are likely involved in the proper development and maturation of long bone structures. Thus, the results herein support the importance of Rspo2 and Rspo3 in cortical bone development and bone mechanical properties.

**SIGNIFICANCE:** These findings support a role for R-spondin proteins in adult bone function. Additional studies are needed to test R-spondin proteins as therapeutic agents in diseases with deficient bone development, helping to translate these results into improved patient outcomes.

**Abstract Title:** Assessing Adverse Neonatal Outcomes Associated with Intrapartum Narcotic Administration

**Authors:** Michelle Azar, Hassan Shukr, Beth Bailey

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Beth Bailey Ph.D.

**Background:** An estimated 83% of deliveries in the US are augmented with pain control, with 67% incorporating spinal analgesia, and 16% incorporating narcotics. Present literature in this sphere has suggested intrapartum fentanyl may be associated with poor neonatal suckling, and thus impaired breastfeeding. It remains unclear the impact of intrapartum pain relief, especially narcotics, on adverse neonatal outcomes beyond impaired breastfeeding.

**Objective:** We examined whether use of intrapartum narcotics increases risk of adverse neonatal outcomes.

**Methods:** Charts of patients admitted for delivery at Covenant Healthcare were reviewed for drugs administered in the intrapartum period and neonatal outcomes. IRB approval was obtained with a waiver of informed consent. Data were summarized using logistic regression, controlling for confounders.

**Results:** Of the 519 participants, 286 (55.1%) received at least one narcotic in the intrapartum period. Narcotics used included: Tylenol III, Morphine, Norco, Nubain, and Fentanyl. Compared to the control group, those who received narcotics were significantly younger, had greater pregnancy weight gain, were less likely to deliver via cesarean section, were less likely to have had preeclampsia, had greater gestational age at delivery, and gave birth to babies that weighed more. Tylenol III predicted a 3 times higher adjusted risk of NICU admission (OR=3.03 (1.06-8.62)). Norco predicted greater than 2.5 times higher risk of 1-minute (OR=2.66 (1.26-5.60)) and 5-minute APGAR scores below 7 (OR=2.61 (1.08-6.31)), and requiring oxygen at birth (OR=2.68 (1.21-5.93)). Morphine predicted a 3 times higher risk of 5-minute APGAR scores below 7 (OR=3.00 (1.26-7.17)). When adjusting for receipt of epidural analgesia, epidural did not significantly increase risk of any study outcomes.

**Conclusion:** Adverse neonatal outcomes including NICU admission, low 1- and 5-minute APGAR scores, and assisted ventilation at birth, were observed following intrapartum Norco, Morphine, and Tylenol III. Further, adverse neonatal outcomes were unrelated to use of epidural analgesia.

**Significance:** Findings support growing evidence that intrapartum narcotics pose risk to neonates, and further research is needed to elucidate potential longer-term effects.

**Abstract Title:** Epstein Barr Virus (EBV) DNAemia and EBV Serology in Pediatric Solid Organ Transplant Recipients: A Single Center Study

**Authors:** Fatema Hammad, Sureyya Savasan, Ahmad Farooqi, Swati Sehgal, Najeeb Zoubi, Jennifer Blake, Christina Bartow, Dean Kim, Amrish Jain

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Amrish Jain M.D.

**Background:** Pediatric solid organ transplant (SOT) recipients commonly experience Epstein-Barr virus (EBV) DNAemia, posing them at risk of developing post-transplant lymphoproliferative disorder (PTLD). There is scarcity of knowledge regarding EBV serological patterns and its relationship with EBV DNAemia in pediatric SOTs.

**Objectives:** To study the prevalence, risk factors, and outcomes for the development of EBV DNAemia and PTLN in pediatric SOT recipients, to compare the clinical characteristics and management of EBV DNAemia based on the transplanted organ and to investigate the changes in serology patterns and their relationship to EBV DNAemia status.

**Methods:** This retrospective study included children  $\leq 21$  years who underwent SOT (kidney, heart, and liver) at a single center between January 1, 2010, and March 31, 2022. Those with incomplete data, and multi-visceral transplant were excluded. EBV DNAemia was defined as  $\geq 120$  copies/ml of the virus by polymerase chain reaction assay. Full EBV serology panel using was categorized as positive based on the following cut-off points: EBV anti-early antigen (EA)  $\geq 11.0$  U/mL, anti-nuclear antigen (EBNA)  $\geq 22.0$  U/mL, anti-viral capsid antigen (VCA) IgG  $\geq 22.0$  U/mL, and anti-VCA IgM  $\geq 36.0$  U/mL. Wilcoxon test and Pearson's Chi-squared/ Fisher-Exact test analysis performed using SAS (version 9.4).

**Results:** Out of 131 SOT recipients, 33 (25%) had EBV DNAemia. Liver transplant recipients exhibited a higher prevalence of EBV DNAemia (47.6%) among all SOT, followed by heart (23.3%), and kidney (20%) transplant recipients. Significant risk factors for development of EBV DNAemia were type of organ ( $p=0.044$ ), younger age ( $p < 0.001$ ), Donor+/Recipient- EBV serology status ( $p=0.001$ ) and type of induction immunosuppression ( $p=0.004$ ). Liver recipients had shortest median time to infection (1.3 months) and shortest median duration of infection (16.6 months). Kidney recipients had the lowest median EBV PCR values range (185-812 copies/mL). EBV DNAemia was asymptomatic and detected during surveillance in 66%, recurrent or persistent EBV DNAemia seen in 60.6%; and 48.5% required only reduction in immunosuppression. Oncology consultation was done in one-third of patients with EBV DNAemia, and only 3 patients (9%) developed PTLN compared to 2 (2%) in the non-EBV group. There were no significant differences in other outcomes (rejection episodes, CMV infection, BK infection, and graft loss) between EBV DNAemia vs. non EBV DNAemia group. Of 131 SOTs, 87 had both pre- and post-transplant EBV serology obtained, serology profile change in recipients with EBV DNAemia was 85.7% vs. 42.4% in EBV DNAemia-negative group. Of the 87 SOTs, 53 had two or more EBV serology panel testing; 64.2% had unchanged EBV serology pattern independent of EBV DNAemia status. This stable profile was seen more commonly in liver (80%), followed by heart (66%) and kidney (55%) transplant recipients.

**Conclusions:** EBV serology pattern remained unchanged in 2/3 of all SOTs despite varying immunosuppression regimens and regardless of EBV DNAemia status. A larger prospective study is required to investigate the potential role of unique EBV serology patterns on the SOT course and outcomes, beyond PTLN development.

**Abstract Title:** Contemporary Nationwide Trends In Major Adverse Cardiac Events In Young Hospitalized Adults With Dependent Cannabis Use In Absence Of Concomitant Tobacco, Alcohol Or Cocaine Use Disorder, 2016-2019

**Authors:** Paritharsh Ghantasala, Rupak Desai, Adil Mohammed

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Paritharsh Ghantasala M.D.

#### Background:

Recreational cannabis use has been on the rise among young adults in recent years. Dependent cannabis use disorder (CUD) has been linked to various cardiac events, but its impact on young adults in the absence of concomitant substance abuse remains unclear. We aim to analyze the nationwide trends in hospitalizations for major adverse cardiac and cerebrovascular events (MACCE) in this specific population.

**Objective:** We aimed to assess the impact of cannabis use disorder on major cardiac and cerebrovascular events in young adults, excluding other substance abuse effects.

#### Methods:

We identified hospitalized young adults (18–44 years) using the National Inpatient Sample (2016–2019), excluding those with concomitant substance abuse (tobacco, alcohol, and cocaine). They were divided into CUD+ and CUD- groups. We assessed the trends in hospitalizations for MACCE, including all-cause mortality (ACM), acute myocardial infarction (AMI), cardiac arrest (CA), and acute ischemic stroke (AIS), using ICD 10 codes.

#### Results:

Of the 27.4 million hospitalizations among young adults without other substance abuse, 4.2% (1.1 million) had CUD. The rates of hospitalizations for MACCE (1.71% vs. 1.35%), AMI (0.86% vs. 0.54%), CA (0.27% vs. 0.24%), and AIS (0.27 vs. 0.24%), were higher in the CUD+ group compared to the CUD- group ( $P < 0.001$ ). However, the rate of ACM hospitalizations (0.30% vs. 0.44%) was lower in the CUD+ group. From 2016 to 2019, the CUD+ group exhibited a relative increase of 5% in MACCE and 20% in AMI hospitalizations, which were lower compared to the respective increases of 22% and 36% in the CUD- group ( $P_{trend} < 0.05$ ). Additionally, there was a relative decrease of 13% in ACM hospitalizations among the CUD+ group, whereas the CUD- group experienced a relative increase of 10% ( $P_{trend} < 0.05$ ).

#### Conclusion:

The CUD+ group had higher rates of MACCE admissions, but the growing trends were more pronounced in the CUD- group through the years. Interestingly, the CUD+ group exhibited lower rates of ACM compared to the CUD- group. Further research is needed to better understand this complex relationship.

**Significance:** The study found that young adults with cannabis use disorder (CUD) had higher rates of major adverse cardiac and cerebrovascular events (MACCE) compared to those without CUD, but the increase in these events over time was more pronounced in the non-CUD group. Additionally, the CUD group showed lower all-cause mortality rates. This suggests a complex relationship between cannabis use and cardiac events, warranting further investigation.

**Abstract Title:** Drug-induced sleep endoscopy for targeted sleep surgery in pediatric patients

**Authors:** Jacob Surma, Anya Costeloe, Theresa Schneider, Ani Mnatsakanian

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Ani Mnatsakanian D.O.

**Objectives:** This study aims to evaluate the efficacy of drug-induced sleep endoscopy (DISE) targeted surgery to identify the locations of obstruction and to determine how DISE findings influence whether the standard of care surgery, adenotonsillectomy, is performed.

**Methods:** This prospective cohort study was done at an academic children's hospital. All patients (n = 42) underwent polysomnography. DISE was performed to evaluate tonsil and adenoid size, Yellon tongue base, lateral pharyngeal wall (LPW) collapse, and signs of laryngomalacia. Surgery was performed based on the most prominent locations of obstruction. Pre-operative and post-operative University of Michigan Pediatric Sleep Questionnaire (UMPSQ) was given to determine the likelihood of residual OSA.

**Results:** Surgeries included tonsillectomy, adenoidectomy, lingual tonsillectomy, laryngeal cleft repair, supraglottoplasty, and turbinate reduction. Patients had improvement in UMPSQ score from  $13.36 \pm 3.67$  to  $5.68 \pm 3.46$  ( $P=0.05$ ). Those who underwent adenotonsillectomy had a greater decrease in UMPSQ scores than those who did not ( $P=0.03$ ). Patients with significant LPW collapse were more likely to have adenotonsillectomy ( $P=0.001$ ), while patients with higher Yellon tongue base scores were less likely ( $P=0.005$ ). There was no statistically significant relationship between OSA severity and whether adenotonsillectomy was performed.

**Conclusions:** DISE is a valuable tool for evaluating children with multi-level obstruction and findings change surgical decision-making for children without enlarged tonsils. Adenotonsillectomy resulted in the greatest decrease in OSA symptoms but was mainly performed on patients with significant LPW collapse.

**Abstract Title:** Identifying Risk Factors for Falls in Rural Aging Adults through Virtual Assessment

**Authors:** Kayleigh Crane, Nicholas Chiaramonti, Asef Hoque, Andrew Nowak, Jyotsna Pandey

**Abstract Category:** Population Health

**Advisor/Mentor:** Jyotsna Pandey M.D. Ph.D.

**Background:**

Aging adults are at high risk for falls, with those who live in rural America at a greater risk than their urban counterparts. By identifying risk factors for falls when virtually completing fall risk assessments, we can work to provide more equitable care to rural adults who may not be able to complete in-person risk assessments.

**Objective:**

Our goal was to identify risk factors for rural aging adults who completed virtual fall risk assessments.

**Methods:**

A cross-sectional study was completed with data collected in a virtual manner from participants of the Healthy Aging Initiative program, directed by Central Michigan University and supported by Michigan Health Endowment Fund. 96 program participants who completed a full risk assessment in 2020 were included in this study. Participants completed validated questionnaires and assessments, including the Fall Risk Questionnaire, the Hearing Handicap Inventory for Adults, and the Vision VIQ exam. Additionally, they completed questions regarding background, socioeconomics, and general health status. After collection, a Mann-Whitney U test was completed due to non-normal distribution of continuous variables.

**Results:**

In an unadjusted risk factor analysis, we found six individual risk factors associated with fall risk. This included age, participants who take more than 4 prescription medications, those who feel unsteady while walking, those worried about falling, those who had a previous fall, and those with hearing loss. When adjusted for all factors, as age (OR=1.164, 95% CI=1.032-1.312) increases, the odds of fall risk increase significantly. Additionally, after adjusting for all other factors, feeling unsteady while walking (OR=9.565, 95% CI=1.950-46.920), and falling in the previous year (OR=12.288, 95% CI=1.825-82.727) remain significant factors associated with higher odds of fall risk. However, the other 3 risk factors became statically insignificant.

**Conclusion:**

While we can appreciate other data that attributes hearing and vision loss to playing a vital role in the likelihood of fall in the aging adult, our study found that age was the highest degree of significant correlation to fall risk. Additionally, feeling unsteady while walking and falling in the previous year are significant risk factors. We recognize that multiple factors could play a role in this analysis, including a small sample size localized over two rural counties in Michigan, a wide range of ages included in the data set, and possibly better instruments available for vision screening.

**Significance:**

Clinically, these results may be used to help identify those who have a fall risk based upon age, previous falls, and feeling unsteady, allowing clinicians to be proactive in fall prevention in the aging rural population.



**Abstract Title:** Social media use and weight bias internalization: association moderated by age and weight perception.

**Authors:** Michelle Moufawad, Asef Hoque, Meredith Kells, Kendrin Sonneville, Samantha Hahn

**Abstract Category:** Population Health

**Advisor/Mentor:** Samantha Hahn Ph.D.

**Background:** Individuals who spend more time on image-based social media have higher levels of weight bias internalization (WBI), a known predictor of disordered eating, but moderators of the association are not well defined.

**Objective:** The current study examined whether weight perception or age moderated associations between time spent on image-based social media and WBI.

**Methods:** Data for the present study come from the baseline visit of the Tracking Our Lives Study, a randomized control trial of college women (n=200). Participants completed questionnaires assessing time spent on social media (continuous), WBI (continuous), weight perception (perceive “overweight” vs. do not perceive “overweight”), and age (continuous, 18-49 yr), as well as confounders race/ethnicity, parent education, sexual orientation, and BMI. Zero-inflated Poisson regressions were performed to determine if weight perception and age moderated associations between time spent on image-based social media (overall and individual platforms Instagram, Facebook, and Snapchat) and WBI, adjusting for aforementioned confounders.

**Results:** As expected, we found a strong, positive association between overall time spent on image-based social media and WBI ( $\beta=0.826$ ,  $p< 0.001$ ). In moderation analyses, the strength of the association was weakened when women perceived themselves to be “overweight” ( $\beta=-0.018$ ,  $p=0.006$ ). Those who were older also experienced a weaker association ( $\beta=-0.001$ ,  $p< 0.001$ ). The association between time spent on Instagram and WBI was weaker in older participants ( $\beta=-0.014$ ,  $p=0.018$ ), though this was the only significant moderation effect found for individual social media platforms.

**Conclusions:** Our results indicate that image-based social media may not be a prominent predictor of WBI among college women who perceive themselves “overweight”, which may be because they experience or internalize more weight stigmatizing messaging from other sources. Further, our results suggest that younger women may be more susceptible to influences on social media that would increase their WBI.

**Significance:** These results suggest that interventions aiming to reduce eating disorder risk among the vulnerable population of college women should prioritize those just beginning college and focus on reducing the amount of time spent on image-based social media.

**Abstract Title:** The Impact of Medicaid Expansion on Life Expectancy in the Midwestern Region of the United States

**Authors:** Alan Ross, Megan Paul, Catherine Yip, Deepti Sanku, Brian Coakley

**Abstract Category:** Population Health

**Advisor/Mentor:** Brian Coakley M.D.

**Background:**

In 2013, nearly 15% of Americans lacked health insurance, resulting in significant disparities in healthcare access per the United States Census. Low-income communities in the U.S. have especially struggled to gain affordable access to healthcare. The expansion of Medicaid via the Affordable Care Act has lessened this financial burden for millions of patients, particularly those from underserved, rural communities. Of note, a substantial portion of Midwestern Americans reside in such communities. Increased accessibility of Medicaid to these populations may lead to positive health outcomes such as increased average life expectancy.

**Objective:**

This study aims to quantify the impact of Medicaid expansion on life expectancy in the Midwestern region of the U.S. via a county-based analysis.

**Methods:**

Bordering counties of states that did and did not adopt Medicaid expansion in the Midwestern U.S. between 2009 and 2018 were collected. The change in life expectancy by county from 2009 to 2018 was determined using data from the Institute for Health Metrics and Evaluation. Poverty rate, percentage of non-White citizens, and median age for each county were determined using U.S. Census data. Summary statistics were then calculated. Furthermore, an unadjusted linear regression was used to determine the association between the status of Medicaid expansion and change in life expectancy by county. This was repeated using an adjusted linear regression, controlling for the poverty rate, median age, and percentage of non-White citizens by county. Unadjusted and adjusted linear regressions were repeated. The beta value (slope), p-value, and 95% confidence interval were calculated.

**Results:**

Medicaid expansion was found to be associated with an increased life expectancy in bordering counties within the Midwestern U.S. (North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, Missouri, Wisconsin, and Illinois) when controlling for the poverty rate, median age, and percentage of non-White citizens by county. Adjusted analyses revealed that for each year that Medicaid was implemented, there was an associated statistically significant 0.43 unit increase in the life expectancy per given county, even after controlling for median age, poverty, and the percentage of non-White citizens.

**Conclusions:**

Results indicated that the implementation of Medicaid expansion in the Midwestern U.S. was associated with an increase in average life expectancy.

**Significance:**

This study identified a population of Midwestern Americans for which Medicaid expansion was associated with an increased life expectancy. Prior to the initial 2014 expansion of Medicaid, rural America housed a significantly greater percentage of uninsured patients compared to their urban counterparts. With the expansion of Medicaid, many of these individuals subsequently had newfound access to affordable healthcare. The associated increase in life expectancy in these Midwestern counties can potentially be attributed to minimizing some of the health disparities that predominate in rural communities, chief among them access to healthcare. Despite this, however, there are still millions who remain uninsured. These findings indicate the importance of prioritizing increased insurance coverage for Americans, especially those living in more rural and underserved areas.

**Abstract Title:** Adverse Childhood Experiences in the post-COVID era: A Comparative Analysis of Youth Risk Behavioral Surveillance System Population Study between 2019 and 2021

**Authors:** Nicholas Sirhan, Anthony Mufarreh, Young Lee, Bradley Hunt, Tyler Anderson, Christopher Mishreky, Beth Bailey

**Abstract Category:** Population Health

**Advisor/Mentor:** Beth Bailey Ph.D.

### Background

Adverse Childhood Experiences (ACEs) are a set of well-understood potentially traumatic experiences that one may experience during years 0 through 17. In this abstract, we use a nonstandard definition of ACEs, which is similar to what is captured by the standardized ACEs tool. Those who experience an increased number of ACEs are known to be at an increased risk for numerous adverse health outcomes, poor health habits, and overall decreased life expectancy. With the Coronavirus disease 2019 (COVID-19) pandemic ultimately contributing to an increase in life stressors, it is reasonable to contemplate its effects on ACEs themselves.

### Objective

The aim of this project was to examine the experience of ACEs in relation to the COVID-19 pandemic using the Youth Risk Behavior Surveillance System (YRBSS) survey data.

### Methods

The YRBSS survey is a national school-based survey conducted biannually by the CDC, that provides data on ACEs-related factors for a nationally representative sample of youth grades 9-12. Survey year 2021 was analyzed using weighted sample prevalence, univariant weighted analysis, and multivariable weighted logistic regressions. Models adjusted for age, sex, ethnicity, race, sexual identity, smoking, alcohol, and illicit drug use. Inclusion criteria were those aged 14 years or more.

### Results

The sample size for the 2019 data was 13,677 and for the 2021 data was 17,232. On regression analysis, adjusted odds ratio showed differences among all ACEs. The odds of experiencing violence and victimization in 2021 is lower compared to 2019 (OR: 0.84, 95% CI: 0.75, 0.95), substance use (OR: 0.60, 95% CI: 0.52, 0.68), sexual health risk (OR: 0.90, 95% CI: 0.76, 1.07), and physical activity (OR: 0.91, 95% CI: 0.66, 1.27). Mental health risk shows an increased trend (OR: 1.48, 95% CI: 1.33, 1.64). From comparison of the 2019 and 2021 YRBSS data, ACEs have decreased in prevalence in all categories except for physical activity ( $p < 0.05$ ). Less socialization with peers, less sleep deprivation, and more monitoring from parents may be associated with the prevalence changes. Mental health status and substance use were significantly different in prevalence; however, that is concordant with our findings that demonstrate an increase in mental illness during COVID-19 with a simultaneous decrease in substance use.

### Conclusions

ACEs have lasting impact on the future health status of children. Elucidating their prevalence in a post-COVID-19 era is key to understanding their relationships to world events and development of targets to reduce.

### Significance

Adverse childhood experiences (ACEs) can significantly influence future occurrences of violence and impact long-term health and safety. This is a novel comparison of ACEs before and after COVID-19 so that we may have better awareness of preventing negative outcomes.

**Abstract Title:** Usage of Reddit & Student Doctor Network in Medical Education Research

**Authors:** Merlin Kochunilathil, Kelly Underman

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:** Kelly Underman Ph.D.

**BACKGROUND:** The relationship between medical education & social media is inextricable, but has been limited to apps such as Twitter, Instagram & Tik Tok in the literature. However, over time forums like Reddit, which has 482 million users, & Student Doctor Network, which has 700,000 members, have also come into the light, especially as these forums, which are popular amongst the medical community, gain mainstream popularity. The purpose of this scoping review is to assess how these social forums are being used within medical education research & to identify what insight they provide, especially considering their expanding informal popularity amongst the medical community.

**METHOD:** The authors searched PubMed, CINAHL and Scopus for relevant articles published from 2005 to present on medical education, which utilize Reddit and/or Student Doctor Network as a data source. Authors independently screened the articles based on the inclusion and exclusion criteria.

Inclusion criteria consisted of peer reviewed journal articles, which focused on physician training or education and utilized Reddit/SDN as a data source. Reviewers coded, extracted, and drew key themes from 24/748 screened articles using the grounded theory methodology.

**RESULTS:** This scoping review examined 24 articles, which were published from 2016-2023, in the final analysis. Five major usages were apparent: (1) Aggregating & validity checking information in the residency pipeline; (2) Scoping perceptions regarding Match & the job market; (3) Scoping perceptions in medicine; (4) Sharing perceptions regarding undergraduate medical education; (5) Self informing on the patient perspective & education. These usages were present at the pre-clinical, clinical, resident and attending levels.

**CONCLUSION:** The findings highlight that Reddit & Student Doctor Network serve as a destination to learn about the different stages of a career in medicine, whether that's as a pre-med, medical student, resident or attending. Its use is not only limited to the medical community and has allowed research to gain insight on the perspectives of stakeholders in medicine like patients.

**SIGNIFICANCE:** This review underscores the potential and importance forums such as Reddit & Student Doctor Network present due to their unique, anonymous, unfiltered and community generated insight. With the growing importance & relevance of medical education research, these forums represent new avenues to learn about the many facets and stakeholders of medicine and gain backstage access into its workings.

**Abstract Title:** Combatting Violence in the Emergency Department: A Quality Improvement Project

**Authors:** Andrew Namespetra, Payton Wolbert, Derek Schaller

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:** Derek Schaller M.D.

### Background

Workplace violence (WPV) continues to affect Emergency Departments nationally and in Michigan. At the Covenant Emergency Care Center (ECC) in Saginaw Michigan, a staggering 68 violent assaults on staff occurred between January and September 2021. In a preliminary retrospective chart review, we determined that most assaults occurred early in the ED course – within the first hour. Furthermore, most patients were presenting with mental health evaluation (MHE) as the chief complaint.

### Objective

This quality improvement project's objective was to implement and analyze a risk assessment tool as an intervention for the early identification of high-risk individuals for WPV.

### Methods

Based on preliminary data and a panel of experts at Covenant ECC, the MIAHTAPS risk assessment tool was selected as an appropriate intervention to pilot in the ECC. Nursing staff used the tool in their initial assessment of all patients seen for MHE to record individual numerical scores in 7 different categories, including Altered Mental Status, Irritable, Agitated, History of Violence, Threatening Verbal/Physical, Attacking Objects, Pacing &/or Staring, as well as a cumulative score. Elevated scores prompted actions based on the severity, including de-escalation, alerting the physician, and timed reassessments. The instances of WPV were collected from security records and compared in the pre-intervention phase (January 1st, 2021, to September 31st, 2021) versus the post-intervention phase (September 1st, 2022, to February 28th, 2023). A retrospective chart review of the Epic electronic medical record identified all MHE and related cases, defined as cases in which a crisis team consultation was ordered.

### Results

In the pre-intervention period, 68 assaults occurred over 9 months, with an average of 7.56 assaults/month. In comparison, the post-intervention period saw 49 assaults over 6 months, with an average of 8.17 assaults/month, with no statistically significant increase in assaults ( $p = 0.41$ ). In the pre-intervention phase, we saw 322 consults/month compared to the post-intervention phase seeing 340 consults/month, with no statistical difference between the two ( $p = 0.35$ ). Of the 2044 crisis consultations, there were 814 MIAHTAPS scales completed (40%). However, MIAHTAPS was used 69% of the time in assaults with 52% of those occurring prior to the assault.

### Conclusions

After the implementation of the MIAHTAPS risk assessment tool, there was no significant reduction in frequency of violent episodes compared to the pre-intervention period. This reflects the lack of statistically significant changes in the monthly volumes of MHE-related complaints within the department. We can conclude that MIAHTAPS did not have a significant effect on instances of WPV, whether positive or negative. There was modest compliance with use of the tool amongst ED staff. Nevertheless, it was used more frequently in patients that were exhibiting violent behavior.

### Significance

This QI project has demonstrated that the implementation of a risk assessment has not resulted in a significant decline in instances of WPV within the Emergency Department. Future iterations of this project may seek factors that have contributed to low user compliance with the tool and explore changes that would make the tool more user-friendly.

Submitter Last	Submitter First	Title	Category	Abstract/Poster #
Chiaramonti	Nick	Pediatric Hip Dysplasia: The Impact of Local Anesthetic on the Duration of Femoral Head Visualization	Basic & Translational	B-1
Chiaramonti	Nick	Investigating the Role of R-spondin-2 in Long Bone Fracture Healing	Basic & Translational	B-2
Cin	Mitchell	Comprehensive Evaluation of Synthetic Mucosal Surrogates for Improved Oral Mucosa Simulation in Otolaryngology-Head and Neck Surgical Training	Basic & Translational	B-3
Cin	Mitchell	Design, Development and Validation of a High-Fidelity, 3D-Printed Buccal Flap Simulator	Basic & Translational	B-4
Coleman	Anna	The Effects of 17 $\alpha$ -Ethinylestradiol on Sexual Phenotype in the Mangrove Rivulus Fish ( <i>Kryptolebias marmoratus</i> )	Basic & Translational	B-5
Crane	Kayleigh	Mitochondria De Novo Salvage Pathways: The Effect of Vigabatrin, a Gamma-aminobutyric Transaminase Inhibitor on Levels of Deoxynucleoside Triphosphate Pools	Basic & Translational	B-6
Ellias	Sara	New nano-mechanical approaches to cancer biology	Basic & Translational	B-7
Graff	Ryan	Optimization of CRISPR Technology for Huntington's Disease following Neural Stem Cell (NSC) Differentiation into Neurons	Basic & Translational	B-8
Graff	Ryan	The Impact of Chronic Progesterone Injections on Water T-Maze and Passive Avoidance Learning in Aged C57 Mice	Basic & Translational	B-9
Ha	Hyungee	Why Is the Deubiquitinase Protein USP8 Essential for Mammalian Cell Survival?	Basic & Translational	B-10
Loftus	Harrison	RAC P29S Mutation in HT-144 Melanoma Cell Lines Enhance Proliferation, Migration, Invasion, and Attenuation of These Biological Processes Driving Melanoma Using PI3K	Basic & Translational	B-11
Martin	Chad	Trehalose metabolism supports the growth of <i>Aedes aegypti</i> cells and modifies gene expression and dengue virus replication	Basic & Translational	B-12
Patel	Kush	Generation of stem-cell derived, vascularized islets for transplantation in Type 1 Diabetes Mellitus therapy.	Basic & Translational	B-13

Wolbert	Payton	Using Dendrimer Nanoparticles to Reprogram Astrocyte into Neurons for Stroke Treatment	Basic & Translational	B-14
Almasnaah	Aiman	Persistent lactic acidosis and high-output heart failure in a 3-year-old with global developmental delay	Case Report/Case Series	C-1
Asbahi	Obadah	Unique Intraoperative Finding of Hepatobiliary Architecture in a Patient with History of Gastroschisis.	Case Report/Case Series	C-2
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**Abstract Title:** Pediatric Hip Dysplasia: The Impact of Local Anesthetic on the Duration of Femoral Head Visualization

**Authors:** Nick Chiaramonti, Alex Gornitzky

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Alex Gornitzky, M.D.

**BACKGROUND:** Closed reduction and spica casting for hip dysplasia is one of the most commonly performed procedures in pediatric orthopaedics. As the fluoroscopic visualization of the arthrogram inevitably fades with time, one technical challenge is maintaining adequate visualization of the hip joint from initial closed reduction through final evaluation in spica cast.

**OBJECTIVE:** The purpose of this study was to evaluate whether a combination of local anesthetic plus radiopaque dye has an improved duration of femoral head visualization as compared to dye alone.

**METHODS:** A total of thirty femurs from fifteen 14-day old mice were harvested and debrided of all attached soft tissues and capsule. The femurs from each mouse were then randomly assigned to one of three groups: 25% dye, 50% dye or 75% dye. Within each group, one femur was incubated for 10 minutes in a dye plus 1% lidocaine solution (experimental group) while the other was incubated in dye plus saline (control group). Each femur was then washed, incubated in saline, and serially radiographed in 5-minute intervals. The visible volume of the femoral head region immediately following incubation was used as a baseline, and each subsequent timepoint was expressed as a fraction of this volume. The brightness of the femoral head in each radiograph was measured by taking the average greyscale of the region and multiplying it by the total volume of the visible region to obtain a quantitative measure of femoral head staining. Results were then averaged across all femurs from each group.

**RESULTS:** As compared to controls, the dye plus lidocaine group had an increased fraction of the femoral head visible by radiographs across all three tested concentrations (Figure 1). The differences were most pronounced at 15-minutes post-incubation, with the 25% dye, 50% dye, and 75% dye groups displaying 11%, 12%, and 20% increases in fraction of femoral head visible on radiograph, respectively. The 25% dye plus 75% lidocaine group displayed the greatest differences from their respective controls.

**CONCLUSIONS:** These findings suggest that combining a radiopaque contrast agent with a local anesthetic may serve to enhance the duration of femoral head visualization after the initial arthrogram by delaying the diffusion of the dye away from the cartilaginous femoral head. Additional work is needed to translate this technique to clinical practice.

**SIGNIFICANCE:** Diluting the arthrogram dye with local anesthetic may be a useful clinical trick for improving fluoroscopic interpretation of the femoral head during closed reduction and spica casting for hip dysplasia.



**Abstract Title:** Investigating the Role of R-spondin-2 in Long Bone Fracture Healing

**Authors:** Nick Chiaramonti, Noah Sinishtaj

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Noah Sinishtaj, BS

**BACKGROUND:** With 178 million cases reported globally in 2019, long bone fractures comprise a significant portion of injuries to the musculoskeletal system. By 2030, 20% of the US population will be over the age of 65 with an increased risk for long bone fractures. Attainment of peak bone mass is essential to prevent adverse fracture in this population. Our prior work has shown that in mice disruption of *Rspo2* reduces peak bone mass and strength.

**OBJECTIVE:** Herein, we advance our understanding of *Rspo2* in bone by disruption the gene in various cell lines following a tibial fracture. We hypothesized that genetic knockout of *Rspo2* would impair fracture healing in mice.

**METHODS:** To assess the role of *Rspo2* in fracture healing, bilateral tibial fractures were created in 16-week-old mice in the following CreERT2 mouse models: alpha Smooth Muscle Actin (aSMA), Rosa, and Osterix (*Osx*). *Rspo2* disruption was induced at the time of injury and sustained during the healing process via tamoxifen injections at a dose of 75 mg/kg. Previous work analyzed microCT scans using Dragonfly software to examine gene expression, bone mineral density, and bone volume of post-operative day 10 and day 15 tibias. Here, we used FIJI software to examine callus formation and composition after Periodic acid-Schiff (PAS) histology staining of post-operative day 10 and day 15 tibias. PAS-stained slides were imaged and analyzed for callus volume as well as cartilage fraction within the callus site.

**RESULTS:** In examining fracture healing in mice with *Rspo2* disruption, significant differences were noted in the callus area of aSMA CreERT2 mice 10 days after fracture. *Rspo2* disruption resulted in an average callus area of  $4.94e6 \mu\text{m}^2$  in Cre<sup>+</sup> mice whereas wild type Cre<sup>-</sup> mice formed an average callus area of  $8.37e6 \mu\text{m}^2$  after 10 days ( $p < 0.01$ ). In *Osx* CreERT2 mice, cartilage fraction was elevated in Cre<sup>-</sup> mice at days 10 and 15 post-operation compared to Cre<sup>+</sup> mice, though these differences were not significant.

**CONCLUSIONS:** From these data, we conclude that constitutive knockout of *Rspo2* during osteoblast differentiation results in significant differences in the healing properties of mouse femurs. These findings are congruent with previous work in our laboratory which established the capacity of *Rspo2* to activate Wnt signaling and regulate osteoblast activity. The lack of *Rspo2* expression in aSMA-expressing cells during the fracture healing process resulted in a decreased callus area, suggesting a possible correlation to worsened bone healing. On the other hand, increased cartilage fraction (albeit nonsignificant) in aSMA and *Osx* Cre<sup>-</sup> mice could define a crucial role of *Rspo2* expression in cartilage development within the fracture callus, ultimately allowing for sufficient maturation and formation of cortical bone. However, additional samples and identification of specific cell types within the fracture callus would be needed to identify this role more thoroughly.

**SIGNIFICANCE:** These findings suggest an important role for R-spondin-2 in long bone fracture healing. Further studies are needed to explore R-spondin-2 as a supplemental treatment option following human long bone fractures.

**Abstract Title:** Comprehensive Evaluation of Synthetic Mucosal Surrogates for Improved Oral Mucosa Simulation in Otolaryngology-Head and Neck Surgical Training

**Authors:** Mitchell Cin, Adhithi Athikumar, Safwan Badr, Shivapriya, Chandu, Moustafa Habra, Omar Ismail, Hamza Khan, Scott Maresh, Abed Najjar, Tarek Taha

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Tarek Taha, M.D.

**Introduction:** Ensuring the fidelity of synthetic materials used in surgical simulators to accurately replicate tissue handling, and repair requirements is crucial for effective training of surgeons. However, the correlation between the choice of tissue surrogates and the training outcomes for trainee surgeons remains poorly understood. Our group surgical simulators rely on high-fidelity replication of oral mucosa using silicone but have received critique regarding the current surrogate material's tensile elasticity and suture retention. Human oral mucosa tissues exhibit site-dependent mechanical properties as studied in the literature.

**Objective:** To further refine our models, we tested the mechanical characteristics of various candidate synthetic mucosal surrogates and qualitatively assessed their biofidelity based on surgeons' subjective evaluations to find a composition of materials that is closest in fidelity during surgical rehearsal by expert craniofacial surgeon.

**Methods:** 15 silicone-based surrogates using variable silicone hardness and slacker percentages, based on industry standards for silicone tissue manufacturing, underwent initial evaluation by laboratory staff. Evaluation included a series of rudimentary material testing, including tactile feeling, needle puncture, suture retention, defect repair, and tensile elasticity. The three samples with the highest suture retention, largest successful defect repair, and highest tensile elasticity were selected for surgical handling assessment by expert craniofacial surgeons and formalized quantitative mechanical testing (samples 153, 925, 977). Qualitative assessment was conducted on a Likert scale. Uniaxial tensile tests were performed to directly compare elastic modulus and tensile strength with oral mucosa tissue.

**Results:** Mechanical testing revealed that the surrogates displayed varied characteristics matching some properties of oral mucosa, but none replicated all the mechanical features of native oral mucosa. Generally, good biofidelity was achieved for compression stiffness and needle puncture force.

However, all samples exhibited too low tensile stiffness, and pull-out forces were variable. In the qualitative assessment, the global performance scores for the surrogate samples were 4, 4.25, 4, and 4 out of 5, samples 153, 925, 977 respectively, a nonsignificant differentiation among the samples tested by surgeons. There was a significant increase in qualitative score compared to the original

**Conclusions:** The surrogate materials displayed a spectrum of mechanical properties encompassing those of real oral mucosa, making them promising candidates for use in our team's otolaryngology surgical simulators. Despite significant mechanical differences among the samples, all surgeons noted a qualitatively striking similarity between them.

**Significance:** This study underscores the challenge of balancing nuanced distinctions in biofidelity and adequate representation for training early surgical learners, pointing towards the need for further refinement in simulating tissue properties for optimizing surgical training experiences.

**Abstract Title:** Design, Development and Validation of a High-Fidelity, 3D-Printed Buccal Flap Simulator

**Authors:** Mitchell Cin, Gary Dunbar, Julien Rossignol, Tarek Taha

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Tarek Taha, M.D.

**Introduction:** The buccal myomucosal flap procedure, popularized by Dr. Robert Mann, is essential in cleft surgery, especially for wide cleft palates. Mastering the technique requires understanding anatomy, tissue manipulation precision, and sound decision-making. However, hands-on training faces challenges with traditional methods like cadavers and VR simulators due to high costs and limited accessibility. The rise of 3D printing technology offers a promising solution, as it produces realistic and customizable models at a lower cost, providing improved affordability, heightened realism, and enhanced tactile feedback compared to traditional VR simulators.

**Objective:** The study details the creation of an affordable and easily accessible training simulator designed for pediatric buccal myomucosal flap procedures. Our goal is to provide a reliable teaching tool to early learners, validated through expert assessments conducted across various institutions and subspecialties.

**Methods:** The simulator developed for the study comprises a buccal myomucosal flap anatomical model and a benchtop stand. A representative pediatric head's CT scan was transformed into a 3D digital model, adapted by skilled personnel under the supervision of craniofacial surgeons using CAD software. The hard tissues were 3D printed with polylactic acid (PLA), while soft tissues were cast in platinum-based silicone rubber. The benchtop stand, also 3D printed with PLA, incorporates surgical ergonomic principles. The model underwent validation by an international consortium of 16 craniofacial surgery experts from various subspecialties, utilizing a Likert scale across six domains.

**Results:** The buccal myomucosal flap cleft palate simulator was rated on a scale of 1–5; 4.31 as a training tool, 3.77 as a competency evaluation tool and 3.92 as a rehearsal tool. The simulator was also rated as very relevant (3.93) to practice.

**Conclusion:** The low-cost, high-fidelity buccal myomucosal flap cleft palate simulator was highly rated through value, realism, and effectiveness and theoretically enables the acquisition of surgical skills in a zero-risk simulated environment. Future plans involve integrating the simulator into a structured curriculum and conducting comprehensive validation studies with diverse participants.

**Significance:** The low-cost 3D-printed buccal myomucosal flap cleft palate simulator is a groundbreaking advancement in training technology, representing the first of its kind in the literature. Continued development and adoption holds the promise of significantly enhancing access to training for competency of cleft and craniofacial procedures, with the ultimate goal of improving patient outcomes.

**Abstract Title:** The Effects of 17 $\alpha$ -Ethinylestradiol on Sexual Phenotype in the Mangrove Rivulus Fish (*Kryptolebias marmoratus*)

**Authors:** Anna Coleman, Olivia McKelvey, Ryan Earley

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Ryan Earley, Ph.D.

The Effects of 17 $\alpha$ -Ethinylestradiol on Sexual Phenotype in the Mangrove Rivulus Fish (*Kryptolebias marmoratus*)

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Abstract Category: Basic/Translational

Advisor: Ryan L. Earley, Ph.D.

Ethinylestradiol (EE2) is a common component of oral contraceptives, and, because it is not removed by wastewater treatment, is abundant in aquatic ecosystems of developed countries. As EE2 is an estrogen receptor (ER) agonist, it typically causes animals in these ecosystems to adopt female-typical physiologies and behaviors. This study examines the effect of embryonic EE2 exposure to *Kryptolebias marmoratus* (the mangrove rivulus, hereafter 'rivulus'), a sex-changing killifish indigenous to tropical regions. Typically rivulus are hermaphrodites but can adopt an exclusively male phenotype in adverse environmental conditions. In this study, we aim to uncover the specific mechanisms underlying hormonal changes in rivulus, which resulted in the development of two separate hypotheses: 1) EE2 binds estrogen receptors and interferes with the positive feedback loop of the hypothalamic-pituitary-gonadal (HPG) axis, which maintains high levels of estrogen; and 2) exposure to EE2 alters the transcription of estrogen receptors themselves throughout the body. Rivulus embryos were exposed to EE2, antagonists for ER $\alpha$  (responsible for negative feedback on estrogen production) or ER $\beta$  (responsible for positive feedback on estrogen production), or combinations of EE2 and the receptor antagonists to determine whether altering estrogen signaling changes the sexual phenotype or the expression of estrogen receptors throughout the body. The secondary aim of this study was to examine if the toxicants affected the probability of embryos hatching, the average time it took rivulus embryos to hatch, and rivulus hatchling mass at several points throughout development. Interestingly, antagonizing ER $\beta$  receptor significantly affected the time it took embryos to hatch, the development of the male rivulus phenotype, and expression of the ER $\beta$  itself. However, when rivulus were treated with an ER $\beta$  antagonist and EE2, these effects did not occur.

These results suggest that EE2 is able to activate the positive feedback loop that the ER $\beta$  antagonist suppressed via an unknown mechanism.

**Abstract Title:** Mitochondria De Novo Salvage Pathways: The Effect of Vigabatrin, a Gamma-aminobutyric Transaminase Inhibitor on Levels of Deoxynucleoside Triphosphate Pools

**Authors:** Kayleigh Crane, Udit Thawani, Edward McKee

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Edward McKee, Ph.D.

**Background:** Vigabatrin is an antiepileptic drug approved by the FDA as monotherapy for a form of epilepsy in infants. Vigabatrin selectively and irreversibly inactivates the gamma-aminobutyric transaminase (ABAT) in the CNS. Current safety concerns include the risk of vision loss and suicidal thoughts. ABAT catalyzes the conversion of GABA into succinic semialdehyde and L-glutamate and has been reported to play a dual role in converting deoxynucleoside diphosphates (dNDPs) to deoxynucleoside triphosphates (dNTPS) as part of the mitochondrial nucleoside diphosphokinase (NDPK) complex. In ABAT deficiencies, elevation of GABA is found within the brain and CSF and research suggests possible deficiencies of mtDNA in tissues.

**Objective:** The goal of this study was to directly evaluate the effect of vigabatrin on the conversion of dNDPs to dNTPs, and its potential for causing mtDNA depletion.

**Methods:** Mitochondria from rat liver or immortal retinal cells (661W) cultured in a quiescent state for 10 days in the presence and absence of vigabatrin (300  $\mu$ M) were incubated with [3H]-thymidine for 60 min in the presence and absence of vigabatrin (300  $\mu$ M). The conversion to [3H]-TMP, -TDP, and -TTP were measured by standard methods. MtDNA and genomic DNA were quantitated in quiescent retinal cells cultured for 10 days + and – vigabatrin using the ScienCell mtDNA kit #M8948.

**Results:** The results show that [3H]-thymidine was readily converted to [3H]-TTP in both isolated liver mitochondria and in the quiescent retinal cells, and that vigabatrin had no effect on the conversion. Further, vigabatrin did not appear to decrease the level of mtDNA in quiescent cells incubated with vigabatrin for 10 days.

**Conclusion:** Our data indicate using direct radiochemical conversion that vigabatrin does not inhibit the conversion of [3H]-TDP to [3H]-TTP and does not inhibit NDPK. Further, we could not show that vigabatrin caused mtDNA depletion in 661W cells as previously reported. Future research could also look at using cells lines that have been show to be completely quiescent. This would give us the same experiment in two different cell lines allowing us to see the reproducibility of the results.

**Significance:** ABAT, which has been identified as a possible de novo salvage pathway for mtDNA, did not reproduce a decrease amount of mtDNA when inhibited, reducing the ability for it to be used as a possible future mechanism in increasing mtDNA in mtDNA depletion syndromes.

**Abstract Title:** New nano-mechanical approaches to cancer biology

**Authors:** Sara Ellias, Mitchell Cin, Brittany Hamama, Harini Sundararaghavan, Rafael Fridman

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Rafael Fridman, Ph.D.

Understanding the responses of cancer cells to changes in their microenvironment is an important step towards personalizing treatment therapies. This requires an understanding of the relationship between cancer cell morphology, the surrounding environment, protein expression, and the effects that these factors have on the development of the disease. In this study, we are focusing on the relationship of cancer environment and the expression of an important receptor, Discoidin Domain Receptors (DDR). DDR senses collagen, helping cancer cells to modify their environment. We will focus on Pancreatic Cancer (PC) cells, which overexpress DDR. PC cells promote the development of a collagen-dense scaffold and fibrosis, which is associated with malignancy and drug resistance. The overall goal is to verify if disrupting DDRs in PC cells will impair the cancer cells' ability to survive and proliferate. In particular, we seek to understand the relationship between DDR expression and cell behavior. Using a novel, recently-developed nano-mechanical technique, based on atomic force microscopy (AFM), the ligand binding and abundance of DDRs can be measured on live PC cells. PC cells, with and without DDR receptors, were seeded onto matrices made of collagen and hyaluronic acid. We developed hydrogel-based materials with varying mechanical and cell adhesion properties to mimic real tumor environments. Cell behavior on the materials were evaluated by measuring adhesion, cell morphology, proliferation, and cell phenotype. We investigated the relationship between DDR expression, cell behavior, type of environment, and receptor-ligand binding through an AFM technique that allows the measurement of cell receptor concentration and adhesion strength on each individual living cell. This project provides real-time insight into the molecular forces that govern DDR-collagen complexes in live cells, a key component in the development of rational therapeutic approaches that target DDR receptors.

**Abstract Title:** Optimization of CRISPR Technology for Huntington's Disease following Neural Stem Cell (NSC) Differentiation into Neurons

**Authors:** Ryan Graff, Arjun Poudel, Ajit Sharma, Bhairavi Srinageshwar, Gary Dunbar, Julien Rossignol

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Julien Rossignol, Ph.D.

**Background:** Huntington's Disease (HD) is a progressive neurodegenerative disorder characterized by death of medium spiny neurons in the striatum. The disease is caused by a trinucleotide CAG repeat in the huntingtin gene, which leads to accumulation of mutant huntingtin protein (mHTT) in the neurons. Subsequent neuronal death ultimately leads to the classic symptoms of HD: chorea, motor impairment, and cognitive issues. Treatment is currently only symptomatic, and new therapies focus on slowing, or even reversing disease progression. One such approach is CRISPR (clustered regularly interspaced short palindromic repeats): a gene-editing tool which may be used to knock down the expression of mutant genes.

**Objective:** The goal of this study is to optimize and further characterize the potential use of CRISPR as a gene-modifying therapy for HD, through an in vitro study in cells from a mouse model of HD (YAC128), using G4 PAMAM dendrimers as a delivery vehicle.

**Methods:** The initial method was to culture primary cortical neurons (PCN) from adult C57 and YAC128 mice. This method did not yield sufficient cells for optimization, so neural stem cells (NSC) were isolated from the striatum and cortex of one-day-old C57 and YAC128 pups and differentiated using specialized media. Differentiated astrocytes were used for optimization, and differentiated neurons will be used for the main experiment. The neurons will be incubated with either saline, dendrimer only, or the dendrimer-CRISPR complex. Following incubation, Sanger sequencing will be performed to confirm knockout, and Western blots will be conducted to analyze the levels of mHTT protein.

**Results:** PCN were cultured in vitro from adult C57 and YAC128 mice. This method gave rise to some neurons; however, cell yields were much higher following the differentiation of neural stem cells (NSC) into astrocytes and neurons using specialized media. PCR has been optimized with HD astrocytes and HEK cells, which demonstrate the presence of HTT gene.

**Conclusion/Significance:** In the coming weeks, we plan to collect more data on CRISPR optimization in astrocytes, including immunocytochemistry for mHTT protein and CRISPR knock-out in different time series to find the best knockout duration with sequencing. After optimization, neurons will be pooled into three groups and receive respective treatments: saline, dendrimer only, and dendrimer-CRISPR complex. Sequencing and Western blots will be conducted to analyze the knockout efficiency and levels of mHTT protein, respectively. We hope this work will inform future directions of the potential therapeutic use of CRISPR technology in HD, including an in vivo study with YAC128 mice.

**Abstract Title:** The Impact of Chronic Progesterone Injections on Water T-Maze and Passive Avoidance Learning in Aged C57 Mice

**Authors:** Ryan Graff, Payton Wolbert, David Doyle, Kayla Reed, Olivia Smith, Lucas Garmo, Summer Nielson, Jacqueline Bowles, Noah Day, Bhairavi Srinageshwar, Kenneth Jenrow, Julien Rossignol, Gary Dunbar, Bhairavi Srinageshwar

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Gary Dunbar, Ph.D.

**Background:** Progesterone is a neurosteroid and sex hormone that has been shown to reduce behavioral and neurologic deficits in pathological states, such as in traumatic brain injury. However, less is known about the changes in cognitive ability as a function of sex and exogenous progesterone treatment.

**Objective:** The goal of the present study was to assess the potential impact of progesterone on the cognitive ability of young C57 mice as a function of sex.

**Methods:** Subcutaneous injections of progesterone (5 mg/kg) or vehicle (30% 2-hydroxy beta-cyclodextrin) were given to young (5–9-month-old) male and female mice for 42 days. The cognitive abilities of the mice were assessed using the water-T-maze for 42 days and passive avoidance for two days.

**Results:** To date, the results demonstrate that exogenous progesterone produces a significant detrimental effect on the water T-maze performance of young female mice. These results also suggest a potential benefit on the performance of male mice. In terms of passive avoidance, the data show a notable sex-specific response: the young females who received progesterone exhibited an increased passive avoidance time compared to control, while no change in was seen in young male mice.

**Conclusion/Significance:** Our preliminary results indicate that progesterone treatment has varied effects on young male and female mice when assessed using different behavioral tasks. The treatment seems to facilitate T-maze performance in young male mice but produces a significant detrimental effect in female mice. Female mice treated with progesterone seemed to exhibit increased learning in the passive avoidance behavior, which suggests that the progesterone effects are related to both sex and type of learning. Additional young and old animals are currently under study, as the goal is to compare the final datasets as a function of age and sex to more clearly elucidate the potential effect of progesterone on cognitive ability. Furthermore, work is underway to explore molecular changes as relevant to cognition. To this end, Western blots will be conducted to analyze levels of mTOR, TNF-alpha, and progesterone receptor in the hippocampus and frontal cortex.



**Abstract Title:** Why Is the Deubiquitinase Protein USP8 Essential for Mammalian Cell Survival?

**Authors:** Hyungee Ha, Yan Li, Debjani Mandal, Prashant Chittiboina

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Prashant Chittiboina, M.D.

**Background:**

Ubiquitin Specific Peptidase 8 (USP8) is a deubiquitinase protein responsible for removing ubiquitin from intracellular proteins, influencing cellular processes such as degradation. Its 40-kDa catalytic fragment located at the C-terminal region (C40) controls the ubiquitin removal from substrate proteins. Recent research has evidenced mutations in the USP8 gene with the development of specific tumors, particularly ACTH-secreting pituitary adenomas, where the USP8 mutation enhances the EGFR pathway. For studying USP8 in tumorigenesis pathway, multiple inhibitory system implementations have been attempted to elucidate the functions and interactions of USP8; however, previous experiments were not successful in complete inhibition.

**Objective:**

Our first goal was to establish the Auxin-Inducible Degron (AID) system, which is a technology to degrade the protein of interest, facilitating the analysis of its role in tumorigenesis. Additionally, we aimed to identify USP8-interacting proteins to understand its involvement in cellular mechanisms.

**Methods:**

Initially, a mammalian cell line was transfected to express endogenous USP8 protein tagged with AID. TIR1 was introduced to form a ubiquitin ligase complex with endogenous E3 ligase within the transfected cells. As auxin addition signaled the ubiquitin ligase complex to degrade AID-tagged USP8, western blot and confocal microscope were used to monitor the process. Additionally, the interactome study involved plasmid constructs expressing USP8 tagged with BirA and C40 tagged with BirA. Biotin addition induced biotinylation on any proteins that interacted with the BirA tagged to USP8 or C40, and LC-MS or western blot analyzed interacting proteins.

**Results:**

The AID system revealed varying USP8 expression levels under three conditions – no TIR1 and auxin, only TIR1, and both TIR1 and auxin. Compared to cells without TIR1 and auxin, USP8 expression slightly decreased with TIR1, while both TIR1 and auxin significantly decreased USP9. For interactome analysis, western blot confirmed the successful transfection with BirA tagged with USP8 protein or C40 region. Also, LC-MS analysis showed that proteins interacting with C40 region were 2-fold more than those interacting with USP8, emphasizing the pivotal role of the C-terminal region in the deubiquitination process. Pathway analysis indicated that proteins from both groups are involved in cell growth, proliferation, and development.

**Conclusions:**

The AID system confirmed the depletion of USP8, facilitating further exploration of its role. The interactome underscored the critical involvement of proteins associated with the C40 region in cellular growth and proliferation. Additionally, pathway analysis supported a higher correlation of USP8 protein and the C40 region with proteins heavily involved in cell survival mechanisms. This finding suggests that the upregulation of USP8 function can lead to unregulated cell survival and tumorigenesis.

**Significance:**

This experiment underscores the correlation between USP8 and crucial cellular functions, particularly in cell survival and proliferation.

**Abstract Title:** RAC P29S Mutation in HT-144 Melanoma Cell Lines Enhance Proliferation, Migration, Invasion, and Attenuation of These Biological Processes Driving Melanoma Using PI3K

**Authors:** Harrison Loftus, Caroline Cassidy, Karissa Konwerski, Rosemary Poku

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Rosemary Poku, Ph.D.

**Background:** Melanoma is a malignant cancer accounting for roughly half of all skin cancer-related deaths annually. It has the highest mutation rate of any cancer, and its incidence rates are increasing. While current immunotherapies include BRAF and MEK inhibitors, treatment resistance is a growing concern. A BRAF mutation in RAC1, a Rho GTPase in the RAS pathway, has shown enhanced proliferation and increased resistance to treatment and is present in 9.2% of sun-exposed melanomas. Furthermore, when RAC1's downstream protein Phosphoinositide 3-kinase (PI3K) becomes overactive, melanoma cells exhibit increased oncogenic effects.

**Objective:** We hypothesized that overexpression of mutant RAC1 would enhance HT144 cell proliferation, migration, invasion, and anchorage-independent growth, and that treatment with a PI3K inhibitor (LY294002) would attenuate these oncogenic phenotypes.

**Methods:** Using HT144 melanoma cells, we investigated specific RAC1 mutations, P29S and Q61L. We investigated the effect of the P29S and Q61L mutation on cell proliferation using MTT assay for proliferation, matrigel assay for invasion, wound healing for migration, soft-agar assay for anchorage-independent growth, and western blot for RAC1 expression compared to the wildtype Rac-1 (Wt). Separately, we attempted to target RAC1 by means of PI3K inhibition, which we propose to be a possible synthetic lethal pairing to RAC1.

**Results:** By day 4, Q61L cell proliferation increased by 25% compared to Wt cells. On the soft-agar assay, treatment with the PI3K inhibitor led to an 82% reduction in colony formation for P29S cells, compared to a 64% reduction in Wt cells. When treated with the PI3K inhibitor, P29S cells demonstrated 78% reduced invasion in the Matrigel assay when compared to untreated P29S cells. On western blot analysis, P29S and Q61L cells demonstrated increased expression of RAC1 compared to Wt, and treatment with the PI3K inhibitor significantly decreased the expression of RAC1 in P29S and Q61L cells.

**Conclusions:** Overexpression of RAC1 in HT144 melanoma cells increased proliferation, invasion, and anchorage-independent cell growth. Additionally, treatment with a PI3K inhibitor demonstrated decreased proliferation, invasion, anchorage-independent cell growth, and expression of mutant RAC1 in P29S cells. This data highlights the key role RAC1 plays in attenuating melanoma proliferation and identifies a potential treatment using a PI3K inhibitor.

**Significance:** While the RAC1 mutation P29S is not fully understood, its implication in treatment-resistant melanomas makes it a desirable target for alternative treatments. By demonstrating the oncogenic effects of this mutation and their attenuation through PI3K inhibition, future research is warranted to evaluate the viability of PI3K inhibition as a novel therapy for treatment-resistant melanomas.

**Abstract Title:** Trehalose metabolism supports the growth of *Aedes aegypti* cells and modifies gene expression and dengue virus replication

**Authors:** Chad Martin, Andrew Marten, Douglas Haslitt, Karishma Kalera, Daniel Swanson, Benjamin Swarts, MJ Conway

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** MJ Conway, Ph.D.

Trehalose is a non-reducing disaccharide that is the major sugar found in insect hemolymph fluid. Trehalose provides energy, and promotes growth, metamorphosis, stress recovery, chitin synthesis, and insect flight. The hydrolysis of trehalose is under the enzymatic control of the enzyme trehalase. Trehalase is critical to the role of trehalose in insect physiology and is required for the regulation of metabolism and glucose generation. Previous research has shown that trehalose is synthesized in the insect fat body by conserved enzymes. This stored energy reserve is hydrolyzed by trehalase to meet the energy demands for development and flight. Trehalase is the only enzyme responsible for the hydrolysis of trehalose, which makes this an attractive molecular target. Here we show that *Aedes aegypti* cells express trehalase, which promotes growth on trehalose-containing cell culture media. Trehalase activity was confirmed by treating cells with novel trehalase inhibitors, which reduced conversion of trehalose to glucose. A fluorescent trehalose probe readily entered cells, which led to a hypothesis that this sugar could impact gene expression. Indeed, RNA-Seq analysis confirmed that trehalose treatment led to dramatic changes in gene expression, which corresponded to increases in dengue virus replication.

**Abstract Title:** Generation of stem-cell derived, vascularized islets for transplantation in Type 1 Diabetes Mellitus therapy.

**Authors:** Kush Patel, Daniel Tremmel

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Daniel Tremmel, Ph.D.

**Background / Objective:** Cell replacement therapy is rapidly emerging as a viable cure for Type 1 Diabetes Mellitus; however, the supply of insulin-producing cells for transplantation is severely limited due to a shortage of pancreatic islet donors. Current strategies include generating stem-cell derived pancreatic islets (SC-islets) for eventual implantation, but current methods generate functionally immature cells (mostly due to lack of vascularization and the importance of endothelial cell proximity), which complicates clinical translation. Our goal with this project is to create functionally competent insulin-secreting cells with a built-in vascular network. We hypothesize that the orthogonal differentiation of human induced pluripotent stem cells (h-iPSCs) into beta cells and vascular cells will enable the development of SC-islets with a built-in vasculature.

**Methods:** We developed an orthogonal differentiation strategy using doxycycline-inducible transgenes encoding key transcription factors to induce differentiation of h-iPSCs into endothelial cells (iECs) and mural cells (iMCs). We are using our differentiation protocol that generates SC-islets from human embryonic stem cells (hESCs) through a multi-stage procedure reminiscent of pancreatic development to generate islet endocrine cells. In initial phases of the experiment, we used INS1 insulin secreting rat insulinoma cells in place of SC-islet cells due to their ease of use (no need for >31-day differentiation protocol) and direct translatability to the behavior of SC-islet cells in vitro. These cells were co-cultured and studied by functional assays, imaging, and flow cytometry.

**Results:** Both transcription factor-based differentiation methods enabled highly efficient differentiation of human iPSCs into competent vascular cells (iECs and iMCs) – h-iPSCs were rapidly and robustly differentiated by simple exposure to doxycycline (4 day process, >95% efficiency). These cells were phenotypically and functionally validated, with the iECs staining positive for CD31, CD144, and VE-Cadherin, and iMCs staining positive for Calponin1, Vimentin, and SM22. These results were confirmed with flow cytometry. Using the INS1 cell line, co-culture of these cells in different ratios of INS1:iEC:iMC did show integrated tube formation reminiscent of vasculature at day 8 (80:18:2 and 91:9:1). In contrast, other ratios (such as 50:50 and 66:33 INS1 to iEC) did not show tube formation, and instead formed segregated cell clusters in which iECs, iMCs, and INS1 cells did not integrate.

**Conclusions / Significance:** This data shows promising results and suggests an in vitro model for creating an intra-islet vasculature may be achievable, as we did see endothelial/mural cell tube formation in our experiments when using INS1 cells, iECs, and iMCs. Future studies may include additional functional testing and analysis, such as using GSIS to quantify insulin secretion and sc-RNA-seq to study maturation markers pre- and post-differentiation. Once the orthogonal differentiation protocol shows significant success, transplantation studies into animal models could demonstrate how these islets function in vivo.

**Abstract Title:** Using Dendrimer Nanoparticles to Reprogram Astrocyte into Neurons for Stroke Treatment

**Authors:** Payton Wolbert, Arjun Poudel, Ajit Sharma, Bhairavi Srinegaeshwar, Gary Dunbar, Julien Rossignol

**Abstract Category:** Basic & Translational

**Advisor/Mentor:** Arjun Poudel, BS

**Background:**

Strokes cause significant brain damage and are classified as ischemic or hemorrhagic leading to the disruption of cerebral perfusion and eventual neurological cell death. Astrocytes are the supportive cells in the central nervous system and respond to damage by undergoing reactive astrogliosis. Recent research has shown potential in the reprogramming of astrocytes into neurons through the modulation of key cell-signaling pathways. They employed the use of small molecules DAPT, CHIR99021, SB43542, and LDN193189 to target Notch, GSK-3 $\beta$ , TGF- $\beta$ , and BMP pathways. Modulating these pathways has been shown to convert reactive astrocytes into neuroblasts, which become mature neurons.

**Objective:**

This study focused on improving the delivery and effectiveness of certain water-insoluble compounds (DAPT, CHIR, and SB) by encapsulating them within G4 PAMAM 70/30 dendrimers and investigate their efficacy in reprogramming astrocytes into neuroblasts by targeting Notch, GSK-3 $\beta$ , TGF- $\beta$ , and BMP pathways under hypoxic conditions.

**Methods:**

Our study used Human Embryonic Kidney (HEK) cells to test four specific chemicals. Upcoming experiments will treat human astrocytes with drugs encapsulated in dendrimers. We assessed the activity of the unencapsulated drugs on HEK cells using Western blot analysis. We encapsulated the three water insoluble drugs (DAPT, SB, and CHIR) and assessed encapsulation success with UV-Visible spectroscopy. Further work will include working with human astrocytes directly and assessing the effectiveness of drug delivery with dendrimers.

**Results:**

The results demonstrated that the drugs effectively influenced specific cellular pathways when used alone, as shown by protein analysis. We confirmed successful encapsulation of DAPT and SB, but not for CHIR. Further work includes treating HEK cells with drug-dendrimer complexes and utilization of oil for CHIR that was not successfully encapsulated into the dendrimer.

**Conclusion:**

In conclusion, initial experiments show promise in the use of specific drugs to convert astrocytes to neurons. Encapsulation of these drugs using dendrimer nanoparticles has been partially successful. Next, we plan to test this method on human astrocytes in hypoxic conditions, improve the drug encapsulation with oil, and continue our work with in vitro astrocytes.

**Abstract Title:** Persistent lactic acidosis and high-output heart failure in a 3-year-old with global developmental delay

**Authors:** Aiman Almasnaah, Samson Ndukwe, Amarilis Martin

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Amarilis Martin, M.D.

### Introduction

Beriberi cardiomyopathy is characterized by high-output heart failure with reduced or preserved ejection fraction and reduced systemic vascular resistance, clinically presenting with tachycardia, generalized edema, and pre-renal AKI. In the setting of thiamine deficiency, peripheral vasodilation occurs forcing the heart to increase cardiac output to meet peripheral tissue oxygen demands. The cardiovascular and nervous systems have the highest oxygen extraction rates; since thiamine plays an essential role in facilitating aerobic respiration, they are most vulnerable during thiamine deficiency. Moreover, the lack of thiamine impedes the enzymatic conversion of pyruvate, which yields high-energy-carrying molecules. Pyruvate is instead converted to lactate, leading to type B lactic acidosis.

### Case Presentation

A 3-year-old female with microcephaly and global developmental delay presented with a history of waddling gait, fatigue, and dysphagia. She was born full-term but had a perinatal history of maternal tobacco use. Her mother reported poor oral intake and repetitive gagging behavior that frequently led to postprandial emesis.

Vital signs were within the normal range for her age except for tachycardia. Initial workup revealed hyponatremia (127 mMol/L), acute kidney injury (AKI) with a blood urea nitrogen (BUN) of 9 mg/dL (baseline < 7 mg/dL) and creatinine of 0.46 mg/dL (baseline < 0.25 mg/dL), and lactic acidosis (5.20 gm/dL). Her inflammatory markers were not elevated. She was given a fluid bolus and was started on dextrose-containing crystalloids.

After the patient's sodium normalized, she was encouraged oral intake. However, she developed hypotension and oliguria. She appeared edematous and her lactic acid increased to 9.57 gm/dL. Her troponin and brain natriuretic peptide levels were elevated at 31 ng/L (normal < 15ng/L) and 492 pg/mL (normal < 101 pg/mL), respectively.

Electrolyte replacement and an epinephrine infusion did not improve her condition; rather her lactic acidosis worsened. After switching to a norepinephrine infusion and giving bicarbonate-containing crystalloids, her lactic acid decreased to 2.9 gm/dL and her blood pressure normalized. However, upon discontinuation, her lactic acid rose again with worsening anasarca despite diuretics. She progressively developed pulmonary edema, a weaker respiratory drive, and hypoxia with a peripheral oxygen saturation (SpO<sub>2</sub>) of 88%. Bilevel positive airway pressure with a fraction of inspired oxygen as high as 40% improved her SpO<sub>2</sub> to 100%. Nevertheless, her lactate continued to rise (14.78 gm/dL), and she became hypotensive again. She was subsequently intubated and started on thiamine for suspicion of type B lactic acidosis.

### Discussion/Conclusions

Considering thiamine deficiency is essential for patients with restricted diets or malabsorption conditions presenting with neurologic symptoms, heart failure, and/or unexplained lactic acidosis. Our patient had limited oral intake coupled with a thiamine-deficient diet followed by hospital dextrose supplementation, which further exacerbated her symptoms. Thiamine should be administered before providing any type of nutrition or dextrose-containing fluids to prevent overloading a system with decreased PDH activity. The patient's lactic acidosis, cardiovascular dysfunction, and neuropathy resolved upon thiamine administration, confirming a type B etiology. A

diagnosis of wet beriberi was established by a serum thiamine level of 30.4 nMol/L (normal 74-222 nMol/L).

**Abstract Title:** Unique Intraoperative Finding of Hepatobiliary Architecture in a Patient with History of Gastroschisis.

**Authors:** Obadah Asbahi, Sydney Pauls, Karissa Konwerski, Michael Sacchetti, Mohammad Shaeer

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Mohammad Shaeer, M.D.

**Introduction:** Gastroschisis is a defect that results in the complete passage of bowel contents or organs through all layers of the anterior abdominal wall. Approximately 1 in 2000 infants in the United States are born with this abnormality resulting in the need for surgical intervention. Despite undergoing surgical correction of this defect, many infants will go on to display anatomical complications related to the abdominal and pelvic organs including malnutrition, surgical adhesions, intestinal atresia and necrosis, malrotations and volvuli, small bowel obstruction, and cryptorchidism. While there is great prevalence of gastrointestinal complications related to individuals with gastroschisis repair, defects of the biliary tracts are incredibly rare. This case study aims to discuss the unique hepatobiliary architecture of a patient with history of gastroschisis.

**Case Report:** A 21-year-old female with a past medical history of premature birth (31 weeks), gastroschisis, pediatric hernia, and imperforate anus presented with tethered cord syndrome revealing incidental finding of gallstones on Lumbar MRI. Abdominal ultrasound confirmed the presence of stones in the gallbladder with the absence of pericholecystic fluid, wall thickening, and choledocholithiasis. Her symptoms included chronic and progressively worsening episodes of sharp, right upper quadrant abdominal pain that radiated diffusely throughout the abdomen with each episode lasting up to 10 hours. Her abdominal pain was aggravated with eating and prevented her from tolerating meals, resulting in a 20 lb weight loss since the onset of symptoms. On the day of surgery, laboratory studies revealed elevated WBC at 24.65 (normal 3.4-11.0 K/ccm), elevated liver transaminases at AST 147 (normal 3-35 IU/L), and ALT at 96 (normal 15-71 IU/L). Intraoperative findings included an enlarged liver that extended well below the costal margin requiring lysis of many adhesions to mobilize. The liver itself was abnormal and displayed multiple fissures. In addition, the gallbladder was noted to be intrahepatic and oriented towards the posterior body of the liver. The gallbladder was removed intact (4.8 x 2.7 x 2.2 cm) with blunt dissection and electrocautery and found to have a cystic duct margin of 0.2 cm, wall thickness average of 0.1 cm, multiple calculi up to 0.5 cm, and dark green viscous bile. The patient remained vitally stable following surgery and was discharged on post-operative day 1 with the sole symptomatic complaint of appropriate incision site tenderness.

**Discussion:** Prematurity can result in many potential anatomical and functional variations. Several cases have been reported of biliary dysfunction present in infants with gastroschisis due to the rare occurrence of these anatomical defects. In our case, given the patient's history of gastroschisis, prematurity, and history of abdominal surgeries, there is increased concern of potential abnormal hepatobiliary anatomy. Subsequently during laparoscopic cholecystectomy, a rare anatomical variant of the hepatobiliary system was discovered. Awareness of this patient's medical history should increase clinical suspicion of potential anatomical abnormalities and may warrant further work up prior to surgery, such as CT imaging, to better recognize unique anatomy and minimize the chance of complications.



**Abstract Title:** Unusual Case of Meckel's Diverticulitis

**Authors:** Oluwayemisi Oyeleke, Jacob Boersma, Phillip Nahirniak

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Phillip Nahirniak, M.D.

**Introduction:** Meckel's diverticulum is a relatively uncommon developmental anomaly of the small intestine that typically remains undiscovered in patients unless it becomes symptomatic. Meckel's diverticulitis is a diagnostic dilemma for surgeons due to the overall rarity of the condition, low sensitivity of CT scan for detection of Meckel's diverticulum, and the fairly non-specific symptoms that resemble other intraabdominal infections. When identified intraoperatively, Meckel's diverticulitis should be addressed surgically, which may involve either diverticulectomy or small bowel resection, depending on the size of the diverticulum. Non-surgical management with drains and antibiotics alone may be ineffective and lead to higher rates of complications.

**Methods:** Here, we present an interesting case of a 62-year-old male with a past medical history of GERD, umbilical hernia, inguinal hernia, and hypertension who presented with 1 day history of abdominal pain, nausea, and vomiting. He had a recent colonoscopy with polypectomy performed 2 years prior. CT scan showed 5.6 x 3.8 cm abscess in the left lower quadrant, which was described by the radiologist as sigmoid diverticulitis with peri-colonic abscess formation. He underwent percutaneous drainage by interventional radiology.

**Results:** Despite percutaneous drain placement, the patient reported lack of improvement in his abdominal pain. His drain was also noted to have difficulty holding suction and frequently filled up with air. There was concern for intraluminal drain placement, so repeat CT scan on hospital day 2 revealed that the tip of the drain was actually within a patulous portion of a Meckel's diverticulum. He was taken to the operating room for diagnostic laparoscopy with Meckel's diverticulectomy and removal of his drain, which was confirmed to be within the lumen of the Meckel's diverticulum.

**Conclusion:** Post-operatively, the patient did very well. He had improvement in his abdominal symptoms. He was discharged on post-operative day 2, tolerating diet and pain significantly improved since admission. Pathology revealed Meckel's diverticulum without evidence of malignancy.

**Discussion:** Meckel's diverticulitis is an uncommon cause of abdominal pain. It presents similarly to other intraabdominal infections, especially colonic diverticulitis and appendicitis. Surgeons should keep Meckel's diverticulitis on their differential diagnosis, particularly when patients do not have an expected improvement with percutaneous drainage of intraabdominal abscesses. CT scan sensitivity is low for detection of Meckel's diverticulum. Inability for percutaneous drains to hold suction should arise suspicion for possible intraluminal placement. When identified, resection of Meckel's diverticulitis should be performed.

**Abstract Title:** Tylenol Tangle: A Case of 5-Oxoproline Toxicity from Unintentional Acetaminophen Overdose

**Authors:** Keith Bouffard, John Jarad, Sayad Osama, Paritharsh Ghantasala

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Paritharsh Ghantasala, M.D.

MUDPILES is a well-known mnemonic to describe the causes of anion gap metabolic acidosis, however novel forms of anion gap acidoses have been elucidated as causes not encompassed by this popular memory aid. Acetaminophen toxicity is widely known to cause hepatic injury and renal injury producing decreased glomerular filtration rate, hypokalemia, and hypophosphatemia but its deleterious effects on renal physiology are less understood. High anion gap metabolic acidosis due to metabolites from chronic acetaminophen consumption is rare and underdiagnosed, making epidemiology and prevalence relatively unknown.

**Case Description:**

A 41-year-old Caucasian female with past medical history of right hemicolectomy for perforation and sepsis, endometriosis, and Graves' disease post thyroidectomy presented complaining of generalized myalgias, arthralgias, and fatigue. She complained of pain radiating from the pelvis to the chest with intense nausea and had been unable to eat a full meal for approximately six weeks. Home medications prior to admission consisted of levothyroxine 88 µg daily and up to 4g of acetaminophen daily. Physical exam revealed an emaciated woman with dry mucous membranes, 4/5 strength in all extremities, diffuse abdominal tenderness to palpation, hypertension, and tachycardia. Laboratory testing revealed hypokalemia, elevated creatinine, an elevated anion gap of 23 mmol/L with concurrent metabolic acidosis with a venous pH of 7.09, and normal thyroid function. Organic acid urine testing was pursued due to the otherwise unexplained anion gap metabolic acidosis, chronic acetaminophen ingestion and the clinical picture fitting an emaciated female with intense nausea and vomiting. It revealed 5-oxoproline markedly elevated at 989 mmol/mol creatinine highly suggestive of acetaminophen toxicity. Treatment was initiated with bicarbonate drip and n-acetylcysteine. Her intense pain and nausea subsided with correction of the anion gap metabolic acidosis. She was stabilized and discharged with instructions to discontinue acetaminophen.

**Discussion:**

Detoxification of acetaminophen is accomplished by glutathione and rare mutations of glutathione synthetase and 5-oxoprolinase have been described as causes of 5-oxoprolinuria. Additionally, chronic consumption of acetaminophen has been established as a rare but increasingly recognized cause of 5-oxoprolinuria high anion gap metabolic acidosis in specific patient populations including chronically ill malnourished women. This causes depletion of glutathione and reduces negative feedback on γ-glutamyl-cysteine synthetase producing increased γ-glutamyl-cysteine and thus increased levels of 5-oxoproline. Prevalence is exceedingly rare and is currently unknown and in the cases of 5-oxoprolinase and glutathione synthetase deficiencies prevalences are < 1/1,000,000. Treatment is simple with administration of sodium bicarbonate acutely, cessation of acetaminophen, and vitamins E and C for free radical scavenging. Increased recognition of and testing for 5-oxoproline anion gap metabolic acidosis could be a potential life-saving measure in hospitalized patients. Testing for 5-oxoproline metabolite is not widely available. Increased knowledge of and testing for 5-oxoprolinuria could be beneficial for survival of patients experiencing high anion gap metabolic acidosis due to chronic acetaminophen ingestion.

**Abstract Title:** Polypharmacy and deprescribing of acetylcholinesterase inhibitors: a case report and literature review

**Authors:** Camille Chan, Saad Chaudhry

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Saad Chaudhry, M.C.

**Introduction:** Major cognitive disorder (dementia) is an acquired loss of cognition function that typically presents with impairments in memory, language, attention, executive function, social cognition, or perceptual-motor domains. It is estimated that 5.8 million people in the United States have Alzheimer's disease and related dementias. By 2060, the number of Alzheimer's disease cases is expected to increase to 14 million. The condition ultimately becomes devastating and debilitating in the severe stages, and there is still yet to be a curative treatment. However, there are pharmacological treatments that may provide a modest delay in the progression of cognitive decline.

Acetylcholinesterase inhibitors, such as donepezil, galantamine, and rivastigmine, are recommended for mild to moderate Alzheimer's. Memantine, an NMDA-receptor antagonist, is recommended for moderate to severe cases. With the addition of new medications, it is good practice to reevaluate patients after initiation and to discontinue if no beneficial cognitive effects are observed. There is limited research on polypharmacy relating to antidementia medications, but polypharmacy in patients with dementia has been linked with adverse outcomes.

**Case Presentation:** Patient is an 81-year-old female with a past medical history of dementia who presented to the hospital for a mechanical fall. She was admitted due to failure of fixation and collapse of her fracture, requiring conversion of previous right hip surgery to the right hip hemiarthroplasty for failed femoral neck fracture fixation. Her medication reconciliation revealed she had been on memantine 10mg BID, galantamine 12mg BID, donepezil 23mg QD, and rivastigmine 6mg BID for several years. These were prescribed by her neurologist who has since retired, and her current primary care physician has continued to order the anti-dementia medications. Throughout her stay, the patient was unable to answer most questions and was typically disoriented. Per her grandson who is her primary caretaker, she has advanced dementia and was around her baseline. She requires assistance with ADLs and IADLs. Patient experiences periods of restlessness at nighttime that are responsive to trazodone. He was unclear if the patient was benefiting from taking the anti-dementia medications. There were no GI symptoms, bradycardia or prolonged QTc due to her medications. The patient was ultimately medically cleared and discharged, but was able to begin the deprescribing cascade of her acetylcholinesterase inhibitors. Patient was strongly recommended to follow up with a geriatrician and work towards reducing polypharmacy.

**Discussion:** There is insufficient research on the efficacy of having more than one acetylcholinesterase inhibitor for the treatment of dementia. Some studies have found the efficacy of the three acetylcholinesterase inhibitors available on the market is similar and the benefit of administration of these compounds is mild and may not be clinically significant. Of note, the benefits of taking such medications may not always outweigh the potential adverse effects of dizziness, insomnia, bradycardia, and cholinergic crisis. Addressing polypharmacy, especially for older adults with dementia, is essential in reducing adverse outcomes such as falls and re-hospitalizations. Further studies on deprescribing acetylcholinesterase inhibitors and their utility in advanced dementia are highly needed.

**Abstract Title:** Exploring the Anatomical Variability of the Aberrant Right Subclavian Artery: A Comprehensive Review and Case Analysis

**Authors:** Arlene Chan, Yosef Mansi, James McConnell, Zachary M. Skeen, Joydeep Chaudhuri

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Joydeep Chaudhuri, M.D.

**Background:** The aberrant right subclavian artery (ARSA) is a rare anatomical variation in the vascular system, increasingly discussed in medical literature. This variation deviates from the typical arterial pattern and holds significance in both anatomical studies and clinical contexts.

**Objective:** This study aims to provide a comprehensive review of the anatomical and epidemiological aspects of ARSA, supplemented by findings from dissection conducted by the Summer Anatomy Dissections group at Central Michigan University College of Medicine. By reviewing existing knowledge and presenting new insights via a case study, the objective is to contribute to a deeper understanding of ARSA, including its prevalence, anatomical characteristics, and potential clinical implications.

**Methods:** A rigorous literature review was conducted using the PubMed database, focusing on articles related to disorders and diseases associated with ARSA. The search criteria included the Mesh term: ("Aberrant subclavian artery"[Supplementary Concept] OR "aberrant"[tiab] OR "ARSA"[tiab]) AND ("right"[tiab]) AND ("Subclavian Artery"[Mesh] OR "subclavian artery"[tiab]). Additionally, a detailed case report is presented based on a cadaveric dissection conducted during the summer of 2023.

**Results:** The review analyzed nine articles published between 2013 and 2023, unveiling a broad spectrum of reported incidence rates for ARSA, ranging from 0.16% to 4.4%. Various studies delved into the connection between ARSA and different medical conditions such as Down syndrome and Kommerell's diverticulum, shedding light on potential clinical correlations. Furthermore, the case report documents the identification of ARSA in a male donor with a history of multiple clotting disorders and vascular issues, underscoring the diverse clinical manifestations associated with this anatomical variant.

**Conclusions:** The occurrence of ARSA is relatively rare in the general population, emphasizing the importance of a thorough anatomical understanding to accurately identify and manage this condition. Proper recognition of ARSA in clinical settings is essential to avoid misinterpretations in imaging studies and to guide surgical interventions effectively. Continued research efforts, including further case studies, are crucial to elucidate the full spectrum of clinical disorders and disease processes associated with ARSA, ultimately improving patient outcomes and informing evidence-based practice. **Significance:** Understanding ARSA's prevalence, anatomical characteristics, and clinical implications is crucial for healthcare practitioners to accurately diagnose and manage this condition. Further research, including additional case studies, is essential for expanding knowledge and improving patient care.

**Abstract Title:** Systemic Lupus Erythematosus with Multi-Organ Involvement: Myocarditis, Lupus Cerebritis, Lupus Nephritis, and Hematological Manifestations

**Authors:** Arthur Sieron, Lindsey Davis, Therese Mead, Rania Esteitie

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Therese Mead, D.O.

### Introduction

Systemic Lupus Erythematosus (SLE) is a multi-system autoimmune disease characterized by upregulation of the innate and adaptive immune system, complement activation, and immune complex formation leading to tissue inflammation. This is a case report of a patient with a history of SLE who developed multiple severe complications of the disease.

### Case Presentation

A 32-year-old female with a history of SLE, Guillain Barre Syndrome, Idiopathic Thrombocytopenic Purpura (ITP), and status post splenectomy presented to the emergency department with a 3-day history of fever, cough, myalgias, generalized weakness, shortness of breath, and right-sided chest pain. On examination, the patient was afebrile and tachycardic, with a malar rash across bilateral cheeks. Motor and neurological exams were unremarkable. Laboratory studies revealed decreased WBCs (2.44 k/cmm), elevated AST (171 IU/L), elevated CK (630 IU/L), elevated ESR (77 mm/hr) and elevated troponin (139 ng/L) with an unremarkable electrocardiogram. Urinalysis showed proteinuria. Echocardiogram showed trace pericardial effusion and cardiomyopathy with ejection fraction of 40%. The patient was administered aspirin due to concern for myocarditis and admitted for further care. Her symptoms rapidly progressed and she developed lower extremity weakness. MRI lumbar spine revealed myositis, which was treated with intravenous immunoglobulin therapy. Her symptoms continued to deteriorate and she developed encephalopathy and aphasia concerning for lupus encephalitis. Lumbar puncture showed elevated protein and was otherwise unremarkable. She was treated with plasmapheresis and corticosteroids. Approximately 2 weeks into hospitalization, she developed Thrombotic Thrombocytopenic Purpura (TTP), renal failure concerning for lupus nephritis, and bacteremia. Anti-nuclear antibody (ANA) panel was positive with a titer of greater than 1:1280. She had no improvement over a three week period despite treatment. The Systemic Lupus Erythematosus Disease Activity Index 2000 (SLEDAI-2K) was greater than 35, suggesting multi-organ involvement and need to escalate therapy. The patient was transferred to a tertiary facility and started on high dose cyclophosphamide, hydroxychloroquine, and corticosteroids which resulted in significant clinical improvement.

### Discussion

In the United States, the prevalence of SLE from 4 state-specific registries was 72.8 per 100,000 person-years, and was 9 times higher among females than males (128.7 versus 14.6 per 100,000). The exact underlying etiology is unknown, but predisposing factors including genetics, hyperestrogenism, and environmental factors have been identified. Clinical manifestations are variable and commonly include arthritis, malar rash, Raynaud phenomenon, and constitutional symptoms. Diagnosis of SLE is primarily via serology of ANAs and anti-double stranded-DNA antibodies, and mainstay of treatment involves immunosuppressants or biological agents. Disease progression may involve cytopenias, serositis, nephritis, carditis, vasculopathy, and neurological complications including cerebritis, meningitis, polyneuropathy, seizures, and psychosis. SLE with multi-organ involvement poses significant morbidity and mortality risk, and lupus nephritis and cerebritis are two of the most severe clinical manifestations. Early recognition of SLE exacerbations and associated complications requires an individualized, multidisciplinary approach to improve outcomes and quality of life. Our patient had a complex clinical course experiencing nephritis, cerebritis, cytopenia, and TTP, with a positive outcome utilizing a multidisciplinary approach and aggressive management following SLEDAI-2K recommendations.

**Abstract Title:** Bilateral Pulmonary Embolism as Complication of Granulosa Cell Tumor

**Authors:** Elizabeth Deming, Steven Ater, Renee Sundstrom

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Renee Sundstrom, D.O.

**Introduction:**

Ovarian cancers are the second most common cancers of the female genital tract and have the greatest morbidity. Many women will experience symptoms for months prior to diagnosis. Increasing age is a risk factor for ovarian cancer, while oral contraceptive use and salpingectomy are protective. A subset of ovarian cancers includes sex cord stromal tumors, such as granulosa cell tumors which account for 6% of ovarian neoplasms. Functional granulosa cell tumors secrete estrogen, creating a hyperestrogenic state which can result in abnormal uterine bleeding, endometrial hyperplasia, and endometrial cancer. Surgery is the primary approach for management of the neoplasm.

**Case presentation:**

37-year-old G0 female with past medical history of morbid obesity presented to the emergency department after a near syncopal episode. Patient reported shortness of breath, lightheadedness, palpitations, and diaphoresis over the previous 24 hours. She was tachycardic on exam. She reported a sedentary lifestyle, but denied recent travel, OCP use, leg pain or swelling. She incidentally reported irregular menstrual cycles over the last several years with no prior evaluation.

CTA chest demonstrated acute bilateral upper and lower lobe pulmonary embolisms. The patient was started on heparin and subsequently underwent mechanical thrombectomy. The etiology of PE was unknown at that time.

A TVUS was obtained to assess abnormal uterine bleeding, which demonstrated 22mm endometrial stripe and large 29x21x34 cm complex mass with solid and cystic components in the left adnexa, highly concerning for ovarian neoplasm. CT Abdomen/Pelvis obtained to further assess pelvic mass. 33cm complex cystic lesion in the left pelvis and abdomen that was in contiguity with the left adnexa noted. Primary considerations included ovarian neoplasm, most likely ovarian carcinoma.

Gynecology Oncology was consulted due to concern for malignancy and planned for hysteroscopy D&C with biopsy of pelvic mass.

Hysteroscopy D&C was completed with findings of papillary vascular changes consistent with endometrial adenocarcinoma, hemorrhagic fluid from ovarian cyst, and clitoromegaly. A large mass in the abdomen was biopsied. Patient was encouraged to undergo TAH with BSO and staging, which was completed without complication. Findings included a large 30lb multi-cystic mass contiguous with left ovary and an enlarged uterus. There was no evidence of intraperitoneal spread. Findings and pathology were consistent with Stage IA endometrial carcinoma and Adult granulosa cell tumor of left ovary.

**Discussion:**

Granulosa cell tumors are functional and primarily secrete estrogen. Hyperestrogenic effects include abnormal uterine bleeding, endometrial hyperplasia, and endometrial carcinoma. In the case presented, the patient had been experiencing vaginal bleeding for several years, likely due to the development of endometrial carcinoma due to exposure to increased estrogen from the ovarian tumor. In addition to gynecologic complaints, the patient presented with shortness of breath and near syncope related to the bilateral pulmonary embolism. Risk factors for the patient for VTE included obesity, sedentary lifestyle, and estrogen-secreting malignancy.

Management of granulosa cell tumors includes surgery, most commonly unilateral adnexectomy as < 5% of tumors are bilateral. As the patient's case was complicated by endometrial carcinoma, a TAH with BSO was completed for definitive management.

**Abstract Title:** A Case of Disseminated BCG after Bladder Cancer Treatment?

**Authors:** Brittany Garza, Mathew Kunz, Derek Schaller

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Derek Schaller, M.D.

**Introduction:**

Bladder cancer is the most common malignancy of the urinary system with intravesical BCG infusions being a mainstay of treatment. This is a case of a patient who received such treatment and presented to the ED for stroke-like symptoms and was incidentally found to have chest imaging concerning for disseminated BCG.

**Case:**

A 91-year old male with a past medical history of bladder cancer status post intravesical BCG therapy and end stage renal disease on dialysis presented to the ED for stroke-like symptoms and hypotension. The patient was receiving dialysis when he had sudden onset right sided weakness, dysarthria, and confusion. By the time the patient arrived in the ER, he had significant improvement in his symptoms. The patient had a CT head and CTA head and neck performed as part of the stroke protocol. TNK was declined. CTA head and neck incidentally showed numerous pulmonary lesions concerning for miliary tuberculosis or metastatic disease. A chest x-ray and chest CT were performed for further evaluation and the imaging was more consistent with miliary TB. The patient was immediately placed in airborne precautions, placed in a negative pressure room, the health department was notified, and infectious disease was consulted.

Per chart review, it was determined the patient had intravesical BCG treatment for his urothelial carcinoma. Disseminated BCG is a known, albeit rare, complication of this treatment. Per infectious disease, the patient didn't need to be in airborne precautions due to it being non-tubercloid mycobacteria. There was initial discussion of initiating triple therapy and pulmonology was consulted for endobronchial ultrasound bronchoscopy. The nodules were deemed too small for biopsy. Quantiferon, histoplasmosis, blastomycosis, and aspergillus laboratory studies were all negative; therefore, anti-TB drugs weren't initiated. Because the patient didn't have fevers, chills, or an elevated WBC count, infectious disease didn't think this was disseminated BCG.

**Discussion:**

Bladder cancer is the most common site of malignancy of the urinary tract system. Treatment options for superficial uroepithelial cancer include transurethral resection of bladder tumor or intravesical therapy if the malignancy is high risk for muscle invasion. Intravesical therapy is a catheter infusion therapy of a large molecular compound. The drug is directly applied to the bladder tumor while limiting transmucosal absorption and systemic toxicity due to the size of the compound. Commonly used agents are mitomycin, epirubicin, and gemcitabine, or BCG. BCG is a live attenuated Mycobacterium bovis and is considered to be the superior intravesical therapy for treatment of bladder cancer. If these therapies fail, a cystectomy must be performed.

A known, but infrequent, side effect of BCG immunotherapy is disseminated BCG. Disseminated BCG can present with renal, liver, bone, or pulmonary involvement, specifically miliary tuberculosis. Miliary tuberculosis is extremely rare making up only 0.3-0.7% of complications. Diagnosis can be challenging as serology may be negative so one must have a high clinical suspicion and obtain a thorough past medical history. Nonetheless, acid fast staining of sputum and blood should be performed. Treatment includes quad therapy for 4 months and corticosteroids.



**Abstract Title:** The Lethal Link: A Case of Infectious Mononucleosis Leading to HLH

**Authors:** Harpreet Grewal, Ana Camagay, Payton Wolbert, Therese Mead,

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Therese Mead, D.O.

“The Lethal Link: A Case of Infectious Mononucleosis Leading to HLH”

#### Introduction

A 26-year-old female with a recent diagnosis of infectious mononucleosis (IM), presented to the emergency department (ED) with progressive fatigue, pleuritic chest pain, fever, abdominal pain, and generalized weakness. Initially treated for sepsis, she progressively deteriorated to respiratory distress and multi-organ system failure despite ICU-level care. Extensive investigations revealed evidence of hemophagocytic lymphohistiocytosis (HLH) likely due to post-Epstein-Barr virus infection.

#### Case Report

A 26-year-old female presented to the ED with shortness of breath, fatigue, intermittent fever, nausea, and generalized pain following a recent hospitalization for infectious mononucleosis. Despite initial improvement during the prior hospitalization, she experienced worsening symptoms. Physical examination revealed pale conjunctiva, diffuse chest wall tenderness, generalized abdominal tenderness, and diffuse musculoskeletal tenderness. Presenting vital signs showed tachycardia, hypotension, and hypoxia, necessitating high-flow oxygen therapy. Imaging studies demonstrated trace bilateral pleural effusions, mild cardiomegaly, and splenomegaly. Laboratory findings revealed leukocytosis (16 k) with left shift, abnormal RBC morphology suggestive of splenic sequestration, transaminitis (ALP 230 U/L, AST 121 IU/L, ALT 136 IU/L) hyperbilirubinemia (total bilirubin 4.7 mg/dL, indirect bilirubin 4.3 mg/dL), and elevated BNP (9,267 pg/mL). Given her recent viral illness, there were initial concerns including myocarditis, heart failure and severe sepsis. The patient was admitted to the critical care unit for management of sepsis with acute hypoxic respiratory failure. Further imaging studies revealed multifocal pneumonia and small pleural effusions, with echocardiography showing preserved left ventricular ejection fraction (55-60%). The patient's liver function continued to deteriorate, prompting transfer to a tertiary center. Hematology/oncology was consulted as the overall clinical picture began to fit the diagnostic criteria for HLH. HLH-94 protocol was initiated including induction chemotherapy using oral dexamethasone and intravenous etoposide. Despite intensive care, including continuous renal replacement therapy, the patient's condition rapidly deteriorated within 24 hours of transfer, with suspected hemophagocytic lymphohistiocytosis (HLH) leading to multi-organ failure. Unfortunately, despite aggressive interventions, the patient succumbed to her illness, highlighting the complexity and severity of her condition.

#### Discussion

This case emphasizes the challenges in the diagnosis and management of fulminant HLH in the setting of viral infections, and the importance of prompt recognition for timely intervention. In our case, even with induction chemotherapy following the HLH-94 protocol, the patient succumbed to the disease within days of treatment initiation. Treatment of HLH involves prompt initiation of immunosuppressive regimens, with newer agents and targeted therapies showing promise. Supportive care, management of underlying triggers, and vigilant monitoring of effective response or relapse are emphasized. The successful treatment of severe EBV-induced HLH has been reported using the IL-1 antagonist anakinra in conjunction with steroids, rituximab, and IVIG, providing a novel therapeutic approach to halt the cytokine storm and address the underlying trigger. HLH is a rare but potentially life-threatening condition that shares similarities with the cytokine storm seen in many viral infections. Early recognition based on clinical features, laboratory studies, and specific tools is crucial for risk stratification and prompt initiation of disease-specific treatment, given its associated high mortality rates.

**Abstract Title:** GYN vs. GI Primary: A Case of Metastatic Signet Ring Cell Carcinoma

**Authors:** Riva Morin, Steven Ater, Renee Sundstrom, Gregory Sutton

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Renee Sundstrom, D.O.

### Introduction

Signet ring cell carcinoma (SRCC) is a rare neoplasm primarily arising from the gastrointestinal (GI) tract and is characterized by greater than 50% of cells with prominent intracellular mucin on histologic evaluation.<sup>1,2</sup> At the time of diagnosis, SRCC is often advanced in nature involving metastasis to other organs including gynecologic organs. Although there are case reports of primary ovarian and breast SRCC, these cases remain exceedingly rare.<sup>3</sup> With advanced disease, there is substantial complexity in differentiating a primary ovarian SRCC compared to a gastrointestinal SRCC with ovarian metastasis.<sup>3,4</sup> The incidence of SRCC has increased 10-fold worldwide from 1970 to 2000.<sup>5</sup> With the rising cases of SRCC and the proportion of those cases being late-stage disease at the time of diagnosis, correct identification of histologic tissue origin is time sensitive and crucial when evaluating patients and initiating treatment.<sup>6</sup>

### Case Presentation

A 20-year-old nulligravid female presented with one month of abdominal pain, bloating, and 20lb weight gain. CT imaging demonstrated large volume ascites with peritoneal masses concerning for carcinomatosis. Abdominal ultrasound was obtained and demonstrated a solid, complex right adnexal mass measuring 15.7 x 15.2cm, ORADS 5. Labs revealed elevated CA125 (137), CA 19-9 (558), CEA (66.4), and LDH (261). The left ovary was mildly enlarged without additional abnormality. She underwent exploratory laparotomy with right oophorectomy and omental biopsy. The patient strongly desired fertility, so the left ovary was left in situ. Initial pathology favored primary ovarian SRCC due to positive PAX8 immunoperoxidase staining. However, GI primary could not be ruled out due to positive CK7 and CK20. Breast origin was excluded based on negative GATA3 and Mammaglobin staining. Adjuvant chemotherapy was initiated with Carboplatin, Paclitaxel, and Bevacizumab. Further testing revealed positive SATB2. Consultation with the University of Michigan determined the tumor was most likely a metastasis of colorectal or appendiceal origin. Endoscopy and colonoscopy biopsies were negative for malignancy. The chemotherapy regimen then was adjusted to Folfirinox and Bevacizumab. Genetic testing was positive for a CHEK2 variant which carries a 2x increased risk of colon cancer.<sup>7</sup> Despite chemotherapy treatment adjustment, progression of the disease persisted and there was noted to be an enlarging left on ovarian mass with lumbar spine and pelvic osseous lesions suggestive for further tumor metastasis. Determination was made to transition therapeutic goals to palliative.

### Discussion/Conclusions

This case demonstrates the insidious onset of symptoms with underlying metastasis and overall poor prognosis with advanced SRCC. Furthermore, this case highlights the diagnostic challenges in differentiating primary origin of SRCC identified in the adnexa. In this case, SATB2 positive staining and CHEK2 mutations favor GI origin. However, endoscopy, colonoscopy, and PET scan failed to identify any GI lesions. Unfortunately, despite extensive evaluation, consultation with multiple centers, and adjustment of chemotherapeutic regimen, the patient's cancer progressed.

**Abstract Title:** Visualized pulmonary artery clots on trans-thoracic echocardiogram in a patient with saddle pulmonary embolism: A case report

**Authors:** Denise Mourad, Ramy Ballout, Peter Fattal, Nishtha Sareen

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Nishtha Sareen, M.D.

**Introduction:** Pulmonary embolism can be a serious and life-threatening condition. Prompt diagnosis is important to reduce mortality. Computed tomography of the chest (CTA) is usually the first-line imaging test for diagnosis. The role of trans-thoracic echocardiography (TTE) is to look for the presence of right heart strain. Visualizing a pulmonary artery thrombus on a TTE is very unusual.

**Case report:** A 21-year-old female with no past medical history was transferred to our hospital from an outside facility for a thrombectomy of bilateral saddle pulmonary embolism. The patient initially presented to the ED of an outlying hospital with left leg pain that started one week prior. She was also having some episodes of shortness of breath with dizziness and recent palpitations. In the ED, she was found to be hypertensive to 149/101, tachypneic to 31, and tachycardic to 103, with a normal oxygen saturation of 95% on room air. Physical examination revealed tenderness and swelling in the left calf, otherwise unremarkable. Laboratory workup was unremarkable, EKG showed an incomplete right bundle branch block, and left lower extremity ultrasound showed a DVT in the left popliteal, posterior tibial, and peroneal veins. A CTA of the chest showed a large bilateral saddle pulmonary embolism extending throughout the bilateral central and main segments of the pulmonary arteries with evidence of right heart strain. The patient denied any personal history of thrombotic events, any oral contraceptive use, any recent travel, or prolonged immobilization but she had a family history of factor V Leiden mutation. A TTE done at our facility showed a mildly increased right ventricular cavity size with severe pulmonary hypertension, a right ventricular systolic pressure of 65 mmHg, and a 1.5\*1.5cm thrombus in the main pulmonary trunk. Bubble contrast study also showed a right-to-left shunt suggestive of a patent foramen ovale. The patient was started on a heparin drip and underwent a mechanical thrombectomy of bilateral pulmonary arteries with successful removal of a large amount of clots from the central segments and the main bilateral pulmonary arteries. The pulmonary artery pressure improved from 44/16 mmHg to 33/15 mmHg after thrombectomy. She was later switched to oral anticoagulation and discharged home after 3 days. The patient followed up after 4 months with our cardiology office and underwent a repeat TTE that showed a normal right ventricular cavity size, otherwise unremarkable. She was also sent for follow-up with the hematology office for a work-up of hypercoagulability.

**Discussion:** In certain instances, like cardiac arrest where bedside TTE is the fastest imaging available or other situations where CTA is unavailable or if there is any contra-indication to radiation, visualization of pulmonary arterial thrombus on TTE could help us make a faster diagnosis and treat rapidly. Some studies have suggested using a modified right parasternal view that provides a better view of the ascending aorta and distal right pulmonary artery, increasing the chance of directly visualizing a clot.

**Conclusions:** TTE can provide direct visualization of clots in pulmonary arteries and help with a faster diagnosis in emergent situations.

**Abstract Title:** Atypical Presentation of Mandibular Osteomyelitis

**Authors:** Dillon Nerland, Farina Kanwal, Walker Foland

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Walker Foland, D.O.

**Introduction:** Mandibular osteomyelitis is a relatively rare pathology, typically caused by native oral bacteria or alpha hemolytic streptococci. These sorts of infections commonly result from contiguous spreading of bacteria into the mandibular medullary space following dental procedures, although they do not typically occur without a predisposing condition, such as previous fracture, radiation therapy, diabetes mellitus, or chronic steroid use. These infections commonly present with anesthesia or hypoesthesia of the affected side with severe mandibular pain.

**Case presentation:** A 54 year old male with a past medical history of HIV well-controlled on ARVT, unilateral salivary gland removal in 1999, COPD, hypertension, and recent full mouth dental extraction with subsequent denture fitting who presented to the emergency department with burning pain and numbness in his right jaw that had been ongoing for the prior 3 days. The patient had his teeth extracted in October of 2023 and most recently had new dentures made 10 days prior to initial presentation. His vital signs were stable on initial presentation; he was mildly hypertensive at 145/74, which was consistent with his history of chronic hypertension. Notably, he was afebrile on initial presentation. Initial physical exam was significant for an edentulous oral cavity without focal area of swelling, with significant tenderness to palpation over his right-sided mandibular skin as well as his right-sided inferior gingiva. The patient was given IV ketorolac and a right-sided inferior alveolar nerve block with 2% lidocaine was performed for analgesia, which controlled the patient's pain for the initial stint of his emergency department evaluation. Laboratory evaluation performed in the emergency department was essentially normal, with a normal white blood cell count of 9.65K/mm<sup>3</sup>. A CT with IV contrast study of the patient's facial bones was performed, which demonstrated findings consistent with mandibular osteomyelitis with surrounding soft tissue edema without drainable abscess present. The patient was then started on IV vancomycin and piperacillin-tazobactam and admitted to the hospital medicine service with Dr. Malliaris, plastic surgery, on consult for management of mandibular osteomyelitis. While being treated inpatient, the patient had an MRI performed which confirmed the CT findings of mandibular osteomyelitis. He was switched to vancomycin monotherapy and discharged home with a PICC line in place to complete 6 weeks of IV vancomycin therapy. The patient had an acute kidney injury secondary to the vancomycin use, which resolved with transition of therapy to daptomycin. At last follow-up with plastic surgery, the patient was doing well without recurrence of pain or other symptoms.

**Discussion:** Odontogenic infections are common in patients with poor oral health, and any recent intra-oral insult could potentially represent a nidus for infection. For patients with presentations concerning for odontogenic infection, a wide differential should be maintained and imaging studies should be considered early. A thorough oral exam should always be performed on these types of patients to attempt to localize the involved areas. Although the incidence of mandibular osteomyelitis is low, even in patients with recent intra-oral procedures, it should remain in the differential for these types of patients.

**Abstract Title:** Neurobartonellosis in an Immunocompetent Host Mimicking Posterior Reversible Encephalopathy Syndrome (PRES)

**Authors:** Grant Raymor, Nwamaka Merah, Nicholas Hadad, Palaniandy Kogulan, Rania Esteitie

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Rania Esteitie, M.D.

**Introduction:** We present a rare case of neurobartonellosis in an immunocompetent female with a history of owning 20 cats, mimicking Posterior Reversible Encephalopathy Syndrome (PRES). Despite classic PRES symptoms, atypical MRI, fever, and inflammatory markers indicated infectious etiology, emphasizing the importance of considering neurobartonellosis in patients with classic PRES symptoms.

**Case Report:** A 64-year-old female with multiple chronic comorbidities including Type 2 Diabetes and CKD was brought in by EMS after a witnessed tonic-clonic seizure. Social history was significant for over 20 cats in her home. On presentation, she was hypertensive 239/116, tachycardic 105, and febrile 100.6 and lethargic on exam. Labs showed WBC 7.78, sodium 152, CRP 18.8. MRI showed scattered areas of cortical and subcortical vasogenic edema, concerning for PRES as the involved areas were mostly posterior. CSF analysis was unremarkable with negative cultures, however serology showed *Bartonella henselae* IgG < 1:8192, and *Bartonella quintana* IgG < 1:256. Blood cultures were negative. A presumptuous diagnosis of neurobartonellosis was made. Empiric antibiotics were switched to doxycycline and rifampin. The patient was also placed on anti-hypertensive and anti-epileptic management.

**Discussion/Conclusion:** This case highlights the potential for neurobartonellosis to mimic PRES in immunocompetent individuals. While the patient presented with classic PRES features, atypical features (e.g., fever, elevated CRP, and scattered bihemispheric subcortical edema outside the posterior regions) and cat exposure prompted exploration of alternative diagnoses. Serological testing alongside clinical presentation and history was crucial for diagnosis. This case emphasizes the importance of considering atypical presentations of *Bartonella* infection in immunocompetent patients, particularly when symptoms mimic other conditions, such as PRES. Early diagnosis and appropriate antibiotic therapy are essential to prevent complications. Additionally, the case underscores the limitations of traditional diagnostic methods like cultures and the collaborative value of serological testing, social history, and clinical presentation when diagnosing neurobartonellosis.

**Abstract Title:** Uterine dehiscence after successful VBAC with long-term in-patient antepartum admission

**Authors:** Cassandra Ross, Kathrin Parisi, Alexa Shepherd

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Alexa Shepherd, M.D.

**INTRODUCTION:**

Uterine dehiscence leading to uterine rupture is one of the potential complications of subsequent pregnancies after cesarean delivery. Patients who desire a trial of labor after cesarean delivery must be counseled on this increased risk. Those that have successfully achieved a vaginal birth after cesarean delivery (VBAC) have an increased chance of successful subsequent VBAC.

**CASE:**

A 38-year-old, gravida 6, para 3 at 24 weeks and 3 days gestation, presented to antepartum from maternal-fetal medicine (MFM) due to suspected uterine scar dehiscence. The patient was referred to MFM from an outside facility for her anatomy ultrasound due to advanced maternal age. She had a history of primary cesarean section in 2016, with two subsequent successful VBACs in 2017 and 2019. The patient noted during her VBAC in 2019, feeling a searing painful sensation with delivery.

Initial ultrasound via MFM at 18w4d, cervical length (CL) was normal at 3.7cm, and the lower uterine segment (LUS) appeared very thin. A 2cm defect in the LUS measured 1.2mm thick superiorly and 2mm thick inferiorly. Follow-up ultrasound with MFM at 23w2d demonstrated the LUS was too thin to measure, and CL was found to have shortened to 1.7-2cm with sludge noted. She was recommended to have an MRI and to start 200mg of vaginal progesterone. MRI at 24w0d noted a CL of 1.6cm with dilation at the internal os, thinning of the LUS appeared beginning at the internal os and extending superiorly over a 3cm segment with 1-2mm in thickness. An outward bulge was also noted, measuring 3cm in diameter by up to 1cm in outward protrusion. At 24w2d, MFM recommended in-patient management, and she presented one day later to labor and delivery antepartum, where she was monitored until delivery at 34w2d.

Throughout her in-patient management, urology was consulted for the possible need for intra-op management, as well as the neonatologist for preterm delivery after completing a betamethasone course. The patient had irregular cramping and contractions throughout her admission that resolved after IV fluids and tocolytics. MFM continued to monitor her; the LUS remained stable, the estimated fetal weight of the fetus remained in the 99th percentile, and polyhydramnios was noted. At the time of delivery, the intraoperative findings noted an extremely thin LUS with a 4x2cm uterine window.

**DISCUSSION:**

Gotoh et al. noted that the thickness of the LUS was not different at 19-26 weeks between those with no prior cesarean versus those with a history of cesarean. Assessing the LUS before 36 weeks gestation allows for the most clinically useful information, and those with an LUS of < 2mm within 1 week of delivery may show an incomplete uterine rupture. In one study, the risk of uterine scar defect at delivery varied from 16% when the LUS was < 2.5mm versus 0.7% when the thickness was >3.5mm. Ultimately, assessing the LUS may impact the delivery timing in those with a prior history of cesarean despite an increased predicted chance of successful VBAC.

**Abstract Title:** A Unique Presentation of Indolent Cervical Vertebral Osteomyelitis Caused by Enterococcus faecalis: A Case Report

**Authors:** Michael Sacchetti, Hazem Eltahawy, Ehab Saleh, Derrek Humphries

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Derrek Humphries, M.D.

**Introduction:**

Enterococcus faecalis is a gram-positive bacterium known to cause urinary tract infections, endocarditis, bacteremia, and wound infections. Although osteomyelitis due to this pathogen is rarely reported, it has been associated with factors such as urinary catheterization, abdominal infections, endocarditis, recent surgeries, dental procedures, colon cancer, intravenous drug use, and diabetes mellitus. As with any systemic infection, it is typical of patients to have clinical signs and symptoms ranging from hemodynamic instability to areas of pain, erythema, and swelling. We report a unique case of cervical vertebral osteomyelitis presenting with an indolent course. To the best of our knowledge, no cases of cervical vertebral osteomyelitis due to Enterococcus faecalis presenting with an indolent course have been reported.

**Case Report:**

We present a 67-year-old female with a history of well-controlled diabetes mellitus and lumbar laminectomy from 10-15 years ago without hardware placement that presented following a two-week history of persistent upper back pain with no inciting injury or preceding remote infection. Physical examination findings were consistent with cervical radiculopathy. Magnetic Resonance Imaging revealed findings suggestive of discitis with associated osteomyelitis of the C5-C6 vertebral bodies. The patient underwent anterior cervical discectomy and fusion (ACDF) from C4-C7 with corpectomies of osteolytic bones at C5-C6. Intravenous administration of Ampicillin and Ceftriaxone was initiated, and was continued for six weeks in the outpatient setting.

**Conclusion:**

Adult cervical spine vertebral osteomyelitis presenting with an indolent course, without a preceding remote infection, trauma, or surgery is extremely rare. They can present as cervical radiculopathy without overt signs of infection, which can cause a delay in the diagnosis. The use of advanced imaging studies is important in making a timely diagnosis and intervention, and preventing potentially devastating complications.

**Abstract Title:** Assessing the Efficacy of a Novel Hybrid Antibiotic Spacer in Two-Stage Knee Periprosthetic Joint Infection Revisions: Description of Surgical Technique

**Authors:** Michael Sacchetti, Mitchell Cin, Brittany Hamama, Marisa Samani, Drew Casey, Tarek Taha

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Tarek Taha, M.D.

**Introduction:** Periprosthetic joint infections (PJI) pose a substantial challenge in arthroplasty surgery, with an estimated risk of 2% following primary procedures and up to 15% after revisions. The conventional approach to address this issue is the standard two-stage revision technique, which entails the removal of infected hardware, the utilization of an antibiotic-impregnated spacer, and subsequently, the installation of a new prosthesis.

**Objective:** In an effort to enhance intraarticular antibiotic concentration, our team introduces a novel two-stage revision technique. This innovative approach incorporates a hybrid antibiotic spacer, crafted from readily available components, and a high antibiotic loading dose. To the best of our knowledge, this specific technique has not been documented in the existing literature.

**Patients and Methods:** This study entails a retrospective review of six knees in skeletally mature patients with PJI who underwent a two-stage revision utilizing a hybrid antibiotic-impregnated spacer at a single regional medical center from June 2019 to August 2021. Briefly, the hybrid construct comprises a Stryker Triathlon femoral component, a 9mm Stryker X3 highly crosslinked polyethylene insert, and an OsteoRemedies tibial wedge. Intraoperative assessment of the range of motion was conducted, and placement was confirmed through intraoperative fluoroscopy and postoperative X-rays. Subsequently, all patients were followed up for a mean duration of one year postoperatively.

**Results:** After undergoing the two-stage revision technique with a hybrid antibiotic-impregnated spacer, patients demonstrated comparable outcomes to the standard of care. These results were evaluated through subjective functional assessment, objective physical examination, interval antibiotic prophylaxis, and reinfection rates. Notably, no instances of arthrofibrosis, manipulation under anesthesia, lysis of adhesions, or reinfections were reported within the specified follow-up period.

**Conclusion:** The findings indicate that our innovative hybrid antibiotic spacer is a suitable intervention in the two-stage revision of knee PJIs. Given that this technique guide demonstrates comparable patient outcomes to the standard of care, further investigation is warranted. Specifically, future studies should delve into local joint antibiotic concentrations during revision, assess tissue antibiotic burden, and conduct a long-term examination of reinfection rates.

**Significance:** This study reinforces prior research findings concerning the optimization of antibiotic concentration in PJI. It underscores the correlation between patient outcomes and reinfection rates with the duration and concentration of intraarticular antibiotics, rather than relying on systemic interval antibiotic dosing.



**Abstract Title:** Title: "It's Not a Tumor": The Evaluation of Pediatric Acute Onset Neuropsychiatric Syndrome (PANS) in an Adolescent

**Authors:** Nancy Saleh, Christopher Mishreky, Caitlin Boyd, Yousif Tawadros, Abishek Bala

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Abishek Bala, M.D.

**Introduction:**

Pediatric acute-onset neuropsychiatric syndrome (PANS) features a heterogeneous constellation of acute obsessive-compulsive disorder (OCD), tic disorder, emotional lability, eating restriction, cognitive, behavioral and/or affective symptoms, often followed by a chronic course with cognitive deterioration. It can be acute or sub-acute in onset, often followed by a chronic, relapsing/remitting course or by a progressive disintegrative course with deterioration of cognitive functions.

**Case Report:** a 17-year-old female with no past medical or psychiatric history was admitted to the inpatient psychiatric unit for self-abusive behavior, acute delusions of impending death, and new onset somatic symptoms of increased eye pressure, pain, and intracranial hypertension. Patient has history of multiple visits to the ED and urgent cares the 2 months prior to hospitalization with extensive workups that included head CTs, which were all negative.

On admission, it was revealed the patient was experiencing debilitating anxiety, suicidal ideation, self-harming behaviors, decreased appetite, decreased sleep, and inability to complete activities of daily living due to somatic preoccupation. There was also evidence of worsening of OCD symptoms, emergence of a facial tic, and multiple strep infections which coincided with the timeline of increased somatic preoccupation. CBC, CMP, ANA, IgE, IgA, IgM, IgG antibodies, ANA, strep throat cultures, anti-streptolysin (ASO), ESR, ASO, Anti-DNAse B were ordered and were negative. With rapport, it was revealed the patient had experienced a life-altering event with the discovery of her grandfather's body after he fell and passed away from an intracranial hemorrhage a year prior, as well as multiple episodes of illness with influenza and Group A Strep. Finally, she was facing stressors of moving and beginning college a few weeks after admission. Risperidone and Zoloft were started and patient was discharged. This was followed by two more admissions due to medications non-adherence, inability to attend college classes, and distressing outbursts. There was apparent symptoms resolution as patient accepted need for treatment in order to proceed with schooling and daily functioning.

**Discussion:**

The presented case demonstrates the complexity and ambiguity of diagnosing and managing a patient with suspected Pediatric Acute Onset Neuropsychiatric Syndrome. This patient's history was notable for psychosocial stressors and an uncommon history of recurring streptococcal infections which presented as a blend of multiple psychiatric illnesses in the acute setting, that included OCD exacerbation, emergence of a tic disorder, emotional lability, and increased anxiety. While rare, this patient's presentation provides an appreciation for the layers of considerations that must be accounted for by the psychiatric team when evaluating a patient presenting with acute symptomatology.

This case also demands the need for further research into acute presentations of psychiatric illness in adolescents. Identifying triggers, understanding the immunologic interplay and pathophysiology, and developing targeted strategies are all worthy investigations to better understand the syndrome and provide improved patient outcomes.

**Abstract Title:** Neuropsychiatric Manifestations Due to Moyamoya disease in an Adult with a History of Sickle Cell Anemia

**Authors:** Nancy Saleh, Andrina Ajo, Adeel Ahmed, Lorrie Garces

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Lorrie Garces, M.D.

**Introduction:** Moyamoya is a rare cerebrovascular disease characterized by the gradual narrowing and occlusion of the internal carotid arteries' terminal branches. Clinical manifestations of Moyamoya are related to cerebral hypoperfusion. While psychiatric manifestations are infrequent, some literature links Moyamoya with anxiety and depression. Rarely, psychosis has been documented in association with Moyamoya, which our case report examines in detail.

**Case Report:** We present a 31-year-old African American female with a history of Moyamoya disease and sickle cell disease, complicated by iron overload and a surgical history of extra cranial-intracranial bypass, presenting to the emergency department with abdominal pain.

Initial evaluation revealed iron overload following a blood transfusion for a sickle crisis, necessitating admission for medical management. Computed Tomography (CT) angiogram of the head and neck revealed markedly small caliber supraclinoid left internal carotid artery and left carotid terminus. MRI of the brain without intravenous contrast revealed no evidence of acute infarction or hemorrhage, however did reveal small chronic infarcts in the left periventricular frontal lobe, consistent with Moyamoya disease.

Upon psychiatric evaluation during her hospital stay, the patient disclosed command auditory hallucinations, visual hallucinations, vague paranoia, depressed mood, anxiety, and suicidal thoughts. She initially articulated events prior to admission well, then later became uncertain about their authenticity and could not recall how she arrived at the hospital. Additionally, she consistently expressed feeling as though she were dead.

The patient previously experienced similar symptoms, which responded effectively to a low dose of Zyprexa during inpatient psychiatric hospitalization; however, shortly after, she was lost to follow up and self-discontinued the medication.

After the patient received conservative treatment with an antiplatelet medication without neurosurgical intervention, and achieved medical stability, she was then admitted to the inpatient psychiatric unit. During her stay, she disclosed near-daily auditory hallucinations spanning the preceding year, alongside paranoia which escalated with heightened depressive or anxious states. She was treated with Zoloft 75 mg and Abilify 5 mg daily for a presumptive diagnosis of schizoaffective disorder, depressive type, which led to resolution of her symptomatology.

**Discussion:**

Given the rarity of Moyamoya disease, there is limited knowledge about the association of Moyamoya disease and psychosis. Current literature suggests that Moyamoya-induced frontal lobe hypoperfusion may serve as a precipitating factor for psychotic symptoms. In patients who present with psychosis, it is imperative to consider their medical history for conditions that could potentially contribute to symptomatology. Hence, this report underscores the significance of recognizing Moyamoya disease as a potential etiological factor in psychosis, which may require antipsychotic treatment modalities in addition to consideration of surgical reperfusion interventions.

**Abstract Title:** Tibial Shaft Fracture Through a Transcortical Tracking Pin Site After Robotic-Assisted Total Knee Arthroplasty: A Case Report

**Authors:** Marisa Samani, Meaghan Holub, Michell Cin, Brittany Hamama, Tarek Taha

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Tarek Taha, M.D.

**Introduction:** The use of robotic-assisted surgery in knee arthroplasty is believed to enhance the accuracy of components and improve patient outcomes, while hospital costs remain comparable to traditional arthroplasty. This procedure requires the utilization of tracking pins firmly attached to the tibia diaphysis to stabilize the bone-tracking hardware. A documented complication in the literature is the occurrence of gross fractures or stress fractures through pin sites, with a reported rate ranging from 0.06% to 4.8%. In this study, we present a unique case involving a tibial diaphyseal fracture associated with a mispositioned transcortical pin track. To our knowledge, this case is the first reported instance of tibial diaphysis pin site fracture in the literature that necessitated intramedullary nailing.

**Case Report:** A 72-year-old female with a medical history encompassing obesity (BMI 39), insulin-dependent diabetes mellitus type 2, coronary artery disease s/p PCI and MI, hyperlipidemia, hypertension, and DVT managed with Eliquis, experienced an atraumatic tibial shaft fracture. This fracture occurred through a 3mm transcortically inserted computer navigation tracking pin, which manifested 8 weeks after a routine total knee arthroplasty performed at an external hospital. The patient's fracture was effectively addressed through fixation with an intramedullary nail, with the added achievement of retaining the original knee prosthesis.

**Discussion/Conclusions:** Surgeons should uphold a heightened level of suspicion for pin-related fractures in patients experiencing persistent tibial pain following robotic-assisted knee arthroplasty. This vigilance is crucial to prevent complete fracture progression, which may necessitate a secondary operation and contribute to additional morbidity. Given that robotic-assisted surgery has distinctive complication risks, the debate regarding the value of technology-assisted surgery and its cost-effectiveness continues. This case is important to document as it records the risk for a postoperative fracture through an improperly placed pin leading to increased morbidity with a second operation.

**Abstract Title:** Axial Plane Mispositioning Leading to Mechanical Failure of an Intramedullary Nail: A Case Report

**Authors:** Marisa Samani, Mitchell Cin, Brittany Hamama, Tarek Taha

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Tarek Taha, M.D.

**Introduction:** The standard of care for pertrochanteric femur fractures is an intramedullary nail (IMN) due to its advanced designs and techniques, low complication rates, and improved healing outcomes. A rare but serious complication is the mechanical failure of the implant, necessitating salvage surgical procedures that can have a severe impact on the patient's health. Breakage of nails has been previously studied in the literature, and various patterns of fixation failures and implant breakage have been reported. This case report outlines an incident involving a mechanical failure of an IMN implant and proximal femoral nonunion, attributed to axial plane mispositioning of the IMN starting point. To our knowledge, this case represents the first reported instance of this specific implant failure pattern.

**Case Presentation:** A 56-year-old female, with no significant medical history, presented with left hip pain following a fall, which led to the diagnosis of a pertrochanteric fracture. Initially, the fracture was treated with an intramedullary nail. However, after 6 months of escalating pain, imaging revealed a mechanical failure of the IMN implant and raised concerns about proximal femur nonunion.

Subsequently, the patient underwent open reduction and internal fixation (ORIF) using a blade plate. She recovered well during the post-operative period without encountering further complications.

**Discussion/Conclusions:** The unintended complication we observed underscores the necessity for increased awareness regarding the importance of the axial plane starting point during anterograde intramedullary nailing. Future analyses of proximal femoral morphology and the optimal starting point in the axial plane can offer insights that may improve surgical outcomes and reduce complications in similar cases. The findings suggest potential improvements in surgical techniques and emphasize the need for heightened awareness of mechanical failure of IMN implants to reduce complications in similar cases.

**Abstract Title:** Unveiling a Rare Triad: Hepatic Portal Venous Gas, Pneumatosis Coli, and Hemorrhagic Gastritis

**Authors:** Kikelomo Sekoni, Kai Yu Li, Akram Alashari

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Akram Alashari, M.D.

**Introduction:** Hepatic portal venous gas (HPVG) has traditionally been an ominous finding associated with severe bowel ischemia that carries a grim prognosis. Recent evidence demonstrates that HPVG can be associated with many other less emergent conditions. While hemorrhagic gastritis (HG) has been associated with gastric pneumatosis, it has rarely been reported as a source for HPVG.

**Case Presentation:** A 56-year-old male with poorly controlled type I diabetes mellites presented to the emergency department for worsening abdominal pain and diarrhea over the last six months. CT of the abdomen and pelvis demonstrated diffuse gastric wall thickening, pneumatosis of the ascending/transverse colon and HPVG. Physical exam was benign and lactic acid levels were within normal limits.

In lieu of his imaging findings, he was taken for urgent diagnostic laparoscopy to rule out bowel ischemia. During this procedure, the bowel was noted to be grossly normal. Intra-operative esophagogastroduodenoscopy (EGD) demonstrated hemorrhagic fluid with thickened rugae in the gastric fundus. No active bleeding was identified. Gastroenterology was consulted and the patient underwent repeat EGD on post-operative day (POD) 2 with similar findings. Pathology from EGD biopsies were positive for H. pylori. The patient was started on pantoprazole and metoclopramide for suspected diabetic gastroparesis with improvement in symptoms. He was discharged on POD 5 in stable condition.

**Discussion/Conclusions:** HPVG is associated with pneumatosis intestinalis and bowel ischemia. However, radiographic findings alone cannot predict the presence or degree of ischemia. Our patient had both radiographic findings but no intra-operative evidence of ischemia. It is possible that high-resolution CT imaging did identify some early signs of bowel ischemia that had improved with pre-operative resuscitation and was not visible at the time of his operation.

There have been several reports of gastric pathology such as severe dilation, emphysema or pyloric stenosis leading to HPVG. The prevailing theory is that these diseases lead to gastric pneumatosis with eventual spread into the portal venous system. However, there was no gastric pneumatosis noted in this patient and there has been little previous discussion regarding HG as a potential cause of HPVG. With that said, the exact pathophysiology of how this patient's HG led to development of HPVG is uncertain.

HG is a potential cause of HPVG. Depending on clinical presentation and radiographic evidence, an EGD should be considered prior to diagnostic laparoscopy or exploratory laparotomy as a less invasive method for identifying underlying etiology of HPVG.

**Abstract Title:** Complications of Combined Heart Medications: Importance of Reconciliation

**Authors:** Shofikur Shuhag, John McGwire, Mohamed El-Haddad

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Mohamed El-Haddad, M.D.

**Introduction:** Medication reconciliation plays an essential role in averting medication errors, safeguarding patient well-being, and optimizing the effectiveness of treatments.

**Case Presentation:** We report a case of an 81-year-old female with a past medical history of grade II diastolic heart failure, intermittent sinus bradycardia - with Type I second-degree AV block, and hypertension, presenting with shortness of breath. Upon presentation, she was hypotensive, bradycardic, and tachypneic. Physical examination revealed bradycardia, respiratory distress, coarse breath sounds, and a chest x-ray confirmed right lower lobe consolidation. Laboratory analysis indicated hyperkalemia and severe acidosis. The patient was subsequently admitted to the medical intensive care unit for acute hypoxic respiratory failure and sepsis. A comparison of the latest electrocardiogram (ECG) with a previous one showed a junctional rhythm with a significant reduction in the ventricular rate. Upon a review of the patient's home medications, it was noted that she was taking both Carvedilol 6.25 mg, a beta blocker, and Verapamil 240 mg, a calcium channel blocker. Considering the suppressive effects of these medications on nodal activity, they were identified as potential contributors to the patient's presentation, particularly in the context of her hyperkalemia and acidosis. The medications were promptly discontinued, and the patient received appropriate treatment for her presenting conditions. She was later discharged with a prescription for Carvedilol 6.25 mg, with the calcium channel blocker discontinued.

**Discussion/Conclusion:** This case highlights the potential complications arising from the concomitant use of beta blockers and calcium channel blockers in elderly patients with complex cardiac histories. The patient's critical clinical state and notable junctional rhythm on ECG were at least partly influenced by the suppressive effects of Carvedilol and Verapamil on nodal activity. The development of hyperkalemia and severe acidosis further complicated the patient's condition, necessitating prompt discontinuation of these medications to facilitate her recovery. This case emphasizes the importance of medication reconciliation, especially in elderly patients with multiple comorbidities, to prevent potential serious complications. Regular medication reconciliation by healthcare providers, which involves careful consideration of overlapping drug mechanisms alongside a comprehensive understanding of patient history, is critical for preventing adverse events and ensuring optimal patient outcomes.

**Abstract Title:** The Renal Riddle: A Hypertensive Emergency Complicated by Page Kidney

**Authors:** Sachin Singh, Gaurav Luthra, Nicholas Lettner-Knowlton, Parintharsh Ghantasala, Hazem Alhourani

**Abstract Category:** Case Report/Case Series  
Hazem Alhourani, M.D.

**Advisor/Mentor:** Paritharsh Ghantasala, M.D.,

**Introduction:**

Page Kidney, or page phenomenon, is a rare condition where external compression of the kidney due to an encapsulated subcapsular hematoma leads to renin-dependent hypertension and decreased renal perfusion. Here, we present a case of resistant hypertension complicated by page phenomenon.

**Clinical description:**

A 38-year-old African American man with a history of hypertension was admitted for three weeks in an outlying facility due to hypertensive emergency and acute renal failure. He underwent hemodialysis and a renal biopsy, which revealed severe arteriosclerosis, acute tubular necrosis with significant interstitial fibrosis, tubular atrophy, and glomerulosclerosis. He subsequently developed left flank pain, for which he came into the ED and was found to have blood pressure (BP) of 230/120 mmHg, creatinine of 6.9 (previously at 3), and significant proteinuria on urinalysis. He underwent a CTA of the abdomen/pelvis that revealed a large subcapsular hematoma of the left kidney. Duplex renal artery ultrasound demonstrated a peak systolic renal artery/aortic velocity ratio of 0.72, ruling out renal artery stenosis. Aldosterone to Direct Renin ratio was 0.7, ruling out hyperaldosteronism. Serologies for ANA, ANCA, and C3/C4 were negative.

Suspicion arose for page kidney as the subcapsular hematoma would cause compression of the renal parenchyma. Interventional Radiology attempted ultrasound-guided aspiration with 8 mL being aspirated with difficulty due to the nature of the hematoma. No interventions were pursued by urology and vascular surgery.

The initial BP regimen included IV labetalol and hydralazine pushes, subsequently transitioning to a regimen of Aliskiren 150 mg daily, Aldactone 50 mg daily, Minoxidil 10 mg daily, Doxazosin 8 mg daily, Labetalol 300 mg three times daily (TID), Hydralazine 100 mg TID, and Clonidine 0.2 mg TID. The patient was unresponsive to Nifedipine and Hydrochlorothiazide, which were discontinued. The regimen was developed in an additive manner. All drugs were gradually up-titrated to maximally tolerated doses and frequency with a goal BP of below 140/90.

The Direct renin level was normal at 45.9. However, this was misleading since multiple factors can affect the level, such as the patient being on labetalol/clonidine and having a low JG cell reserve, given the setting of severe tubular atrophy with fibrosis.

**Discussion:**

Post-renal injury hypertension is rare. In one review of referrals to a general medical clinic, only 10 out of 17,410 cases were identified [0.06%]. Page kidney is treatable and diagnosed from imaging studies. It should be considered in young patients in the setting of abdominal or iatrogenic trauma who rapidly develop resistant hypertension after the causative event.

Management entails renal decompression by evacuation of hematoma by interventional/surgical methods, which were not possible in this case due to the chronic nature of the hematoma that underwent capsulation with a fibro-collagenous shell not amenable to percutaneous aspiration.

**Conclusion:**

This case highlights how resistant hypertension is multifactorial and to approach its management with a multidisciplinary team. To optimize patient outcomes, we should tailor the regimen for every

patient and have an aggressive approach to meet adequate BP parameters to avoid complications like Stroke, Hypertensive encephalopathy, retinopathy, and cardiomyopathy.



**Abstract Title:** SPONTANEOUS DIZYGOTIC TWIN PREGNANCY AFTER BILATERAL SALPINGECTOMY

**Authors:** Herchran Singh, Renee Sundstrom

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Renee Sundstrom, D.O.

**Introduction:**

Of the available contraception in the United States, long acting reversible contraception (i.e. levonorgestrel IUD, implant, or copper IUD) and permanent surgical sterilization have demonstrated the lowest failure rate. As one of the most effective forms of contraception, the failure rate of bilateral salpingectomy is 0.5%. Pregnancy in patients after salpingectomy is usually desired and often occurs via assisted reproductive technology. Spontaneous pregnancy after this procedure is exceedingly uncommon and the occurrence of twin pregnancy adds an additional layer of rarity. The prevalence of all twin pregnancies in the United States is 31.2 per 1000 live births, including reproductive technology assisted pregnancies. Spontaneous twin pregnancy has a prevalence of 9-16 in 1000 in the United States. This report discusses a particularly uncommon case of a spontaneous dizygotic twin pregnancy status post a bilateral salpingectomy.

**Case Report:**

A 35 year old woman, gravida 5 para 4, with a past medical history of hyperthyroidism, hypertension, and migraines and a past surgical history of bilateral salpingectomy for desired sterilization in May of 2021 presented to the emergency department due to abdominal pain, nausea, and vomiting in December of 2023. The patient stated that she was concerned for a possible pregnancy due to missed menses, increasing breast tenderness, and intractable nausea and vomiting. On physical assessment, the patient was noted to have stable vitals and benign exam except for mild suprapubic tenderness. Labs revealed positive urine pregnancy test with a serum beta-HCG of 94827.91 mIU/ml.

Transabdominal and transvaginal first trimester ultrasounds were conducted to rule-out ectopic pregnancy, which showed a gravid uterus measuring 14.1 x 13.4 x 7.7 cm with twin intrauterine gestation identified (gestational age: fetus A 12w6d and fetus B 13w1d). Review of the operative report demonstrated removal of the tubes from the mid-portion to the fimbriated end. Additionally, the pathology report describes two fimbriated fallopian tubes measuring 4.0 cm in length by 0.6 cm in average diameter and 3.7 in length by 0.6 in average diameter. Follow up work up with cell free DNA testing and an anatomy ultrasound demonstrated dizygotic (dichorionic, diamniotic) twins. The patient was counseled on the rarity of failure of bilateral salpingectomy and that her case is extraordinary because she had two separate eggs that were released, fertilized, and implanted. The patient was presented with her options for continuing or terminating her pregnancy. Although it was an unplanned pregnancy, it was ultimately desired and the patient planned to continue obstetric care.

**Discussion/Conclusion:**

This case demonstrates that despite the low rate of spontaneous pregnancy after bilateral salpingectomy (failure rate of bilateral salpingectomy is 0.5%), pregnancy is still possible. Furthermore, spontaneous dizygotic twin pregnancy is even more unlikely, and this is one of the few documented cases. Clinicians should be aware of the risk of failure of salpingectomy and counsel patients of this, albeit unlikely, possibility of pregnancy.

**Abstract Title:** Escaping the Shadows: Understanding the Psychiatric Effects and Developmental Challenges of Adolescent Cult Survivors, and the Call for Research on Family Dynamics and Mental Health

**Authors:** Nicholas Sirhan, Abishek Bala

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Abishek Bala, M.D.

### Introduction

Cults, characterized by their insular and controlling nature, have long been recognized for their detrimental impact on individuals' mental health in those still part of the practice and those who are no longer in them. Leaving such environments presents a myriad of challenges, often leaving survivors with enduring psychological scars. In this presentation, we explore the psychiatric effects experienced by individuals who break free from cultic environments, particularly adolescents who are navigating critical developmental stages. Adolescence, a period marked by Eriksonian identity formation and the quest for autonomy, intersects with cult dynamics, exacerbating the challenges faced by young survivors.

### Case Presentation

The patient is a 17-year-old female who presented to a psychiatric inpatient facility for suicidal ideation. It was noted that she was previously in a cult, where she was abused, forced to believe certain things, and was encouraged to idolize a man that claimed to be "God." She was eventually ostracized for skepticism about the faith. During examinations, it was evident that she had endured some trauma that we believe led to the actions that put her in this situation. It was clear to us that she lacked a sense of purpose and had chronic feelings of emptiness. It was also clear that she had developed dependence while being in the cult. As a result, all of these factors have led to maladaptive coping mechanisms as evidenced by her substance abuse, self-harming thoughts and behaviors, as well as suicidal thoughts.

### Discussion/Conclusions

The patient's journey highlights the pervasive influence of psychological manipulation, indoctrination tactics, and coercive control exerted by cult leaders, contributing to the development of various psychiatric conditions such as PTSD, anxiety disorders, and depression. Additionally, it underscores the disruption of key developmental tasks, such as establishing a cohesive sense of self and forging meaningful social connections, as cult indoctrination subverts individual autonomy and fosters dependency on the group. Cult involvement during adolescence can impede the exploration of diverse identities and values, perpetuating a state of identity diffusion or foreclosure. Furthermore, the enduring effects of cult-induced trauma manifest in maladaptive coping mechanisms, interpersonal difficulties, and existential crises long after the escape.

This case presentation emphasized the importance of comprehensive psychiatric assessment and trauma-informed care for individuals who have fled cultic environments. Cognitive-behavioral interventions, trauma-focused therapy, and support groups are essential in addressing the unique needs of survivors and facilitating their recovery journey. Additionally, collaborative efforts between mental health professionals, social workers, and support networks are pivotal in mitigating the risk of re-victimization and fostering resilience in individuals rebuilding their lives post-cult.

Factors such as social isolation, identity disruption, and the loss of autonomy emerge as central themes in understanding the lasting psychological toll of cult involvement and subsequent escape. There remains a crucial need for further research into the impact of cult involvement on family members and effective interventions by mental health professionals. It is imperative that more attention is directed towards understanding the dynamics of family involvement with cults and the resultant mental health outcomes.

**Abstract Title:** A Rare Case of COVID-Induced Necrotizing Autoimmune Myositis: An Unfamiliar Landscape

**Authors:** Nicholas Sirhan, Rania Esteitie

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Rania Esteitie, M.D.

### Introduction

Since the COVID-19 pandemic, caused by the SARS-COV-2 virus, we have seen a diverse range of signs and symptoms linked to this multi-organ virus. Although it is commonly known for causing severe acute respiratory syndrome (SARS), there have been reports of many different neuromuscular diseases thought to be triggered by the virus, though the mechanism to this date is still unclear. Necrotizing autoimmune myositis (NAM) has been documented in a limited number of cases as a variant of idiopathic inflammatory myopathies (IIM) occurring subsequent to COVID-19 infection. Muscle biopsy is the gold-standard for diagnosis of these conditions.

### Case Presentation

A 69-year-old male presented to the ED due to a mechanical fall after an unknown length of prolonged downtime. He had proximal muscle weakness and pain limited to his buttocks and shoulders, eventually progressing to quadriplegia. Physical examination of his skin revealed no Gottron papules or heliotrope rash, shawl sign, or V sign. His statin use prior to admission and elevated creatine kinase of 5,284 at the time attributed his admitting diagnosis to rhabdomyolysis. AST and ALT were also elevated to 269 and 152, respectively. His CK levels for the next 7-10 days improved to 1500-1700s, but never normalized.

Three weeks after admission, concern for potential autoimmune etiology of his myositis was raised when his creatine kinase levels did not any further after his treatment of COVID and rhabdomyolysis. Workup revealed an elevated ANA at > 1:1280 and aldolase elevated at 26.2. Anti-JO-1, SSA/SSB, and ANCA levels were negative. Anti-SRP and –HMGCRCR antibodies were ordered later in his hospital course and were negative as well. EMG showed axonal peripheral neuropathy and proximal myopathy. He was subsequently started on IVIG for five days, a ten-day course of glucocorticoids (methylprednisolone 62.5 TID with taper). During the next five days on IVIG therapy, his CK was at its lowest (893). Muscle biopsy showed necrotizing myopathy without endomysial lymphocytic invasion.

### Discussion/Conclusion

IIM are a group of immune-mediated diseases that present with muscle inflammation and progressive muscle weakness. NAM is the most common category of IIM that usually presents with subacute proximal muscle weakness, dysphagia, and dyspnea. While viral infections such as COVID have been linked to this, other triggers such as malignancies, immune checkpoint inhibitors, and statins have also been seen. Though NAM can present with positive anti-SRP or HMGCRCR antibodies, our patient's serology was only positive for ANA, which is not specific. Muscle biopsy would show muscle fiber necrosis with regeneration and degeneration with absent or minimal inflammation, as seen in our patient. NAM typically manifests with subacute, progressive weakness in proximal muscles, weakness in the lower extremities, as well as weakness in other distal muscles, along with symptoms such as dysphagia and dyspnea.

Necrotizing autoimmune myopathy is a rare condition with largely unknown causes in most cases and a pathogenesis that has yet to be clearly defined. Identifying risk factors, detecting associated autoantibodies like SRP and HMGCRCR, performing timely muscle biopsies, and initiating early and aggressive immunotherapy are linked to enhanced outcomes.

**Abstract Title:** From Fatigue to Firestorm: Unraveling Tumor Lysis Syndrome in the Shadow of CLL

**Authors:** Nicholas Sirhan, Camille Chan, Joanne Mathew

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Joanne Mathew, M.D.

## Introduction

Chronic Lymphocytic Leukemia (CLL) is a hematological malignancy characterized by the clonal proliferation of mature B-lymphocytes. While CLL typically progresses slowly, a critical turning point arises when transformation occurs, escalating the risk of complications such as Tumor Lysis Syndrome (TLS). TLS is a rare phenomenon typically seen in patients with hematologic cancers starting chemotherapy or with high tumor burden. It is a potentially life-threatening emergency caused by the rapid destruction of tumor cells and subsequent release of intracellular components. The risk of TLS is not uniform among hematological disorders, as it has been observed more frequently in acute lymphoblastic leukemia and acute myeloid leukemia, and rarely in patients with CLL. This case aims to unravel the intricate interplay between CLL and the risks for developing TLS, shedding light on the diagnostic challenges, risk stratification, and management strategies essential for navigating this clinical conundrum.

## Case Presentation

A 67-year-old male with a past medical history of CLL diagnosed two years earlier, presented to the ER with a 1-month history of worsening lethargy, fatigue, and easy bruisability. On arrival, his CBC was significant for an elevated WBC count of 239.8, a low platelet count of 3000, and an RBC count of 3.07, all indicative of a heavy tumor burden. His other labs were significant for an elevated uric acid at 7.4, potassium of 5.5, and evidence of an AKI with a creatinine of 1.4, above baseline. Although it is unusual for chronic lymphocytic leukemia to develop tumor lysis syndrome, it could not be excluded based on his lab results with increasing creatinine, potassium, and uric acid. He was started on IV fluids, received a dose of rasburicase, and daily allopurinol.

Given his advanced staging of CLL and concerns for development of TLS, he was admitted and started on Zanubrutinib (Brukinsa). A CT showed massive splenomegaly with an AP measurement of 19 cm and extensive adenopathy above and below the diaphragm. Within two days of starting chemotherapy, he developed TLS with an acute elevation in his serum potassium to 6.2 and a uric acid of 9.

## Discussion

TLS represents a critical, potentially life-threatening complication, usually associated with aggressive hematologic malignancies. Although CLL generally follows an indolent course, cases of transformation can precipitate TLS, demanding heightened clinical vigilance. Recognizing patients at high risk for TLS development becomes paramount, necessitating a nuanced approach that extends beyond conventional criteria.

Even when patients do not meet standard TLS criteria, changes in laboratory parameters can serve as early indicators of impending metabolic disturbances. Identifying these subtle shifts is pivotal for timely intervention, allowing for preemptive measures to mitigate the risk of TLS. Given CLL's typically slow progression, the development of TLS can catch both clinicians and patients off guard as it is typically rare in these patients. Thus, understanding the nuanced relationship between CLL transformation, lab changes, and TLS risk is essential for informed decision-making. This demonstrates the need for a proactive, context-driven approach in managing CLL patients to prevent the devastating consequences of undetected TLS.

**Abstract Title:** Unveiling Uncommon Terrain: An Atypical Presentation of Osteomyelitis in a Pediatric Patient with Sickle Cell Disease

**Authors:** Nicholas Sirhan, Norah Fanning, Alina Philip

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Alina Philip, D.O.

### Intro

Sickle cell disease (SCD), affecting approximately 100,000 Americans, is a clinically significant hematological pathology with high incidence in the United States among Blacks and African Americans. Vaso-occlusive infarcts of the bone are the most common complication of SCD. This occurs when sickled red blood cells obstruct the microvasculature, resulting in chronic tissue ischemia, presenting with severe pain and or swelling. In SCD patients, distinguishing between osteonecrosis and osteomyelitis can be difficult. Vaso-occlusive infarcts are far more common than osteomyelitis in patients with SCD, meaning osteomyelitis is often overlooked or misdiagnosed in the context of joint pain and elevated C-reactive protein.

### Case Presentation

A 12-year-old male with SCD and hereditary persistence of fetal hemoglobin presented with pain in his right hip, thigh, and knee after having fallen on his hip one week prior. He was found to have a WBC count of 27.37 and elevated C-reactive protein and subsequently developed fevers despite broad-spectrum antibiotic treatment, leading to a probable diagnosis of osteomyelitis. Despite this, blood cultures were negative, and MRI showed extensive osteonecrosis but no definite evidence of osteomyelitis. Our case demonstrates the difficulty of diagnosing osteomyelitis in the context of SCD and other ischemic bone processes, the limited utility of imaging, and the importance of clinical context in accurately diagnosing and treating such patients.

### Discussion

Osteomyelitis is often indistinguishable from vaso-occlusive infarcts in SCD patients, especially as both conditions can present with fever and a painful swollen limb with limited range of motion. Laboratory testing is not always useful in differentiating between these conditions, as both may cause elevations in CRP and WBC count. The utility of such labs is also limited after administration of empiric antibiotics, as was the case in the presented patient. Additionally, the early administration of antibiotics may also explain the patient's negative blood cultures. However, even without the administration of antibiotics, negative blood cultures do not definitively rule out osteomyelitis. A patient's history may also provide important clues for diagnosis. Our patient had a reported history of trauma to the affected leg one week prior to presentation. This may be more suggestive of osteonecrosis, but the presence of continued fevers swayed the clinical decision making towards a probable diagnosis of osteomyelitis. As in our case, it is often challenging to diagnose osteomyelitis in children with sickle cell disease due to many overlapping symptoms with a typical vaso-occlusive crisis such as osteonecrosis. Imaging plays an important role in the diagnosis but is not always definitive.

### Conclusions

It is extremely difficult to differentiate between an acute vaso-occlusive crisis and osteomyelitis in a patient with SCD. A missed diagnosis of osteomyelitis, however, may be detrimental, leading to bone deformity and chronic changes. The utility of imaging such as MRI is limited in these cases, placing greater emphasis on a good history and physical exam, laboratory results, and close monitoring of clinical course.

**Abstract Title:** Suspected Pulmonary Histoplasmosis Following a COVID-19 Infection

**Authors:** Maya Takagi, Nicholas Haddad

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Nicholas Haddad, M.D.

**Introduction:** Histoplasmosis is a condition caused by the dimorphic fungus *Histoplasma capsulatum*. Although most infections are asymptomatic, the fungus can lead to disease in immunocompromised individuals and those exposed to a large inoculum of the fungus. The symptoms of histoplasmosis are non-specific and mimic other pulmonary diseases, such as tuberculosis and malignancy, which makes its diagnosis challenging.

**Case Presentation:** We report a 32-year-old, non-smoking, previously healthy female who presented with a non-productive cough, shortness of breath on exertion, and sharp chest pain on inspiration following a recent COVID-19 infection. Her chest CT in the emergency department showed numerous small non-specific, non-calcified pulmonary nodules in both lungs. A presumed pleurisy diagnosis was made, and she was treated with methylprednisolone. The patient's symptoms persisted after the steroid treatment, ultimately leading to a pulmonary wedge resection. Although the biopsy revealed granulomas and no organisms, culture was not possible because the sample was sent in formalin. Urine and serum histoplasma antigens were negative. The patient was treated for a presumed histoplasmosis given the patient's imaging, biopsy, symptoms, and demographic region. The symptoms and nodules resolved after the completion of the treatment.

**Conclusion:** Although histoplasmosis in an immunocompetent individual is rare, recognition of this disease as a differential for non-specific pulmonary symptoms in a mycosis endemic area is critical to institute appropriate work-up and appropriate management of this condition including cultures and molecular testing.

**Abstract Title:** Neuroarthropathy of Foot and Ankle Associated with Lupus

**Authors:** Nhan Tran, Andrew Cohen

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Andrew Cohen, DPM

Charcot arthro-neuropathy is now well recognized as one of the sequelae in the foot and ankle of patients with diabetic peripheral neuropathy, but it may be associated with other peripheral neuropathy. While it is not a commonly reported complication, it is known that systemic lupus erythematosus is correlated with peripheral neuropathy. However, despite lupus neuropathy, Charcot arthro-neuropathy has not been commonly reported with systemic lupus erythematosus. Therefore, we report a case of a middle-aged female patient with lupus neuropathy who was diagnosed with Charcot arthropathy to her right 1st metatarsal phalangeal joint. X-ray and MRI showed significant soft tissue swelling with periosteal erosion and articular erosion to the 1st metatarsal phalangeal joint. Osteomyelitis was ruled with a bone biopsy. The patient ultimately was treated with a combination of external fixation with antibiotic spacer and non-weight bearing. At the 6-month follow-up, the patient reported being able to ambulate in a running shoe with customized orthotics without pain and swelling. .

**Abstract Title:** Hand and Forearm Compartment Syndrome Secondary to Intravenous Infiltration

**Authors:** Joseph Vyskocil, Jon Sheu, Paul Telehowski

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** Paul Telehowski, M.D.

### Introduction

Acute compartment syndrome (ACS) in the hand and forearm is an uncommon yet significant orthopedic crisis. The misplacement or migration of an intravenous catheter can cause fluid extravasation into interstitial tissues, which is a rare but known cause of ACS. Diagnosis of ACS is usually clinical, but this can be challenging in anesthetized or obtunded patients who are unable to communicate. Management involves emergent fasciotomies to relieve compartment pressures.

### Case Presentation

We present the case of a 64-year-old female who developed ACS in the hand and forearm following a carotid endarterectomy. The patient experienced significant swelling in her left hand and forearm due to an infiltrated intravenous catheter. The diagnosis was based solely on physical examination, as the patient was under anesthesia. Findings included swelling, tissue tension, and color changes suggestive of early ischemia. Emergent fasciotomies were performed to decompress the affected compartments.

### Discussion/Conclusion

ACS resulting from iatrogenic fluid extravasation is a severe condition with a rare etiology. Prompt identification and surgical intervention are essential to reduce associated morbidity and mortality. In certain cases, the diagnosis must be made by physical exam alone. The rarity of this etiology necessitates heightened awareness among inpatients who have a limited ability to communicate.



**Abstract Title:** Treatment of Recurrent Spindle Cell Carcinoma in the Lower Extremity After Radiation and Excision: A Case Report

**Authors:** Ryan Woldahl, George Malliaras

**Abstract Category:** Case Report/Case Series

**Advisor/Mentor:** George Malliaras, M.D.

**CLINICAL PRESENTATION:** A 47 year old female patient who presented status post radiation and excisional treatment of spindle cell carcinoma of the right lower extremity. Post radiation treatment, the patient had extensive soft tissue deficit with bone exposure despite multiple months of wound care.

**TREATMENT AND SURGICAL PROCEDURE:** Patient had a preoperative CT angiogram of the right lower extremity to assess her vascular anatomy in preparation for free flap placement to her right leg. Patient was then taken to the operative room for harvesting of left radial forearm free fasciocutaneous flap for reconstruction of her right lower extremity wound. Post procedure, it was discovered from the pathology report that there were positive margins of residual spindle cell carcinoma to the right lower extremity. Three months post operatively, the patient was again taken to the operative suite for final resection of residual spindle cell carcinoma with elevation of the free flap and adjacent tissue transfer.

**CONCLUSION:** Spindle cell carcinoma (SpCC) is a rare and aggressive variant of squamous cell carcinoma and often affects the long bones in the arms and legs. Patients who have radiation therapy and excision of these lesions sometimes develop chronic nonhealing wounds. In this case, we presented a patient who required advanced free flap placement in order to heal a chronic nonhealing ulceration due to treatment of SpCC. The patient required additional surgery post free flap placement to her right lower extremity due to positive margins from pathology review. This is a unique case that highlights the delicate nature of treatment of nonhealing wounds with advanced surgical techniques.

**Abstract Title:** Role of Novel Automated Methods to Detect Sleep Disordered Breathing Using Heart Rate Changes Among Patients who Use Chronographic Medications

**Authors:** Nabila Ahmed, Adhithi Athikumar, Safwan Badr, Shivapriya Chandu, Moustafa Habra, Omar Ismail, Hamza Khan, Scott Maresh, Abed Najjar, Abdulghani Sankari

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Abdulghani Sankari, M.D.

**Background:** Sleep disordered breathing is characterized by the recurrent asphyxiation events while sleeping and is associated with increased risk for cardiovascular morbidity. The severity of sleep disordered breathing (SDB) is determined by recurrent hypopnea and apnea events during sleep, where hypopnea is a reduction in air flow and apnea is the absence of air flow in sleep. The diagnosis of sleep disordered breathing is made using the apnea-hypopnea index (AHI), which is the number of all apnea and hypopnea events per hour of sleep. SDB can be diagnosed using laboratory nocturnal polysomnography (NPSG), the gold standard method, or portable monitoring, called home sleep apnea testing (HSAT). Elevated nocturnal heart rate is known to increase the risk of negative cardiovascular outcomes later in life. Recent studies determined that a novel automated electrocardiogram-based detection method serves as a reliable indicator for sleep disordered breathing. Previous research discovered that individuals with elevated heart rate per hour values during sleep had a higher probability of suffering from cardiac-related events. However, the previous study's inclusion criteria did not include patients taking heart-rate related medications.

**Objective:** To determine the role of novel automated methods to detect heart rate accelerations in the diagnosis of sleep disordered breathing among patients who use chronographic medications. This study expands on previously established research and determines if this novel automated detection method can be used for patients taking chronographic medications.

**Methodology:** PSG recordings from 856 participants in the Sleep Heart Health Study (SHHS) were analyzed using an automated method to detect heart rate changes using electrocardiogram (ECG) and pulse signals. Cohort participants were included in the study if they were aged 40 years and older, had complete PSG, no history of a cardiovascular event, and were using beta blockers prior to enrolling in the study. Using PSG, nocturnal respiratory-related heart rate accelerations were analyzed for any correlation to AHI. Studies were eliminated if they had poor ECG signal quality or if an arrhythmia was present.

**Predictor Variables:** The main predictor variables are the heart-rate intervals (RRI) per hour and the heart rate acceleration index (HRAI) per hour for an entire NPSG. RRI is defined by the time between successive QRS complexes on an ECG. HRAI is defined by the heart rate acceleration.

**Results:** The respiratory-related dip index (RRDI) shared a similar value as NPSG based AHI, where RRDI had a value of (mean  $\pm$  standard deviation)  $24.4 \pm 28.2/h$  and total AHI was  $26.2 \pm 19.7/h$ . The total HRAI had a mean value of  $29.8/h \pm 18.6/h$ . Total AHI and RRDI had a Pearson correlation coefficient of 0.205 ( $p < 0.001$ ). Total AHI and HRAI had a Pearson correlation coefficient of 0.321 ( $p < 0.001$ ). This indicates that the results are statistically significant.

**Conclusion:** The novel automated detection method for nocturnal heart rate changes correlate with AHI in patients with SDB who use chronographic medications.

**Significance:** The novel automated detection method can provide accurate prediction for the diagnosis of SDB for patients who take chronographic medication.

**Abstract Title:** Child Development Following Prenatal Opioid Exposure: Early Signs of Attention Deficits

**Authors:** Andrina Ajo, Soundharya Subramaniam, Oludamilola Olufosoye, Beth Bailey

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Beth Bailey, Ph.D.

**Background:** Attention Deficit Hyperactivity Disorder (ADHD) is a prevalent neuropsychiatric disorder affecting children and adolescents, characterized by symptoms of inattention, hyperactivity, and impulsivity. These symptoms often persist into adulthood, leading to significant functional impairment in academic, social, and occupational domains. Emerging evidence suggests that delays in fine motor, gross motor, social, and communication skills in early childhood are linked to later diagnosis of ADHD. While alcohol and tobacco exposure have been identified as risk factors for ADHD, the long-term consequences of prenatal opioid exposure on neurodevelopmental outcomes and its potential association with ADHD remain inadequately explored.

**Objective:** To examine early developmental milestones linked to ADHD in children exposed to opioids in utero.

**Methods:** Charts of children with confirmed prenatal opioid exposure were reviewed, identifying 30 participants in the opioid-exposed group. Additionally, a random sample of 30 participants from a larger control group served as controls for this analysis. Data from the Ages and Stages Questionnaire 3 (ASQ-3), completed by parents during the 9-month well-child visits, were collected. The ASQ-3 assesses six domains of child development: communication, gross motor, fine motor, problem solving, and personal-social skills. T-tests and chi-square analyses were employed to compare background factors between the two study groups and to explore bivariate differences in ASQ-3 domain scores. Linear regression analysis was utilized to predict each domain score based on opioid exposure status, controlling for background factors that exhibited significant differences ( $p < .10$ ) between the two groups. Adjusted mean differences and corresponding 95% confidence intervals were reported.

**Results:** Compared to those unexposed, children who were prenatally exposed to opioids scored significantly lower ( $p < .05$ ) on the communication and personal-social domains of the ASQ-3 after control for confounders. Additionally, the opioid exposure group scored lower on the gross motor domain of the ASQ-3, but differences only trended toward significance after control for confounding ( $p < .10$ ). The groups did not differ significantly in performance on the problem solving or fine motor scales.

**Conclusion:** The study findings reveal a significant association between prenatal opioid exposure and enduring neurodevelopmental delays, particularly in milestones linked to ADHD. Further research with expanded sample sizes and extended follow-up periods is imperative to explore the potential correlation between in utero opioid exposure and subsequent ADHD diagnosis in children.

**Significance:** This study shows neurodevelopmental consequences of opioid exposure. The results suggest that early detection of symptoms may help reduce adverse outcomes many children experience in academic and social settings due to undiagnosed ADHD.

**Abstract Title:** A Pilot Study Investigating Prenatal Barriers to Healthcare for People with Intellectual and Developmental Disabilities

**Authors:** Paige Benard, Nicholas Sirhan, Kelly Ellis, Asef Hoque, Brenda Varriano, Ariel Cascio, Neli Ragina

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Neli Ragina, Ph.D.

### Background

Studies have reported pregnancy rates ranging from 0.5%–10% or higher among individuals with intellectual disability (ID) or developmental disability (DD), depending on the population studied, the definition of disability, and other factors<sup>1,2</sup>. Pregnancy-related outcomes indicate mothers with ID and DD were significantly more likely to have preterm deliveries, low birth weight infants, and stillbirths<sup>1</sup>. Studies have demonstrated that healthcare barriers in people with disabilities include difficulties with accessibility<sup>3</sup>, exclusion from informational resources<sup>4</sup>, inadequate provider training<sup>5</sup>, and social stigma<sup>6,7</sup>. In addition to having an ID or DD, expectant mothers who also experienced racial and socioeconomic disparities were more likely to have adverse birth outcomes<sup>3</sup>. In Michigan, poorer health outcomes are reported in 14 rural, central Michigan counties, further exacerbating barriers to healthcare faced by marginalized populations<sup>8</sup>, such as mothers with ID and DD living in rural communities. Although, healthcare barriers before, during, and after pregnancy have been characterized, there is limited data on what the barriers are for people with ID and DD specifically during pregnancy<sup>9,10</sup>.

### Objective

The aim of this study is to identify barriers that prevent pregnant people with ID and DD in central Michigan from receiving adequate prenatal care.

### Methods

A mixed method approach was used where participants were given the option of taking a closed-ended survey and/or an open-ended semi-structured interview. These are modeled after a previous study on motivators, facilitators, and barriers of health care utilization among inner-city women<sup>11</sup>. The target population was identified from the electronic medical record system using the following ICD-10 codes: for ID (277.2, 299.0, 299.00, 299.01, 299.1, 299.10, 299.11, 299.8, 299.80, 299.81, 317-318.2, 319, 330.8, 758.0, 758.31, 759.81, 759.83) and for DD (299.9, 299.90, 299.91, 333.71, 343.0 – 343.3, 343.8, 343.9, 344.89, 759.5, 760.71).

### Results

All 8 participants identified as women. As for race, participants were white (N=3), black (N=4), and other (N=1). For age, 3 of the participants were aged 18–20 years, whereas 2 reported older. Participants indicated the reasons for seeing a doctor include learning about labor and delivery (n=7), to have a healthy baby (n=7), and to talk to someone about their pregnancy (n=6). Participants indicated reasons for avoiding prenatal visits include being able to take care of themselves during pregnancy (n=4), did not want to be examined by a man (n=4) and the unplanned nature of the pregnancy (n=4). Common barriers to access included transportation problems (n=2) and not knowing where they could go to see a doctor about their pregnancy (n=2). Depression was reported as a major barrier to seeing a doctor (n=5).

### Conclusion

Our pilot study provides preliminary data on specific concerns and barriers noted by respondents including logistical and informational obstacles, personal preferences, and depression most notably impacting access to care. These preliminary findings are the first findings to the authors' knowledge investigating specific barriers within pregnant people with ID or DD diagnoses.

### Significance

By identifying and recognizing the challenges that pregnant people with ID and DD face in obtaining healthcare we can design interventions that will improve access and healthcare quality.

**Abstract Title:** Can Emergency Physicians Accurately Predict Source of Infection for Septic Patients Upon Presentation to the Emergency Department?

**Authors:** Margaret Beyer, Nicole Wanis, Jo-Ann Rammal, Stephanie Stokes-Buzzelli, David Berger, Sudhir Baliga, Joseph Miller, Ronny Otero, Howard Klausner

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Howard Klausner, M.D.

**Background:** Patients with severe infections often present to the Emergency Department (ED) for initial evaluation. Patient history and physical exam can often be limited early in the septic patient's course. Classic signs of productive cough, fever, or dysuria with cloudy urine are often lacking. CMS Sepsis Core Measures (SEP-1) require clinicians to determine whether a patient with an infection has severe sepsis or septic shock and is expected to initiate broad-spectrum antibiotics and weight-based fluid resuscitation within 3 hours of establishing sepsis. With limited information obtained from history and physical examination, many clinicians are tasked with accurately predicting the source of infection. As a result, they may opt to prescribe early broad-spectrum antimicrobial coverage without attempting to predict the likely source of infection.

**Objective:** The objective of this study was to assess the level of agreement between clinician prediction of likely source of infection and final diagnosis of source of infection.

**Methods:** This was a prospective observational trial. Data was collected between September 2017 and December 2019 at an urban tertiary care medical center ED, with the assistance of undergraduate research associates. Clinicians were surveyed after the initial patient encounter and before labs resulted. Fisher's Exact test was used to determine the potential significant association between guessed sources and the diagnosis of the final source. Simultaneously, the Kappa statistic was used to evaluate the level of agreement.

**Results:** There were 111 patients included in the analysis, 62 (55.9%) were female, 89 (80.2%) were African American, and the mean age was 53.1 (SD 19.2) years. The median time from patient arrival to treating clinician survey was 2 [IQR 1, 3] hours. The median time to antibiotic administration was 4 [IQR 2, 5] hours. Median ED length of stay was 8 [IQR 6, 12] hours. Overall, there was a high level of agreement between clinician's guessed sources and final source diagnosis. Fisher's Exact test had a p-value < 0.001, showing the significant association between two sources. Kappa statistics had a value of 0.717 (95% CI = (0.596, 0.838)), suggesting a substantial level of agreement beyond chance.

**Conclusions:** This trial sheds light on the challenging task faced by clinicians in predicting the likely source of infection in patients presenting with severe sepsis or septic shock. Our study found a high level of agreement between clinicians' guessed sources and final source diagnosis. This illustrates that clinicians can accurately predict the probable source of infection despite the limitations of clinical examination and history to gather information.

**Significance:** These results emphasize the importance of further research to refine the methods used in predicting sources of infection, potentially guiding more accurate and targeted early interventions for patients with severe sepsis or septic shock.

**Abstract Title:** Assessing the Phenomenon of Brain Fog in Long COVID Patients Using a Novel Survey

**Authors:** Wing Lee Sheung, Patrick Iskander Fakhoury, Hyungee Ha, Pauline Do, Udit Thawani, Hannah Yeung, Sethu Reddy

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Sethu Reddy, M.D.

### Background

Since the onset of the COVID-19 pandemic, there has been growing concern regarding the long-term impacts of COVID-19 on health. This long-term sequela is commonly referred to as “long COVID.” Long COVID symptoms often manifest well beyond the acute infection phase. Brain fog, a prevalent symptom of long COVID, is a term used to characterize cognitive impairment. There is speculation that factors such as pre-existing conditions may affect the severity and duration of brain fog symptoms. An understanding of the progression of brain fog over time and its relationship with COVID-19 infection will help clinicians treat and improve the prognosis of individuals experiencing long COVID symptoms. Given that brain fog tends to be a “catch-all” term, it would be helpful to describe the symptoms in more detail to define a “long COVID-related brain fog syndrome.”

### Objectives

Our goal is to identify the prevalence and manifestations of brain fog in individuals who have had self-reported COVID-19 diagnosis and determine the impact of any pre-existing conditions on the severity of brain fog symptoms.

### Methods:

This is a prospective, cross-sectional survey study designed to evaluate the severity and frequency of brain fog symptoms between individuals aged 18 to 65 with (Experimental) or without (Control) a history of COVID-19 diagnosis. Subjects were recruited from university-affiliated practices and interviewed during provider visits to determine if they met the study eligibility criteria. A novel, validated survey instrument aimed at assessing and characterizing brain fog was administered. Descriptive statistics were used to analyze the differences in brain fog between the experimental group with a diagnosis of COVID-19 six months ago or earlier, and the control group with no history of COVID-19.

### Results

Within the first two months of the study, a total of 57 patients (Control=27, Experimental=30) completed the brain fog survey. Among patients reporting brain fog, the occurrence was 11/27 (40.7%) and 24/30 (80%) for the control and experimental groups, respectively. These findings are statistically significant based on our preliminary dataset ( $p=0.002$ ). The survey examined 26 cognitive function modalities measured on a Likert scale, of which 21 modalities demonstrated similar results in both groups. We will present this updated information at the Symposium.

### Conclusion

These preliminary results suggest that patients diagnosed with COVID-19 are more likely to develop brain fog symptoms as compared to those without a COVID-19 history. This may provide some support to our hypothesis that previous COVID-19 infection has a long-term effect on cognitive function. Our survey instrument may be useful in operationally defining “brain fog” for a more precise symptom characterization. We aim to continue patient recruitment to include up to 300 subjects in our dataset and analyze the relationship of patient variables to brain fog. Further conclusions and insights into prospective future investigations will be deduced once the full data set is collected.

### Significance

**This study demonstrates the increased frequency of brain fog symptoms within the experimental group compared to the control group, suggesting the possibility that a history of COVID infection modulates the occurrence of brain fog symptoms.**

**Abstract Title:** Unraveling the heterogeneity of adipose tissue distributions among individuals with type-2 diabetes mellitus using high-throughput imaging analysis

**Authors:** Shahzaib Chughtai, Peng Zhang

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Peng Zhang, Ph.D.

**Background:** Patients with Type 2 diabetes mellitus (T2DM) are susceptible to a variety of complications such as diabetic retinopathy, nephropathy, myocardial infarction, and stroke. Risk factors of T2DM include environmental factors, lifestyle, and genetic predisposition. The clinician's "eyeball test" is a commonly used way of assessing functional status in patients. Alternatively, they may gauge patient health using body mass index (BMI). These approaches are inherently imprecise in evaluation of a given patient's condition. Analytic Morphomics can provide quantifiable data on patient health and physical condition. This technique involves obtaining measurements on specific biomarkers throughout a patient's body, which can provide greater specificity than current methods. The distribution of adipose tissue in abdominal areas of the body is known to correlate with insulin resistance and the progression of Type 2 Diabetes.

**Objective:** The aim of this study is to analyze the utility of morphomic analysis in predicting complications of T2DM, and to ultimately develop a more individualized risk assessment tool for these complications.

**Methods:** Morphomic characteristics were acquired through quantitative measurements on de-identified abdominal computed tomography scans. 1788 patients from a clinical registry were used for reference imaging analysis. 238 diabetic patients were identified. The geometry and tissue characteristics for the diabetic individuals were then compared with those for non-diabetic individuals. Contrast enhanced CT images were used for analyzing spine, skin, fascia, dorsal muscle group (DMG), skeletal muscle, and the psoas muscles. In addition, pelvis scans were processed as an anchor for fascia measurements. We focused on the distribution of adipose tissue as our morphomic biomarker and analyzed its relationship with T2DM.

**Results and Conclusions:** Our results show that T2DM patients have significantly greater levels of adipose infiltrated muscle compared to the control group. At the L4 level on the left side of the body, diabetic individuals had higher lean density to normal density psoas muscle ratios. The difference was found to be significant,  $t(34)=2.906$ , two tail p-value = 0.0063. Diabetic patients exhibited greater visceral adipose tissue area, lower lean muscle and greater adipose-infiltrated muscle than the control group did.

**Significance:** The significant differences in psoas and DMG density ratios, between the two groups of patients, support the idea that adipose infiltration levels and low density muscle can be useful indicators of diabetes likelihood. Focusing on these imaging features, along with use of morphomic analysis, may lead to increasingly accurate prognostic tools for T2DM.



**Abstract Title:** Determination of the Effect of CKD Status and Number of Fractures on Parathyroid Hormone Levels in a Population of Postmenopausal Women  
A Pilot Study in a Community-Based Hospital

**Authors:** Shivam Desai, Neehar Haryadi, Michael Sacchetti, Joel Dejonge, Christina Maser

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Christina Maser, M.D.

## Background

The prevalence of osteoporosis and fractures has been increasing in the older population in the United States. It is currently estimated that almost 10.2 million people in the United States aged 50 years and older have a diagnosis of osteoporosis, with more than 80% being post-menopausal women. Among these women, it is estimated that one in two of them will have an osteoporosis-related fracture, due to the loss of estrogen's role in the maintenance of bone health.

While estrogen deficiency is a major hormonal cause of osteoporosis, the etiology of this disease is likely multifactorial. One proposed etiology involves a rise in parathyroid hormone (PTH), a hormone that promotes reabsorption of calcium, via multiple mechanisms.

Elevation of PTH beyond the normal physiologic range of 15-65 pg/mL can be seen in patients with chronic kidney disease (CKD). This is because of the kidney's response to PTH, resulting in increased bone turnover and risk of fracture.

Current guidelines state PTH should be measured only when serum calcium is elevated. However, with nearly 16.6% of postmenopausal women receiving a diagnosis of CKD and suffering fractures, PTH levels must be considered.

## Objective

Due to the prevalence of osteoporosis, and subsequent increased number of fractures experienced by postmenopausal women, we sought to explore the association between PTH levels, CKD status, and number of fractures a woman experiences.

## Methods

A retrospective chart review was carried out on patients identified to be female, over the age of 40, and had a fracture over the past 5 years. We collected and recorded patient demographics, patients' diseases, characteristics of the fractures and treatment, treatment course of osteoporosis, and biochemical details of endocrine dysfunction, including markers of parathyroid or thyroid disease. Data pertaining to CKD status, number of fractures, and PTH levels were then analyzed using a one sample t-test and Wilcoxon between the four groups and plotted.

## Results

In our study, patients who were CKD positive and had suffered two or more fractures had PTH values nearly twice as high as those individuals who were CKD positive and had suffered only one fracture ( $p < 0.0001$ ). In addition, patients who were CKD positive and had suffered one fracture were also found to have significantly higher PTH values than those individuals who were CKD negative and had suffered two or more fractures ( $p < 0.0001$ ).

## Conclusion

From our analysis, the results show that postmenopausal women with CKD who suffered multiple fractures had significantly elevated PTH values. This indicates that current screening guidelines may not be sufficient in this population and number of fractures and CKD status must be considered in screening for hyperparathyroidism.

## Significance

Recognition of CKD status as a factor for screening for hyperparathyroidism will help to implement early bisphosphonate and vitamin D treatments that ultimately prevent future fractures for this population.

**Abstract Title:** Identifying methods used to manage weight and shape by first year university students: a qualitative analysis

**Authors:** Rico Generoso, Samantha Hahn

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Samantha Hahn, Ph.D.

**Background:** The transition from high school to college is a critical period for young adults, marked by changes in the food environment, identity formation, perceived social pressures, and exposure to diet culture. High levels of weight- and shape-related concerns are observed as well in this population, meaning that first year college students may go to great lengths in order to change their weight or shape. However, we have an inadequate understanding of the contemporary strategies used by young adults to change their weight or shape. For decades, the measures used to assess weight and shape management strategies have remained stagnant and focused on behaviors used to lose weight. However, the behaviors young adults are adopting today to manage their weight and shape are influenced by social media and disseminating changing beliefs around ideal bodies, nutrition, and physical activity. Especially given the development of new supplements and technology, evaluating contemporary behaviors is crucial to understanding their impact on health.

**Objective:** To identify contemporary strategies used by first-year university students to lose weight, maintain weight, or change their body shape.

**Methods:** First-year university students (n=661) completed an open-ended, web-based survey. Cross-sectional data were analyzed qualitatively using a reflexive thematic approach to identify strategies used to lose weight, maintain weight, or alter body composition. Thematic maps were constructed for each weight-related goal.

**Results:** Four main types of strategies were used to achieve all three weight-related goals among first-year college students: changes in diet, changes in exercise, self-monitoring, and disordered eating. One behavioral strategy observed across all weight-related goals was prioritizing protein consumption, including protein gained from supplementation. However, there were also differences in strategies by weight-related goal. For example, only participants aiming to lose or maintain weight reported mindful strategies for monitoring diet. Individuals aiming to alter body composition reported heterogeneity in goal-related intentions (i.e., to gain muscle, to tone, or to change shape), targeting specific body parts through exercise, and extensive unregulated supplement use.

**Conclusion:** First-year college students use a variety of strategies to manage their weight and shape, many of which are harmful for health. Some strategies were observed across goals, whereas others were specific to the weight-related goal. More research is needed to understand the impacts, particularly the safety, of using the contemporary strategies identified in the present study.

**Significance:** Many college students, regardless of their goal, exhibit behaviors that could be considered disordered eating but are not currently assessed in traditional disordered eating and dietary assessment methods. Amidst a vast amount of weight and shape-related information and misinformation on social media, increases in curvy and muscular body image ideals, and associated social pressures, additional research is needed to assess what influences first-year college students to perform potentially harmful behaviors to manage their weight or shape and what the long-term implications may be on mental and physical health.

**Abstract Title:** Understanding motives for participation and engagement in the Otago Exercise Program: a study among mid-Michigan older adults

**Authors:** Rica Generoso, Harrison Loftus, Jyotsna Pandey

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Jyotsna Pandey, M.D., Ph.D.

**Background:** Falls are one of the major health risks faced by older adults (Moreland, Kakara, & Henry, 2020). The Otago Exercise Program is an evidence-based fall prevention program that has been shown to significantly reduce falls and improve strength and balance in older adults (Yang et al., 2022). While there is strong evidence to support the physical benefits of the Otago Exercise Program, little is known about individuals' intrinsic motives to participate in the program beyond concerns over falling. Recent pilot surveys distributed to Otago Exercise Program participants have reflected overall satisfaction with the Otago classes, strong improvements in strength and cognitive abilities, and increased socialization reported by participants.

**Objective:** To further assess the motives driving older adults in rural central Mid-Michigan to participate in the Otago Exercise Program in hopes of maximizing future and continued participation and providing more proactive fall prevention in the community.

**Methods:** Surveys to gauge overall satisfaction with the Otago program, noticeable improvements in strength, balance and cognition, and increased socialization were distributed to participants at four centers. These centers are located in the Senior Centers or Commissions on Aging (COA) premises in Isabella, Gratiot, Clare and Midland counties, and are run in collaboration with them. The present Otago program participants reside throughout the central Michigan area. Survey responses were analyzed to better understand satisfaction with the Otago Exercise program and motives to continue participating over time.

**Results:** Of 17 respondents, 59% reported that they worry about falling during daily activities. The majority of participants reported retention or improvement in independence (88%), improved balance (81%), improved mood and well-being (81%), and increased motivation to be more active during the day (94%), with 47% reporting more than 3 hours of movement in addition to the weekly class. All participants reported satisfaction with social benefits and improved strength that come with participation. Additional benefits include help with overcoming fears around falling (57%) and improved memory and focus (56%).

**Conclusion:** Our findings provide initial insight into what motivates rural-dwelling older adults to participate in the Otago Exercise Program, a proven effective methodology for reducing fall risk. A unique benefit of the program is its accessibility and its ability to foster a sense of community, especially among individuals living in rural locations such as central Michigan. By understanding the factors influencing motivation in the program, further studies may improve access and visibility of the program, which will ideally improve physical health and emotional wellbeing within these rural Michigan communities.

**Significance:** Rural communities have historically suffered from inequitable access to health care services and are not innately conducive to socialization amongst older populations. Building both strength and community is crucial for older individuals living alone or in homes with stairs. Preventative healthcare measures are the single most effective method for reducing health complications later in life. Thus, increasing awareness and access to the Otago Exercise Program within rural areas of Michigan may help improve long-term health outcomes in these communities.

**Abstract Title:** Effect of Urinary Protocol on Urinary Retention following Total Joint Arthroplasty

**Authors:** Brittany Hamama, Joseph Vyskocil, Samantha Silvers, Karissa Konwerski, Michell Cin, Tarek Taha

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Tarek Taha, M.D.

**Introduction:** Post-operative urinary retention (POUR) is a well-known complication following total joint arthroplasty (TJA). One possible intervention to reduce the incidence of POUR is the implementation of a preoperative urinary retention protocol. Prior studies report inconclusive evidence to support or refute the use of alpha-adrenergic medications such as tamsulosin or direct-acting parasympathomimetic agents such as bethanechol as chemical prophylaxis in the prevention of POUR.

**Objective:** The aim of this study is to investigate whether using a preoperative urinary retention protocol including bethanechol and tamsulosin reduces the incidence of POUR, minimizing hospital length of stay and facilitating patient recovery. This study compares the incidence of urinary retention in patients undergoing total joint replacement with and without a urinary protocol using sampled total joint arthroplasty patient data.

**Methods:** Statistical analysis was primarily conducted using SAS software, version 9.4 (SAS institute Inc., Cary, NC). Descriptive statistics provided were mean and standard deviation for age at the procedure and count and percentage for categorical variables. Multivariable logistic regression with penalized likelihood estimate by Firth was used to identify the association between development of POUR and the variables of interests. The analytical results were considered to be significant when the 95% confidence intervals (CI) for odds ratio (OR) did not contain 1. The urinary protocol included administration of bethanechol and tamsulosin to patients undergoing total joint arthroplasty.

**Results:** Data from 236 patients were gathered, with 153 undergoing the urinary protocol (bethanechol and tamsulosin) and 83 not utilizing the protocol. Patients subjected to the urinary protocol were 16.19 times more likely to experience POUR compared to those who did not follow the protocol. Furthermore, there was no statistically significant correlation between the occurrence of POUR and factors such as the type of procedure, patient age, gender, anesthesia (general/spinal), or foley catheter status.

**Conclusions:** The results of this study challenge the efficacy of using a preoperative urinary retention protocol involving bethanechol and tamsulosin in reducing the incidence POUR after TJA. Instead of offering a protective effect, the protocol appears to exacerbate the risk of developing POUR. These findings prompt a reevaluation of the use of such pharmacological prophylaxis in the preoperative management of patients undergoing TJA. Given the complexity of POUR's etiology and the limited impact of demographic and surgical variables observed in this study, it becomes clear that the mechanisms by which urinary retention protocols impact POUR require further investigation.

**Significance:** This study's findings highlight the need for a reassessment of preoperative urinary retention protocols in orthopaedic surgery, particularly those involving bethanechol and tamsulosin, which unexpectedly may heighten the risk of POUR rather than mitigate it.

**Abstract Title:** Microbial Etiology and Antibiotic Resistance Patterns of Urinary Tract Pathogens in Hospitalized Children: A Single-Center Experience

**Authors:** Fatema Hammad, Michelle Talukder, Ahmad Farooqi, Wael Abukwaik

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Wael Abukwaik, M.D.

**Background:** Urinary tract infections (UTIs) are common in children. Early diagnosis and prompt treatment are crucial to avoid complications. However, providing appropriate empirical antibiotic treatment is challenging for any clinician while waiting for 48 hours for susceptibility results, considering the rise in urinary pathogens resistant to commonly used antibiotics, especially with the emergence of extended-spectrum beta-lactamase (ESBL)-producing organisms.

**Objectives:** Our study aims to investigate the local resistance patterns of uropathogens causing acute UTI in hospitalized children at Children's Hospital of Michigan during a 3-year period and to provide guidance for the preferred choice of empirical antibiotic treatment at the time of diagnosis.

**Methods:** We conducted a retrospective study that included children aged >1 month and < 18 years admitted for acute UTI between April 1, 2020, and March 31, 2023. UTI defined as positive urine culture with a single microorganism of  $\geq 100,000$  colony-forming units (CFU)/mL. Patient with inappropriate method of urine collection, on intermittent catheterization and immunocompromised were excluded. We use SAS (version 9.4) to perform statistical analysis.

**Results:** Data from 310 children were analyzed, with 83% being female. The majority of patients (40%) were under one year of age, and 87% were generally healthy without underlying urological abnormalities. A notable portion had a previous history of UTI (35%) or constipation (22%). Afebrile UTIs were significantly associated with recent hospitalization ( $p=0.010$ ) and antibiotic use within the last 30 days before UTI onset ( $p=0.036$ ). The predominant causative organism was Escherichia coli (E.Coli), identified in 83% of patients, followed by Klebsiella pneumonia (7%), with 24 out of 257 (9%) being E.coli ESBL-producing organisms. All microorganisms exhibited the highest resistance to Ampicillin (54%), followed by Amp/Sulbactam (41%). Trimethoprim/Sulfamethoxazole resistance slightly increased to (28%) during April 2022-March 2023 from (22%) the previous two years. Cephalosporin antibiotic resistance was highest against Cefazolin (a first-generation cephalosporin) at (15%). Aminoglycosides demonstrated low resistance rates among all cultured uropathogens (4%), and carbapenem resistance was lowest at (0.3%).

**Conclusion:** E. coli is the predominant uropathogen causing acute UTI during childhood. Our data suggest an increasing resistant trend to Ampicillin and Trimethoprim/Sulfamethoxazole.

Cephalosporins may be the most appropriate choice of antibiotic as empirical treatment for acute UTI in our community.

**Abstract Title:** The effects of vitamin D levels on risk of ovarian cancer and prognosis: a systematic review

**Authors:** Emily Heinrich, Magdalena Iannello, Meaghan Holub, Morgan Minelli, Claire Bova, Brianna Callahan, Beth Bailey

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Beth Bailey, Ph.D.

**Background:** Ovarian cancer is the eighth most common cancer in women with the highest mortality rate of all gynecological cancers. Serum vitamin D level has been explored as a possible modifiable risk factor for development and progression of this disease, although studies have varying results.

**Objective:** The proposed study aims to answer the questions: do women with low levels of vitamin D have a higher risk for developing ovarian cancer and, do low vitamin D levels at the time of ovarian cancer diagnosis predict a poorer prognosis than in those patients with adequate vitamin D levels?

**Methods:** A systematic search was performed in PubMed, CINAHL, Cochrane, and Scopus. Cohort, case-control, in vivo, in vitro, and ex vivo studies assessing the effect of vitamin D levels on the risk of developing ovarian cancer, prognosis at time of diagnosis of ovarian cancer, or both, published in English since 2010 were included.

**Results:** Seventeen studies were included in this review. Mixed results were concluded from the case-control studies. Approximately half of the studies found ovarian cancer patients to have lower vitamin D levels. However, other case-control studies did not find significant links between vitamin D serum levels and ovarian cancer patients. Of the studies to investigate survival rates, both articles reported significant increases in survival rate in vitamin D sufficient patients. Cohort studies found similar mixed results to the case-control experiments, while experimental studies produced more significant results pertaining to vitamin D's ability to reduce proliferation and decrease progression in ovarian cancer cell lines.

**Conclusions:** This review has determined that lower vitamin D levels are a risk factor for the development of ovarian cancer. In addition, it was found that ovarian cancer patients with low vitamin D levels have a worse prognosis comparatively.

**Significance:** These results accentuate the recommendation for supportive monitoring and management of vitamin D status in ovarian cancer patients to promote better outcomes with surgical and medical management. Future therapies that utilize vitamin D and its derivatives may have major implications in reducing the mortality rate associated with ovarian cancer and provide a promising avenue for future research into curative therapies for this deadly disease.

**Abstract Title:** Monotherapy in Heart Transplantation Proves to be Safe While Followed by T-Cell Immune Function Testing

**Authors:** Eunji Jeong, Avani Kanungo, Jon Kobashigawa

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Jon Kobashigawa, M.D.

**Purpose of Study:**

Tacrolimus monotherapy immunosuppression (TMI) in heart transplantation occurs due to adverse effects from concurrent drugs. It has been found to be safe as noted by the TICTAC trial (2011). However, tacrolimus levels in that study were maintained in the 8-12 ng/ml range resulting in higher serum creatinine levels at 1-year post-transplant. The T-cell immune function blood test (TCIF) is used to assess the immunosuppressive state of heart transplant patients. It is not known if tacrolimus levels in the 4-8 ng/ml range provide adequate immunosuppression on TMI using the TCIF.

**Methods Used:**

Between 2010 and 2021 we assessed 15 heart transplant patients who were maintained on TMI for at least 9 months. During this period of monotherapy, tacrolimus levels, along with TCIF were recorded. The tacrolimus level and TCIF results ( $\geq 2$  tests) were averaged during this period of time. Subsequent 3-year (actuarial) survival, development of rejection, cardiac dysfunction, cardiac allograft vasculopathy, and renal dysfunction (GFR) were recorded.

**Summary of Results:**

Of the patients on TMI, the average tacrolimus level was  $6.5 \pm 0.9$  ng/ml and the TCIF test was  $266.2 \pm 157.5$  (therapeutic 200-550). There were no episodes of cardiac rejection within 3 years of starting monotherapy. Furthermore, cardiac function remained normal, and 86.6% had no development of cardiac allograft vasculopathy (CAV) and survival was 93.3% within 3 years of monotherapy. GFR remained in an acceptable range. (see Table)

**Conclusions:**

Tacrolimus monotherapy in heart transplant patients maintained at a therapeutic TCIF range appears to be safe and efficacious. With this lower level of tacrolimus, there does not appear to be a risk for rejection and/or renal dysfunction.



**Abstract Title:** ACOG & KDIGO Criteria Used In The Diagnosis Of AKI In Pregnant Patients With Pre-Eclampsia

**Authors:** Thomas Johnon, Lexie Alexander, Steven Ater, Maliha Berner, Stephanie Esposito, Renee Sundstrom

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Renee Sundstrom, D.O.

**Background:** Identifying acute kidney injury (AKI) in pregnant patients diagnosed with pre-eclampsia remains an important clinical challenge, early identification of AKI reduces morbidity and mortality in this population.

**Objective:** Acute kidney injury may serve as an earlier indicator of severe pre-eclampsia than the current ACOG criteria for renal insufficiency. We hypothesized that there was significantly more acute kidney injury identified in pregnant patients with preeclampsia when using KDIGO criteria vs the ACOG criteria.

**Methods:** In this study conducted and approved by the IRB (IRB#C-23-08), the charts of 418 patients between the ages of 18 and 45 years old who were diagnosed with pre-eclampsia at Covenant Medical Center in Saginaw, MI between January 2020 and December 2022 were reviewed. Data was abstracted from these charts and analyzed statistically for significance using a multivariate linear regression model.

**Results:** Patients were evaluated based on the proportion of patients who meet the KDIGO criteria and later develop severe features of preeclampsia vs those who do not develop severe features. We found that of the 418 (41.39%) patients included in the study, 173 patients had AKI as defined by KDIGO criteria, while only 36 (8.61%) patients had AKI as defined by ACOG criteria. Of those with KDIGO-AKI, 74.6% of patients had at least one severe feature, while 100% of patients with ACOG-AKI had at least one severe feature.

**Conclusions & Significance:** This suggests that centers where only ACOG criteria is used to diagnose AKI in patients with pre-eclampsia may be missing cases of AKI and patients' renal protection may not be adequate. Further exploration into this question should examine the effect, identification, and management of AKI using these two criteria systems.

**Abstract Title:** Improving Cardiovascular-Related Outcomes in Patients after a Percutaneous Coronary Intervention (PCI) with Ticagrelor

**Authors:** Sharat Kamath, Richard Mortensen

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Richard Mortensen, M.D., Ph.D.

**Background:** Coronary artery disease is the most common type of heart disease and the leading cause of death in the United States. Excessive plaque buildup can result in sudden plaque rupture with platelet aggregation, leading to an acute thrombus formation. This can cause a sudden occlusion of the coronary arteries and an acute myocardial infarction. Patients may need to undergo a percutaneous coronary intervention (PCI) to restore blood flow to the heart. After the procedure, patients are placed on an antiplatelet regimen to prevent the formation of a stent thrombosis. Antiplatelet medications can prevent stent thrombosis by inhibiting the platelet aggregation step of hemostasis via P2Y12 receptor inhibition. Ticagrelor is the first oral, reversible, direct-acting inhibitor of the P2Y12 receptor and functions by preventing adenosine diphosphate binding to P2Y12; by doing so, ticagrelor inhibits continued platelet aggregation.

**Objective:** This literature review investigated whether the inhibition of platelet aggregation via P2Y12 receptor inhibition with ticagrelor improves cardiovascular-related patient outcomes, such as ischemic events, bleeding events, stroke events, and death from cardiovascular causes, following a PCI.

**Methods:** A comprehensive search of peer-reviewed journals relevant to ticagrelor and PCIs were procured from PubMed from 2003 to 2021. Articles from PubMed were researched, read, analyzed, evaluated, and summarized. The reference section for each article was searched to find additional articles that could be potentially utilized for the review. The journals and publications that were searched included: Circulation, StatPearls, Journal of Clinical Investigation, Journal of the American College of Cardiology, New England Journal of Medicine, The BMJ, The Lancet, European Heart Journal, JACC: Cardiovascular Intervention, Therapeutics and Clinical Risk Management, BioMed Research International, JAMA, and Catheterization and Cardiovascular Interventions. Several figures from the articles were utilized and modified for this review. This review consists of 36 articles.

**Results:** Ticagrelor results in significantly greater mean percentage inhibition of platelet aggregation than clopidogrel. Ticagrelor decreases the cumulative incidence of adverse cardiovascular events compared to clopidogrel after 12 months. Ticagrelor decreases the cumulative incidence of cardiac death, myocardial infarction, and stroke in patients with coronary bifurcation lesions compared to clopidogrel after 12 months. Ticagrelor monotherapy after 3 months of dual antiplatelet therapy decreases the cumulative incidence of major bleeding and adverse cardiac events. Ticagrelor reduces the rate of cardiovascular death, myocardial infarction, and stroke through 3 years.

**Conclusions:** Several clinical trials demonstrated that ticagrelor decreases the composite of cardiovascular death, myocardial infarction, and stroke as well as major bleeding in heart patients after a PCI. However, ticagrelor can also result in higher rates of minor bleeding so further research into ticagrelor and the broader class of P2Y12 inhibitors is needed to improve the lives of heart patients.

**Significance:** This review highlights the effectiveness of ticagrelor with regard to improving cardiovascular-related outcomes. Further research into ticagrelor as well as the broader class of P2Y12 inhibitors could be worthwhile for heart patients in the United States, as heart disease is the leading cause of death in this country and over 18 million adults are currently living with coronary artery disease.

**Abstract Title:** Exploring the Possible Utility of Bacteriophage Therapy to Combat Antimicrobial Resistance Using the “One Health” Context: A Systematic Review

**Authors:** Sharat Kamath, Drake Dzierwa, Ryan Graff, Andrew Stevens, Neli Ragina

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Neli Ragina, Ph.D.

**Background:** “One Health” is a concept that calls for the combined efforts of multiple disciplines of science to obtain a higher standard of health for humans, animals, and the ecosystem/environment. As many pathogenic microbes around the world develop antibiotic resistance, researchers have turned to bacteriophages as a potential treatment for antimicrobial resistance. Bacteriophages are viruses that infect and replicate within bacteria, with some phages altering their bacterial host’s genome. By utilizing a bacteriophage’s preference in a prokaryotic host, these potential treatments could function without the risk of infecting humans themselves. Few studies have compared the efficacies of phages against resistant microbes to current antibiotic treatments and even fewer have done so within a One Health context.

**Objective:** This systematic review sought to review the current literature to evaluate the efficacy of bacteriophage therapy vs. current antibiotic treatment in the One Health context against Methicillin-resistant *Staphylococcus aureus* (MRSA) and *Pseudomonas aeruginosa*, two common causes of nosocomial infections.

**Methods:** Articles from PubMed, CINAHL, and Scopus were procured from 2010-2023. The inclusion criteria were articles from 2010 or later, articles with relevance to the comparison of bacteriophage therapy to current treatment regimen to MRSA or *Pseudomonas aeruginosa* infection AND/OR relevant to the One Health approach to antibiotic resistance, articles that also included a quantifiable bacterial load, and articles written in English. Articles were excluded if they were written before 2010, had no relevance to current treatment of MRSA or *P. aeruginosa* and/or no relevance to the One Health approach, did not mention phage therapy, were not written in English, and did not have quantifiable bacterial load. 1,048 abstracts were procured and reviewed. 107 of the 1,048 were duplicate articles. Of those that remained, 40 articles were included based on abstracts and 901 were excluded. After reviewing those 40 articles, 26 constituted the final dataset, including 4 systematic reviews and 22 experimental studies.

**Results:** 14 articles in the final dataset (n=26) concluded that bacteriophage therapy alone was more effective than antibiotic therapy alone. 7 showed antibiotics alone were more effective than bacteriophages alone, and 5 were inconclusive when comparing efficacy.

**Conclusions:** 14 of the studies included in the final dataset determined that bacteriophage treatment alone was significantly more effective than antibiotic therapy alone against MRSA and/or *P. aeruginosa*. A common thread in this dataset is the synergism of combined bacteriophage and antibiotic therapy, as combination therapy has been shown to augment the load reduction seen with antibiotics alone. The One Health analysis revealed that antimicrobial resistance resulted in higher medical costs, increased economic burden, prolonged hospital stays, and increased mortality. Additionally, it was found that widespread use of antimicrobials can increase bacterial resistance in animals, contaminate the water supply, and antibiotics in food production can result in hypersensitivity and allergic reactions.

**Significance:** This review highlights the potential utility of bacteriophages as treatment options against MRSA and/or *P. aeruginosa*- both alone and as adjunct therapy- especially through the integrative lens of One Health.

**Abstract Title:** A Review of the Clinical Utilization of Oral Antibacterial Therapy in the Treatment of Bone Infections in Adults

**Authors:** Robert Kasemodel, Nicholas Haddad, Maddie Carr, Haley Gorski, John Harad, Jennifer Jarvis, Jibrán Ajaz, Lina Mansour

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Nicholas Haddad, M.D.

**Background:** Chronic osteomyelitis in adults is managed with prolonged courses of intravenous antibiotics in conjunction with surgical debridement of necrotic bone. Over the past 40 years, there has been no paradigm shift in this approach, as randomized controlled trials of this standard of care compared to alternatives such as prolonged oral antibiotics are scarce. However, there have been many small trials, case reports, and review papers evaluating the effectiveness of oral treatment for chronic osteomyelitis. The oral route for infections requiring prolonged treatment is intuitively and practically more favorable due to several advantages, the most important of which is the avoidance of long-term IV antimicrobial therapy with its complications, inconvenience, and cost.

**Objective:** The primary objective of this review is to promulgate clinical recommendations on the use of oral antibiotics in bone infections in the context of initial therapy, transition from intravenous therapy, and the role of chronic suppression. The secondary objective is to summarize current knowledge of the specific oral antimicrobial agents that are commonly utilized, together with a synopsis of the available literature pertaining to their pharmacokinetic/pharmacodynamic properties and duration of therapy in bone infection.

**Methods:** We reviewed the literature evaluating oral antibiotic therapy in the management of chronic bone infections since 1975. The majority of osteomyelitis infections are caused by *Staphylococcus aureus*, hence we focus on its treatment using oral antibiotics; however, we also emphasize subpopulations of patients with diabetes, implanted hardware, and with less common bacterial organisms.

**Results:** In the majority of the reviewed papers, there were no clinically significant differences between oral and parenteral antibiotics for the treatment of osteomyelitis if the targeted pathogen(s) were sensitive to the antibiotic(s) being utilized. These results outline the importance of pathogen-specific therapy, which could be enteral as long as other patient and drug related factors are taken into consideration.

**Conclusions:** When used in the appropriate patient and condition, oral treatment is a welcome alternative to IV therapy with ample advantages and generally equally favorable outcomes.

**Significance:** This review displays the myriad studies which discuss the clinical efficacy and advantageous profiles of oral vs. parenteral antibiotics for treating osteomyelitis in adults—a discussion that ultimately leads to distillation of those papers into clinically applicable recommendations.

**Abstract Title:** Comparison of Ideal versus Actual Body Weight Dosing of Intravenous Immunoglobulins for Immune Thrombocytopenia: A Retrospective Analysis

**Authors:** Hamdi Lababidi, Jimmy Gonzalez

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Jimmy Gonzalez, Pharm.D.

**Background:** Intravenous immunoglobulin (IVIG) is a weight-based therapy used to treat immune thrombocytopenia (ITP). Although pharmacokinetic data support the use of ideal body weight (IBW) based dosing, clinical outcomes for this dosing strategy are lacking.

**Objective:** This study aimed to compare the clinical outcomes between actual body weight (ABW) and IBW-based dosing of IVIG in the treatment of ITP as well as to compare the costs associated with the two dosing strategies.

**Methods:** This retrospective, multicenter chart review compared clinical outcomes and costs for patients with ITP treated with IVIG dosed via ABW or IBW. Data were collected from November 1, 2019 to May 5, 2022. The primary outcome was early platelet response, and secondary outcomes included length of stay (LOS) and increase in platelet count.

**Results:** A total of 74 patients were included for analysis. Early platelet response rates were not significantly different (59.1% vs. 46.2%,  $P = 0.309$ ), nor was LOS (9 vs. 7 days,  $P = 0.195$ ) nor the increase in platelet count (54.5 vs.  $14.5 \times 10^9/L$ ,  $P = 0.471$ ). The estimated average cost of IVIG per patient was \$5,880.57 lower for the IBW group.

**Conclusions:** The utilization of IBW-based dosing of IVIG for ITP treatment was not associated with a change in early platelet response, LOS, or increase in platelet count compared with ABW-based dosing but was associated with cost savings.

**Significance:** This study suggests that for ITP treatment, electing to dose IVIG via an IBW-based strategy would not produce significant differences in clinical outcomes compared to an ABW-based strategy. Significant cost reductions were, however, observed with IBW-based dosing. Further research, such as a prospective investigation with a larger sample size or a meta-analysis, would be needed to further explore differences between these two treatment strategies.

**Abstract Title:** Determination of Risk Factors for the Development of Capsular Contracture in Reconstructive Breast Surgery

**Authors:** Alexia Lucas, Magdalena Iannello, Beth Bailey, Anthony Zacharek

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Anthony Zacharek, M.D.

Capsular contracture (CC) is a significant complication associated with breast implant placement. To reduce risk, it becomes crucial to pinpoint the primary factors associated with CC development in patients undergoing breast implant surgery. The goal of this study was to improve the outcomes of breast reconstruction using breast implants by examining the relationships between CC development and eleven previously investigated risk factors: implant type, implant placement, incision type, the use of acellular dermal matrix (ADM), the application of antibiotic pocket irrigation, the utilization of oral Accolate, patient age, patient race, medical insurance type, prior radiation therapy, and previous occurrence of capsular contracture. This retrospective, case control, chart review included 100 patients who received breast implants for reconstruction following mastectomy. This study compared patients who developed CC (n=50) with those who did not (n=50). Significant risk factors for developing CC were non-private medical insurance ( $p = 0.024$ ), textured implant type ( $p < 0.001$ ), prepectoral implant placement ( $p = 0.024$ ), inframammary incision type ( $p=0.021$ ), and non-usage of ADM ( $p < 0.001$ ). After control for significant background differences, an increased risk for the development of CC for patients who had prepectoral versus subpectoral implant placement (2.33(1.01-5.45)), inframammary versus other incision type (4.60(1.16-18.22)), and non-usage versus usage of ADM (17.12(6.13-47.75)). Overall, among the eleven evaluated risk factors, non-private insurance, textured implants, prepectoral implant placement, and inframammary incision type were identified as significantly increasing the risk of developing capsular contracture, and the use of ADM substantially reducing the likelihood of capsular contracture development. Findings provide both patients and physicians with data to make well-informed decisions about their reconstructive breast procedures, and to better evaluate whether opting for breast implants aligns with the most appropriate method of reconstruction for them.

**Abstract Title:** IDENTIFYING PATIENT AND FAMILY KNOWLEDGE GAPS ABOUT HEMATOPOIETIC STEM CELL TRANSPLANT AS A TREATMENT FOR SICKLE CELL DISEASE

**Authors:** Katherine Mesaros, Brian Berman, Erin Goode, Karin Przyklenk, Robert Thomas

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Brian Berman, M.D.

**Background:** Sickle cell disease (SCD) is the most common inherited hemoglobinopathy worldwide, occurring in approximately 1 in 400 black Americans. With a human leukocyte antigen (HLA) matched sibling donor, a hematopoietic stem cell transplant (HSCT) can be curative, with low mortality risk. While HSCT has been shown to be curative, only 1,200 transplants have been reported since 1984. Younger recipients have less complications, including both acute and chronic graft versus host disease, making it advisable to identify candidates in early childhood.

**Objective:** Utilizing the parental population at a sickle cell center at an urban tertiary care center in the Midwest, our aim was to identify gaps of knowledge about HSCT and potential candidates for HLA testing.

**Methods:** Surveys were conducted by parents or guardians at their child's annual comprehensive sickle cell clinic appointments. After informed consent was obtained, subjects were educated about HSCT risks and benefits before completing a nine-question survey, using a Likert scale to determine knowledge of HSCT and willingness to participate in HLA testing. Data were analyzed descriptively.

**Results:** Eighty-six parents/guardians completed the survey. The median patient was 10 years of age (1-21 years). Most caregivers (88%) were aware that HSCT was a curative option for SCD. However, significant gaps in both the subjects' understanding of HSCT and willingness to consider HSCT therapy for their children were identified. Fifty-nine percent knew that the ideal donor for HSCT is a full sibling, without SCD, who is a "tissue HLA match." A minority (26%) of parent/guardians were aware that the test for an HLA match can be a painless cheek swab of patient and full siblings, at no cost to the family. Half (51%) of parents/guardians expressed interest in obtaining cheek swab tests from potential sibling donors. Despite apparent knowledge gaps, 81% of parents/guardians noted that if a potential sibling donor were available, they would like to learn more about HSCT as an option for their child.

**Conclusions:** Our results reveal that guardians of patients treated at our hematology clinic are aware that HSCT is a curative therapy for SCD. However, we found additional education is required to increase subjects' understanding of the simple, painless process of identifying potential sibling-donors via cheek swab. Our data suggests that an educational strategy may increase the willingness of families to consider cheek swab testing, and therefore identify potential sibling donors.

**Abstract Title:** Elderly Adult Opioid and Substance Use patterns Following COVID-19 Mandated Isolation: A Study in Urban and Rural Michigan

**Authors:** Eleanor Nguyen, Yousif Gariaqoza, Brandon Snel, Varun Vadnala, Jyotsna Pandey

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Jyotsna Pandey, M.D., Ph.D.

**Introduction:** Among homebound older adults there exists a need to evaluate the intersectionality between socioeconomic status, aging, and drug use. Within the backdrop of COVID-19 mandated isolation, this study seeks to elucidate this intersectionality utilizing a population of socioeconomically disadvantaged older adults (aged 60 and older) residing in inner-city Detroit and rural central Michigan, evaluating the impact of significant crisis periods on drug use (prescribed or otherwise) behaviors. Insights garnered for this study are situated to significantly contribute to the understanding of the complexities faced by this population, especially in times of heightened stress due to isolation.

**Methods:** A 57 question IRB-approved survey was distributed to participants of the Program of All-Inclusive Care for the Elderly (PACE). The questionnaire assessed changes in opioid and other drug use of both self and non-self during COVID-19 isolation. Descriptive statistics were utilized to analyze the data.

**Results:** The survey predominantly represented females (61%) and White/Caucasian individuals (74%). Most participants were aged 55-64, with varied educational backgrounds. In opioid use, 38 participants had a history with 12 reporting regular use. Notably, one participant used opioids for non-pain relief, and six used non-prescribed opioids. Only two participants started using opioids in the last six months, and one experienced an overdose without medical intervention. This individual also reported a shift in opioid use during COVID-19. Responses from loved ones indicated that 6 out of 14 were current opioid users, with four experiencing an overdose during COVID-19. The majority initially used prescribed opioids, with 12 undergoing treatment. COVID-19 impacts showed 21 out of 48 respondents reporting an increase in substance use, including a rise in opioid use. One notable comment mentioned a personal tragedy related to opioid misuse.

**Conclusion:** The study found limited evidence of increased opioid use among the elderly during the pandemic, despite a rise in other substance use. This highlights the impact of isolation on substance use patterns. Half of the current opioid users are in treatment, emphasizing the importance of such services. The data suggests a need for ongoing monitoring and education about opioid prescriptions, particularly due to misuse arising from legal prescriptions for pain relief.



**Abstract Title:** Predictive Characteristics of Run-In Period Adherence In a Randomized Controlled Trial

**Authors:** Carla Obeid

**Abstract Category:** Clinical Health

**Advisor/Mentor:**

**Introduction:** The run-in period has been used in randomized controlled trials in obstructive sleep apnea (OSA) to assess continuous positive airway pressure (CPAP) adherence. We hypothesize that there are differences in participant characteristics and PAP adherence between those excluded after the run-in period and those included in the final analytic sample of the Sleep Apnea Stress Study (SASS, NCT00607893), a trial designed to examine effect of PAP treatment on intermediate cardiovascular outcomes. **Methods:** The SASS trial was designed to include a 2-week run-in period with a 1-month wash-out period. Patients with CPAP adherence >4 hours of CPAP use for 70% of run-in period nights were randomized. Demographic factors were compared among groups using analysis of variance (ANOVA) or Kruskal-Wallis test in continuous variables, Pearson's chi-square test or Fisher's exact test was used for categorical variables. Bonferroni correction was applied for pairwise comparisons. SAS version 9.4 (The SAS Institute Cary, NC) was used to perform all analyses. **Results:** Fifty-nine participants (30.8%) who did not meet PAP adherence threshold were excluded after run-in period and compared to Sham and CPAP treatment group (n=74 in each group). Results are presented as excluded vs sham treatment vs CPAP treatment. Participants excluded after the run-in period were more likely to be female than those who proceeded to randomization: 66% vs. 47% vs. 45%, p=0.031 and of Black race: 73% vs. 42% vs. 47%, p=0.002. Participants excluded after the run-in period and those non-adherent to treatment in sham and CPAP were younger than adherent participants: excluded: 48.9±12.0, sham non-adherent 49.7±12.3, CPAP non-adherent 47.7 ± 13.2, sham adherent 58.3±9.3, CPAP non-adherent 54.3 ± 9.4, p=0.014. In the run-in period, participants who were excluded had the median of number of days using the device 12 (IQR 7-15), mean of average daily use 2.8±2.1 hours and median percent of days with 4+ hours use 18.2% (IQR 0-57.1%). **Conclusion:** We identify that age and race are predictors of run-in period non-adherence to PAP therapy underscoring the need to develop pre-randomization PAP adherence optimization strategies specific to these subgroups to ensure representation in the trial. **Support (if any):** This work was supported by NIH HL079114-02.

**Abstract Title:** Immune Checkpoint Inhibitors and Immune mediated T1D and DKA

**Authors:** Manthan Patel, Aiden VanLoo, Adil Mohammed, Natalia Oviedo, Jun Kim, Samantha Silvers, Rami Ebrahim, Tiara Bolton, Chad Martin, Hunter Li, Rupak Desai, Sethu Reddy, Nicholas Hadad

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Rupak Desai, MBBS, Sethu Reddy, M.D., Nicholas Haddad, M.D.

**Background:**

Diabetic Ketoacidosis (DKA) is a medical emergency that arises from acute metabolic complications due to insulin deficiency. It accounts for 14% of all hospital admissions of diabetic patients<sup>1</sup>. DKA arises mainly in patients with type 1 diabetes, and around 3% of type 1 diabetics initially present to the hospital with DKA. With the recent advancement in cancer research, immune modulator therapies like Immune checkpoint inhibitors (ICIs) have become the guideline therapy for more than 12 different cancers. With the increased use of ICIs, there have been increased reports of various endocrinologic adverse events. There is limited research that quantifies and consolidates information about DKA and average glycemic index, risk factors, demographics symptomatic presentations of patients developing Type 1 DM with ICI use. We performed a systematic review of published case reports to identify commonalities between patient disease presentation, ICI use, and development of immune-mediated diabetes mellitus.

**Objective:**

To understand and quantify the impact of Immune checkpoint inhibitors (ICIs) on patient's glycemic index and further identify any relationship between patient presentation.

**Methods:**

A comprehensive systemic literature search from PubMed Web Science, CINAHL, and Google Scholar was performed identifying case reports showing the development of new-onset diabetes mellitus in patients using immune checkpoint inhibitors. Descriptive analysis was performed to better identify the characteristics and presentation of patients.

**Results:**

Based on our parameters, 130 reports with 149 cases were included. Primary tumors among the patients comprised lung cancer (34.9%) and melanoma (31.5%). Amongst all the cases, about 88% of the patients were treated with anti-PD-1 (program cell death) receptor, with nivolumab (34.9%) and pembrolizumab (26.2%) being the most common agents. Cases were more commonly found to be males (61.7%) and of Asian (36.6%) or North American (35.6%) background. Presentation most commonly started after the third cycle (13.4%) and was noted to occur between 1-50 doses. Diabetic Ketoacidosis was diagnosed in 69.8% of individuals, and the average presenting blood glucose was 611 mg/dl with HbA1c of 8.2%. Autoantibody data was largely missing; however, anti-GAD antibodies were noted to be present in 29.5% of cases. 34.2% of patients had coexisting endocrinopathies with thyroiditis being the most common, occurring in 20% of patients. 1.3% of patients did not survive the initial hospitalizations, with the vast majority (95.3%) remaining on insulin and a select few (2%) were eventually able to discontinue insulin.

**Conclusions:**

Diabetic Ketoacidosis is a rare but potentially life-threatening metabolic emergency. Thus, it is paramount that clinicians maintain close monitoring of blood glucose and endocrine function when a cancer patient who recently started ICIs gets admitted for hyperglycemia. Patients with Keytruda usage or lung cancer have increased odds of having DKA. Further research is warranted to understand the onset of diabetes mellitus at the molecular level.

**Significance:**

As the use of Immune checkpoint inhibitors (ICIs) increases, it is important to understand the full scope of its impact on the patient. We demonstrate the relationship between ICIs and DKA with further stratification of risk factors, which will allow physicians to treat and subvert metabolic emergency.

**Abstract Title:** Investigation of effects of hypothyroidism and fracture history on bone mineral density in post-menopausal women: A Pilot Study in a Community-Based Hospital

**Authors:** Michael Sacchetti, Joel Dejonge, Shivam Desai, Neehar Haryadi, Christina Maser

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Christina Maser, M.D.

**Background:** Hypothyroidism's impact on bone health and fracture risk is less understood than hyperthyroidism. Overt hypothyroidism suppresses bone turnover, prolonging the remodeling cycle. Limited clinical data exists on hypothyroid states and decreased bone mineral density (BMD). Studies on post-thyroidectomy hypothyroidism yield conflicting results. Autoimmune-induced hypothyroidism links to higher fracture scores, and levothyroxine overtreatment may mimic hyperthyroidism. Literature reviews differ on hypothyroidism's effects on bone health, with some studies not finding a clear connection with decreased BMD. Investigating hypothyroidism's additional impact on BMD in postmenopausal women, who already face increased bone loss, is relevant. Our study aims to compare BMD in postmenopausal women based on history of hypothyroidism and bone fracture history.

**Objective:** This preliminary analysis aims to assess the potential association between post-menopausal status, thyroid disease, fracture history, and bone mineral density.

**Methods:** This retrospective study focused on post-menopausal females (minimum age 40) diagnosed with osteopenia or osteoporosis, who presented with fractures at a local emergency department from January 2020 to December 2022. The participants were categorized into four groups: those with hypothyroidism and one fracture (group 1), hypothyroidism with a history of at least two fractures (group 2), euthyroid individuals with no thyroid disease history and one fracture (group 3), and euthyroid individuals with a history of at least two fractures (group 4). Via chart review, the study collected BMD data from lumbar spine, bilateral hips, and bilateral wrists using dual x-ray absorptiometry (DEXA) scans. T-scores from bilateral hips and wrists were combined for patients with only one side scanned.

**Results:** In comparing the L-spine BMD between the four groups, 59 individuals in group 1, 46 individuals in group 2, 134 individuals in group 3, and 102 individuals in group 4 had a BMD of a L-spine reported. The comparison of L-spine BMD yielded a p-value of 0.745. T-score of the hip had 57 individuals in group 1, 46 individuals in group 2, 132 individuals in group 3, and 95 individuals in group 4 had a T-score of their hip reported. The comparison of hip T-scores yielded a p-value of 0.114. T-score of the wrist had 36 individuals in group 1, 22 individuals in group 2, 83 individuals in group 3, and 64 individuals in group 4 had a T-score of their wrist reported. The comparison wrist T-scores yielded a p-value of 0.668.

**Conclusions:** In comparing BMD of the L-spine, T-score of the wrist, and T-score of the hip, we report no significant differences in these values indicative of bone loss between the four groups. Initial thoughts included a possible additive effect of hypothyroidism on diminished bone health in post-menopausal women. However, this preliminary analysis shows no significant change in BMD among postmenopausal women based on history of hypothyroidism and bone fracture history.

**Significance:** Further analysis on hypothyroidism and BMD will need to consist of a subset of the data to compare the fractures and bone mineral density values between those who have primary hypothyroidism, hypothyroidism status post thyroidectomy, and those who are euthyroid with no thyroid disease.

**Abstract Title:** Determination of risk factors associated with amyloidosis and when to perform a biopsy during carpal tunnel surgery: A Pilot Study in a Community-Based Hospital

**Authors:** Michael Sacchetti, Shivam Desai, Bradley Hunt, Charles Keane, Anthony Zacharek

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Anthony Zacharek, M.D.

**Background:** Carpal tunnel syndrome (CTS) is a common disorder causing pain and numbness of the upper extremity due to median nerve compression. The exact cause remains uncertain, with research exploring anatomical variants, cystic disease, rheumatologic causes, and the wild-type transthyretin amyloid subtype that is associated with increased risks of cardiac and renal amyloidosis. While clinicians biopsy during surgery due to CTS preceding cardiovascular disease, there is no formal screening protocol. Amyloid deposition in the kidneys can also lead to complications, emphasizing the need for cost-effective screening guidelines. Although previous research proposed guidelines, their efficacy is limited, necessitating further investigation and expansion to include chronic kidney disease and idiopathic neuropathy.

**Objective:** The pilot study assesses proposed screening guidelines in a community hospital, serving a semi-rural population, to determine when to obtain tenosynovial biopsy in amyloidosis testing during carpal tunnel surgery.

**Methods:** This retrospective study analyzed carpal tunnel release surgery patients through a proposed risk factor screening algorithm for intraoperative tenosynovial biopsy testing for amyloidosis, including those with a history of chronic kidney disease. Positive and negative amyloidosis cases were compared, with analyses stratified and compared based on associated risk factors.

**Results:** The study contains a sample of 105 patients (47.6% female) with a mean age of 66.0 years old. Of those, 20.0 % (n=21) cases tested positive for amyloidosis with congo red staining at one hospital, and 80.0 % (n=84) tested negative. In the amyloidosis group, 47.6% of cases (n=10) were identified with history of CKD, compared to 25.0% of cases (n=21) in the non-amyloidosis group (p=0.042). In the amyloidosis group, 71.4% of cases (n=15) were identified with diabetes, in contrast to 39.3% of cases (n=33) in the non-amyloidosis group (p=0.008). Lastly, 38.1% of cases (n=8) in the amyloidosis group had a history of heart failure, compared to 13.1% of cases (n=11) in the non-amyloidosis group (p=0.022). Furthermore, statistical analysis comparing blood urea nitrogen (BUN), creatinine, and the number of patients that had a GFR  $\geq$  60 between the amyloidosis and non-amyloidosis groups revealed p-values of  $< 0.05$ .

Lastly, a logistic regression model for predicting positive amyloidosis showed that a race of non-white had an odds ratio of 4.037 (95% CI = 1.051-53.572, p=0.045), diabetes had an odds ratio of 4.468 (95% CI = 1.124-22.104, p=0.035) and that atrial fibrillation had an odds ratio of 5.885 (95% CI = 1.548-61.292, p=0.015).

**Conclusions:** In this cohort, 20.0% tested positive for amyloidosis using a previously proposed screening algorithm, which was expanded to include chronic kidney disease (CKD). Independently, a significant association was found between a history of CKD, diabetes, and heart failure with positive amyloidosis. In logistic regression adjusting for other factors, non-white race, diabetes, and atrial fibrillation were significantly associated with higher odds of a positive amyloidosis biopsy result.

**Significance:** Further analysis will need to be conducted based on the positive patient's mass spectrometry results. Given its small scale, larger prospective studies are needed to validate the clinical utility of the screening algorithm, plus diabetes and CKD as a potential risk factor.

**Abstract Title:** Family Dynamic Factors as Predictors of Postpartum Depression: The Roles of Co-Parenting and Multiple Children

**Authors:** Deepti Sanku, Beth Bailey

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Beth Bailey, Ph.D.

**Background:**

Postpartum depression (PPD) remains the most common psychological complication of pregnancy that mothers often silently suffer with. PPD impacts the health, quality of life, and safety of both the mother and her child. Studies reveal associations between partner/co-parenting status and rates of PPD. However, there is a lack of investigation into the impact that presence of other children within the household (other children) has alongside partner status in determining PPD.

**Objective:**

This retrospective chart review aimed to identify at-risk populations of PPD, focusing specifically on the family dynamic factors of presence of a co-parent and other children. Identifying high-risk populations of patients can allow physicians to offer additional screening, support, and treatment to expectant at-risk mothers prior to delivery and early in the postpartum period to mitigate the impact of PPD.

**Methods:**

141 maternal-child dyads receiving care between 2015 and 2017 at a university-affiliated pediatric practice in the Midwestern U.S. were identified for chart review. A majority of these pregnancies were complicated by substance use. Assessments administered during a pediatric well child visit, including the Edinburgh Postnatal Depression Scale (EPDS), were reviewed and abstracted along with background factors. Mothers who completed at least one EPDS (n=123) were included in the final study sample and were considered positive for PPD if their highest score was 10 or higher. Initial analysis of background factors related to co-parenting status utilized independent samples t-tests and chi-square analysis, with  $p < .10$  considered significant for purposes of identification of confounding factors. Follow-up logistic regression analyses predicted PPD from co-parenting status and presence of other children, controlling for significant background factors.

**Results:**

Of the 123 mothers in the sample, 36 (29.3%) were identified as experiencing PPD. Maternal age and medical insurance status at delivery were significantly related to co-parenting status and were included as control variables in subsequent analyses. Absence of a co-parent did not significantly predict PPD (33.7% vs 26.9%,  $p > .05$ ). However, 33.7% of mothers with other children experienced PPD, compared to 12.0% of first-time mothers ( $p < .05$ ). In adjusted analyses, mothers with other children were four times more likely to have experienced PPD than women who were first time mothers [aOR=4.07 (95% CI 1.10-15.02)].

**Conclusions:**

This study identified other children, but not parenting alone, as a key predictor of PPD.

**Significance:**

These results identify the commonly overlooked risk factor of other children for PPD, which appears to negate any potential benefit from the presence of a co-parent. PPD remains under-diagnosed potentially due to inadequate screening assessments for PPD. The predictor of other children should be included in revisions of future standardized PPD assessments to reflect its influence on PPD. This will allow better identification of PPD. Additionally, providers should prioritize being aware of household make-up for pregnant patients before childbirth to prepare proper treatment regimens for

their at-risk patients. It is crucial for providers to be aware of the substantial risk that other children may pose to pregnant women to identify and treat PPD early.

**Abstract Title:** Determining Time to Achieve Clinically Meaningful Improvements in Pain and Disability Following Transforaminal Lumbar Interbody Fusion

**Authors:** Fatima Anwar, Vishrudh Vadudevan, Andrea Roca, Yousaf Ilyas, Alexandra Loya, Srinath Medakkar, Vincent Federico, Kern Singh

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Kern Singh, M.D.

**Background:** No study has determined how long it takes for patients undergoing minimally invasive transforaminal lumbar interbody fusion (MIS-TLIF) to achieve the minimum clinically important difference (MCID) or factors associated with early or delayed MCID achievement.

**Objective:** To determine the time it takes to achieve MCID for back pain, leg pain, disability, and physical function after MIS-TLIF and identify predictors for timing of MCID achievement.

**Methods:** Patients undergoing MIS-TLIF by the senior author were retrospectively identified.

Potential predictors of MCID achievement were collected, including demographic, diagnostic, and patient-reported outcome (PRO) data. PROs of interest included Visual Analog Scale (VAS)-Back, VAS-Leg, Oswestry Disability Index (ODI), and Patient-Reported Outcome Measurement Information System Physical Function (PROMIS-PF). PROs were collected at preoperative and 6-week, 12-week, 6-month, 1-year, and 2-year postoperative time points. MCID achievement was determined through comparison of the change in PRO scores to previously determined values in literature. Kaplan-Meier survival analysis was utilized to determine time to achieve MCID. Predictive values of delayed MCID achievement were identified through multivariable Cox regression analysis.

**Results:** Four-hundred fifteen patients were included for analysis. On average, MCID for VAS-Back was achieved at 45.6 weeks, for VAS-Leg at 41.1 weeks, for ODI at 47.6 weeks and for PROMIS-PF at 61.3 weeks. Late predictors of PROMIS-PF MCID achievement were an American Society of Anesthesiologists score of 2, workers' compensation status, better baseline PROMIS-PF, revision surgery (HR: 0.26-0.95), while a diagnosis of herniated disc was an early predictor (HR: 3.69). Workers' compensation was a late predictor MCID attainment for ODI (HR: 0.20), and worse baseline ODI and a diagnosis of herniated disc were early predictors (HR: 1.05-2.17). Hispanic ethnicity, workers' compensation, and private insurance predicted later MCID achievement for VAS-Back (HR: 0.17-0.35) and worse baseline VAS-Back was an early predictor (HR: 1.30). Foraminal stenosis and worse VAS-leg predicted faster and Hispanic ethnicity predicted slower MCID achievement for VAS-Leg (HR: 1.15 and 0.29, respectively).

**Conclusion:** Comorbidity burden, insurance status, ethnicity, spinal pathology, and baseline PROs significantly influenced the time it took for patients undergoing MIS-TLIF to experience clinically significant improvements. These results reflect underlying health disparities and can be used to identify patients that could benefit from targeted postoperative interventions to improve recovery.

**Abstract Title:** Tubular versus Unilateral Biportal Endoscopic Lumbar Decompression for Obese Patients

**Authors:** Fatima Anwar, Vishrudh Vasudevan, Andrea Roca, Alexandra Loya, Srinath Medakkar, Kern Singh

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Kern Singh, M.D.

**Background:** As endoscopic lumbar decompression is increasingly performed, it is of vital importance to evaluate outcomes compared to tubular LD in diverse populations such as patients with obesity.

**Objective:** To evaluate the safety and efficacy of tubular versus unilateral biportal endoscopic (UBE) LD for obese patients.

**Methods:** A retrospective chart review was performed to identify patients with a body mass index of 30 kg/m<sup>2</sup> or higher undergoing elective UBE or tubular LD between January 2020 to November 2023. Patients were grouped based on operative technique. Demographic, surgical, complication, and clinical outcome data were collected. Patient-reported outcome measures (PROMs) of interest included Visual Analog Scale (VAS)-Back and Leg, Oswestry Disability Index (ODI), Patient-Reported Outcome Measurement Information System Physical Function (PROMIS-PF), Veterans Rand 12-Item Health Survey Physical and Mental Composite Scores (VR-12 MCS/PCS).

**Results:** One-hundred nine patients met inclusion criteria, with 81 in the tubular group. Operative time was significantly longer for the UBE group ( $p < 0.001$ ). There was no difference in postoperative length of stay, postoperative day 0 pain scores, or estimated blood loss between groups ( $p \geq 0.425$ , all). There was no difference in acute post-surgical complications ( $p = 0.562$ , all). One patient in the tubular group developed mild respiratory distress responsive to albuterol. Four weeks postoperatively, one patient developed a superficial surgical site infection that resolved with antibiotics. There were no complications at six weeks or twelve weeks postoperatively in either group. There were no differences in baseline, 6-week, or final follow-up PROMs between groups or improvements in PROMs ( $p \geq 0.078$ , all).

**Conclusion:** The average operative time for UBE LD was longer than for tubular LD in obese patients. However, there was no greater risk of complications for obese patients undergoing UBE LD compared to tubular LD. Likewise, patients reported similar postoperative clinical outcomes and postoperative improvements in outcomes. These findings can be used to inform patient selection for UBE LD.



**Abstract Title:** The Safety of Unilateral Biportal Endoscopic Lumbar Decompression for Obese Patients

**Authors:** Fatima Anwar, Vishrudh Vasudevan, Andrea Roca, Alexandra Loya, Srinath Medakkar, Kern Singh

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Kern Singh M.D.

**Background:** While unilateral biportal endoscopy (UBE) is growing in popularity globally, studies evaluating its safety across diverse populations are lacking. Specifically, there is scarce literature evaluating complications and outcomes of UBE in patients with obesity.

**Objective:** To compare perioperative outcomes, complications and early clinical outcomes of UBE in non-obese and obese patients.

**Methods:** We performed a retrospective review of patients undergoing elective UBE lumbar decompression by the senior author. Patients were divided into cohorts based on preoperative body mass index (BMI) < 30 (Non-Obese) or  $\geq 30$  (Obese). Data regarding demographics, comorbidities, perioperative variables, perioperative through twelve week postoperative complications, and early (six and 12 week postoperative) patient-reported outcomes (PROs) were gathered. PROs of interest included Visual Analog Scale-Back Pain (VAS-BP), VAS-Leg Pain (VAS-LP), Oswestry Disability Index (ODI), Patient-Reported Outcome Measurement Information System-Physical Function (PROMIS-PF), 12-Item Veterans Rand Health Survey Physical Composite Score (VR-12 PCS), VR-12 Mental Composite Score (VR-12 MCS), and Patient-Health Questionnaire-9 (PHQ-9). Chi-square analysis and Student's t-test were used to compare demographics, perioperative data, complication rates, and baseline patient-reported outcomes. Multivariate regression was used to compare postoperative patient-reported outcomes and changes in outcomes.

**Results:** Fifty-two patients were included in the non-obese group and 36 were in the obese group. There were significant differences in ethnicity between groups ( $p=0.049$ ). Patients in the obese group had higher comorbidity burdens ( $p \leq 0.039$ , all). There were no differences in length of stay, estimated blood loss, operative time, and postoperative day 0 pain scores or narcotic consumption.

Perioperatively, two non-obese patients in the sample experienced nausea/vomiting, but there were no other post-surgical complications. One non-obese patient developed a postoperative spinal headache responsive to conservative management. There were no six- or twelve-week complications. Two non-obese patients required reoperations. One patient developed a recurrent herniation after a bending motion six weeks postoperatively and underwent a revision UBE LD. The second patient underwent a subsequent lumbar fusion for known isthmic spondylolisthesis. No obese patients required reoperation. Obese patients reported inferior baseline PROMIS-PF and VAS-BP ( $p \leq 0.046$ , both). Six weeks postoperatively, obese patients reported inferior VR-12 PCS and ODI ( $p \leq 0.025$ , both). Twelve weeks postoperatively, obese patients reported worse VAS-BP ( $p=0.048$ ). There were no significant differences in magnitude of improvement by six weeks or twelve weeks postoperatively ( $p \geq 0.176$ ).

**Conclusion:** Though patients with obesity had greater comorbidity burdens, their perioperative outcomes were similar as non-obese patients. Obese patients were not at increased risk of short- and mid-term complications, or reoperations. Obese patients had worse baseline back pain and physical function, and worse disability and physical health at six weeks postoperatively, and worse back pain twelve weeks postoperatively, but reported similar improvements in all outcomes as non-obese patients. UBE can safely be performed in appropriately selected obese patients.

**Abstract Title:** Correlations Between Race and Socioeconomic Status with Discharge Destination and Resulting Joint Replacement Surgery Outcomes: A Systematic Review

**Authors:** Benjamin West, Grant Raymor, Ahmad Yousef, Aiman Almasnaah, Usher Khan, Hussein Hamade, Michael Wolohan

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Michael Wolohan, M.D.

One of the most critical aspects of the postoperative clinical course following total joint arthroplasty (TJA) is rehabilitation. Rehabilitation modality is often determined by many factors unique to each patient. Common factors physicians consider are comorbidities, pre-operative function, insurance status, and more. Other factors, including race and socioeconomic status (SES), are likely at play but do not play a clearly delineated role. There are many studies that focus on these factors, but not many dissect the interaction between them or how they may predict the ultimate choice of rehabilitation modality and TJA outcome.

The goal of this study is to assess current literature to determine whether race and SES appear to be linked to the choice of rehabilitation modality and if this choice can affect the post-surgical outcome. A systematic review of literature was performed on articles that studied the relationship between race and/or SES and discharge destination following either primary total knee arthroplasty (TKA) or total hip arthroplasty (THA). Discussions about the corresponding post-surgical outcomes were also considered in our review. For the literature search, the PubMed, CINAHL, and Scopus databases were searched. Publications included met these criteria: participants received a primary joint replacement, details of patients' race or economic status were provided, participation in post-operative rehabilitation was documented, and indicators of surgical outcomes were provided. Studies were excluded for: participants receiving secondary or revision joint replacements, participants in clinical trials, or articles that were literature reviews. 814 articles were retrieved, and after review 35 were included in the study.

Results predominantly demonstrated a correlation between minority and lower SES patients and assignment to an inpatient rehabilitation facility or skilled nursing facility as opposed to a home discharge with outpatient therapy which was the more common modality associated with white and higher SES patients. Inpatient therapy modalities were also associated with negative post-operative outcomes including readmission rates, persistent pain, and functional measures.

Non-white minorities and lower SES TJA patients appear more likely to be discharged to inpatient rehabilitation centers. Inpatient rehabilitation centers have been associated with negative outcomes including increased readmission rates, prolonged pain following arthroplasty, and decreased functional scores. Therefore, variables disproportionately associated with non-white minorities and lower SES may predispose these cohorts to rehabilitation modalities that lead to negative post-surgical outcomes. Of note, these choices in discharge destination may be due to underlying factors such as preexisting conditions, insurance coverage, home environment, and patient preferences. More research needs to be done to further isolate the impacts of each of these factors on post-operative TJA recovery.

With the increase in recent publications focusing on disparities in medical outcomes, it is important to summarize current findings that may delineate discrepancies in orthopedic surgery outcomes. The current review suggests that there may be associations between race and SES with post-operative discharge destination which may lead to worse orthopedic surgical outcomes for non-white minorities and lower SES patients. These findings highlight the importance of further examination into the intersection of race and SES on total joint arthroplasty decision-making and outcomes.

**Abstract Title:** Cleats are a risk factor for ACL tears in female lacrosse and soccer players

**Authors:** Spencer Williams, Zoe Cass, Caitlin Slaminko, Karina Sethi, Alexa Donahoe, Paul Sethi

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Paul Sethi, M.D.

**Purpose:**

Anterior cruciate ligament (ACL) tears are common in female athletes, with most injuries caused by non-contact mechanisms. Beyond gender, it is important to identify modifiable risk factors for an ACL tear, such as the type of shoe and playing surface. The purpose of this study was to evaluate the effect of shoe type on the risk of ACL injury in competitive female athletes.

**Methods:**

A retrospective review of 256 female athletes was conducted: 128 female soccer and lacrosse athletes who had torn their ACLs and 128 age and sport matched athletes who had never torn their ACL. Sports, level of competition, mechanism of injury, type of shoe, type of stud in shoe, and playing surface were identified.

**Results:**

75.0% of study subjects who tore their ACLs were wearing cleats. In contrast, only 55.5% of the age matched group with normal ACLs wore cleats. There was a significant association found between ACL tear and the type of shoe they were wearing ( $p < 0.05$ ). In athletes who tore their ACL, 46.4% of their cleats had conical studs, 14.4% had blades, and 15.2% had a mix of the two, compared to those who have never torn their ACL with 30.5% having conical studs, 18.8% blades and 6.3% mixed. The odds of sustaining an ACL tear while wearing conical studs were 2.02 times higher than wearing blades and 2.87 times higher than wearing turf shoes.

**Conclusion:**

Female athletes who wore cleats were more likely to tear their ACL when compared to sport and age matched athletes who wore turf shoes. Wearing turf shoes as opposed to cleats appears to reduce the risk for ACL tears in high-level female athletes. Cleats with long, conical studs, especially around the perimeter of the cleat were associated with an increased risk of ACL tear and more common in the 128 athletes in this study who tore their ACLs. Based on this data, we recommend further exploration for a shoe that prevents shoe wear from being an additional risk factor for ACL injuries in female athletes.

**Abstract Title:** Birth Outcomes Following Anti-Viral Therapy for Treatment of COVID-19 During Pregnancy

**Authors:** Hannah Yang, Yosra Elsayed, Victoria Zablocki, Beth Bailey

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Beth Bailey, Ph.D.

**Background:**

While the impact of COVID-19 has been evaluated on maternal and perinatal outcomes, there is limited evidence on the most effective management of COVID-19 during pregnancy. Recent investigations have shown that a five-day course of administration of Ritonavir-Boosted Nirmatrelvir (NMV-r) for patients with mild-to-moderate COVID-19 with high risk factors can significantly reduce hospitalization and the risk of death. However, the safety and efficacy of treating pregnant patients with NMV-r have not been clearly established as clinical trials of NMV-r have excluded pregnant women.

**Objective:**

The aim of this pilot study was to examine, using observational data, birth outcomes following the use of antiviral therapy for COVID-19 infection in pregnancy.

**Methods:**

This retrospective chart review pilot study involved patients diagnosed with COVID-19 who received care at a single university-affiliated obstetrics practice grouped as having received, or not received, Ritonavir-Boosted Nirmatrelvir (NMV-r). Participant background information and birth outcomes were extracted and analyzed.

**Results:**

Of 141 patients who had COVID-19 during pregnancy, nine were prescribed and took a course of NMV-r. Infants born to women who took NMV-r had significantly shorter hospital stays (average of 2.5 days less) compared to infants born to women who did not take NMV-r. In addition, there were multiple non-significant but clinically meaningful group differences: more than 10% of those who did not take NMV-r delivered preterm, while all those who took NMV-r delivered after 37 weeks, and infants born to women who did not take NMV-r were three times more likely to be admitted to the NICU compared to infants born to women who took a course of NMV-r.

**Conclusion:**

Pregnant women who took NMV-r as treatment for COVID-19 had better birth outcomes than those who did not, with no identified adverse effects in this small convenience sample. Based on this pilot study, NMV-r may improve clinical outcomes for women who contract COVID-19 during pregnancy.

**Significance:**

**What is Already Known About this Subject?** With the lack of clinical trials on the use of NMV-r during pregnancy, case and small case control studies have been utilized to evaluate the safety of NMV-r in this population. This previous work demonstrated that the use of NMV-r is well tolerated among pregnant patients with no evidence of an increase in neonatal complications.

**What this Study adds?** Our study found that the use of NMV-r in pregnant patients with COVID-19 may be associated with improved clinical outcomes with shorter hospital stays and decreased rates of preterm birth and NICU admission. In addition, this study found no identifiable adverse effects with the use of NMV-r during pregnancy, consistent with the conclusions of previous studies.

**Abstract Title:** Effect of the Timing of COVID-19 Infection During Pregnancy and Newborn Size

**Authors:** Hannah Yang, Yosra Elsayed, Victoria Zablocki, Beth Bailey

**Abstract Category:** Clinical Health

**Advisor/Mentor:** Beth Bailey, Ph.D.

**Background:**

Epidemiological studies have shown a link between maternal viral infections and adverse birth outcomes including miscarriages, preterm birth, and congenital defects. Viral infections during pregnancy, such as influenza, have been extensively studied due to their prevalence. Infants born women who had influenza during pregnancy have been found to have significantly lower birth weights compared to those born to women who did not have influenza. While COVID-19 is similar to influenza in incidence and infectivity, specific birth outcomes related to COVID-19 infection during pregnancy are less well understood.

**Objective:**

The objective of this study was to examine the effect of COVID-19 infection during pregnancy on birth outcomes, including the relationship between the trimester of COVID-19 infection and newborn size. Findings could be used to better inform appropriate management of COVID-19 during pregnancy.

**Methods:**

This retrospective chart review study included patients diagnosed with COVID-19 who received care at a single university-affiliated obstetrics practice. Pregnant patients with a diagnosis of COVID-19 between April 2022 through April 2023 were included in this study. Participant demographics and birth outcomes were extracted and analyzed.

**Results:**

Our sample included 141 women who had COVID-19 during pregnancy, were grouped based on the trimester of COVID-19 infection. In analyses adjusted for confounding background factors, those with a COVID-19 infection during the second trimester (n=57) and third trimester (n=50) had newborns with significantly decreased head circumference at birth compared to those infected during the first trimester ( $p < 0.05$ ). In addition, compared to those with a COVID-19 infection during the first trimester, those who had COVID-19 during the third trimester had an average 1.3cm decreased birth length.

**Conclusion:**

In the current study, COVID-19 infection later in pregnancy, especially in the third trimester, significantly predicted decreased newborn size.

**Significance:**

While previous studies have demonstrated that COVID-19 infection during the third trimester of pregnancy is associated with adverse outcomes, studies have yet to evaluate the effect of infection during each trimester on specific newborn characteristics. We found that head circumference and birth length may be impacted, particularly when infection occurs in the third trimester, indicating that additional monitoring of later term pregnancies impacted by COVID-19 may be warranted.

**Abstract Title:** Quality of Life Implications Following Glossectomy: A Thematic Analysis and Review of the Literature

**Authors:** Abdulghafoor Alani, Kevin Knapp, Udit Thawani, Hunter Li, Young Lee, Beth Bailey

**Abstract Category:** Population Health

**Advisor/Mentor:** Beth Bailey, Ph.D.

Glossectomy is the removal of a portion or the whole tongue, typically following discovery of lesions suspicious for malignancy. The tongue is involved in mastication, swallowing, taste, and phonation, all of which significantly affect quality of life (QoL) and self-image. To our knowledge, no studies offer easily digestible thematic narratives for patients undergoing glossectomies, which could empower patients during their treatment journey. Our goal was to review qualitative studies examining glossectomy and QoL, and to identify common themes that could facilitate patient decision making and adjustment. The relevant literature was searched using multiple databases and relevant terms. Thematic analysis was utilized to describe the impact of partial or total glossectomy with or without free flap reconstruction on lived experience of patients. Our study analyzed 371 patients across seven studies. Five major themes emerged: (1) Patient satisfaction and adaptation: despite limited functionality, patients were satisfied; (2) Negative impacts on function; (3) Surgical factors influences on QoL: the extent of tongue resection significantly impacted QoL; (4) Objective vs. self-reported: discrepancies between objective measures and patient-reported outcomes; and (5) recovery trajectories and implications for clinical practice: improvement in functionality underscores the importance of ongoing management. Adjuvant therapy's impact necessitates setting realistic expectations. Our findings emphasize the need for personalized care and understanding patient measures of adjustment and success beyond clinical data. We hope our study provides useful information for patients who may find connection in these themes and corresponding narratives rather than numerical abstractions more typical of medical research.

**Abstract Title:** Preeclampsia Risk in Pregnant Patients with Pre-Existing Ischemic Heart Disease

**Authors:** Michelle Azar, Beth Bailey

**Abstract Category:** Population Health

**Advisor/Mentor:** Beth Bailey, Ph.D.

**Background:** Preeclampsia (PreE) impacts 1 in 25 US pregnancies. Over 70,000 maternal and 500,000 fetal deaths occur globally every year as a result of PreE. Recognized risk factors include obesity, chronic hypertension, and diabetes. PreE may elevate risk of cardiovascular disease (CVD) later in life. Despite shared vascular integrity concerns with known risk factors, there is no clear link between pre-existing CVD, particularly ischemic heart disease (IHD), and increased risk of PreE during pregnancy.

**Objective:** This study investigated whether pre-existing IHD heightens risk of PreE in pregnant patients, and if this relationship can be explained by elevated rates of hypertension, diabetes, and obesity.

**Methods:** Data were obtained from the Healthcare Cost and Utilization Project (HCUP) national database, containing comprehensive de-identified patient data on US hospital encounters. ICD-10 codes for IHD, chronic hypertension, gestational and pre-existing diabetes, obesity, and PreE were used to identify relevant cases among delivery admissions. Data were analyzed using logistic regression, controlling for confounders.

**Results:** The sample included 1,670,527 patients who delivered between 2016 and 2019. While no differences by race were observed, patients with IHD were significantly older and more likely to qualify for Medicaid. After controlling for age and insurance status, pregnant patients with IHD were nearly three times more likely to develop PreE than those without IHD (OR=2.75 (1.93-3.39)). With adjustment for possible mediators including chronic hypertension, pre-existing and gestational diabetes, and obesity, IHD was still associated with a two-fold increased risk of PreE (OR=2.07 (1.44-2.99)).

**Conclusions:** Pregnant women with pre-existing IHD face significantly higher risk of developing PreE, even when considering comorbidities including obesity, diabetes, and hypertension. PreE is a leading cause of maternal morbidity and mortality worldwide. As the incidence of IHD rises, understanding the potential interactions between these conditions becomes crucial.

**Significance:** No prior studies have examined the directional interaction between IHD and subsequent PreE. These findings support that further research is needed to clarify connections between IHD and PreE, especially in identifying IHD and its risk factors to improve PreE prophylaxis and management.

**Abstract Title:** An Exploration of Frequent Injuries in Soccer – Treatment and Return to Play Guidelines

**Authors:** Nick Chiaramonti, Michael Chiaramonti, Robert Ablove

**Abstract Category:** Population Health

**Advisor/Mentor:** Robert Ablove, M.D.

**INTRODUCTION:** With over 150,000 professional players worldwide, and 240 million amateur players, soccer stands alone as the most played sport.<sup>1</sup> It also has one of the highest injury rates among major sports, with the vast majority of injuries affecting the musculoskeletal system. As such, soccer injuries require a great deal of attention from medical professionals. Currently, there exists no review paper that details the relative frequency of soccer injuries, management of each injury, and return to play protocol for each injury. This paper aims to guide medical management of soccer injuries by compiling a list of common injuries and exploring standards of care and return to play guidelines for each injury.

**METHODS:** A literature review was performed to find articles examining soccer-related injuries. Articles were screened by examining the abstract for relevant injury and/or treatment findings. Articles that discussed relevant soccer injuries were read fully to identify the prevalence and severity of injuries presented. For consistency and clarity, articles included in this literature review were separated by age group, sex, and level of competition to guide medical professionals treating various populations more appropriately. Then, all major injuries were compared across age, sex, and competition level to compile the most common injuries in soccer. Lastly, information pertaining to treatment and return to play guidelines was added to the subsection of each injury, when available.

**RESULTS:** We identified 16 major soccer injuries across 34 peer-reviewed papers. The majority of injuries in soccer are musculoskeletal strains and contusions that occur in the lower extremities, primarily the knee and ankle. Other common injury sites include the shoulder, arm, wrist, and hand. The most common injuries outside of the musculoskeletal system were concussions. In general, injury rates appeared to be higher amongst professional athletes than in amateur and youth players.<sup>4</sup> As for age-related differences, more senior soccer players tend to be more susceptible to overuse injuries such as adductor tenosynovitis and Achilles tendinitis.

**DISCUSSION:** With some studies estimating an injury rate as high as 35 per 1000 hours of soccer exposure, the findings of this literature review can be useful for medical providers and soccer players to understand the risks of the sport.<sup>2</sup> Strained leg muscles comprise the most common category of injury in soccer of all levels. While the most severe muscle strains can keep one from playing for 6-8 weeks, they can also be susceptible to repeat injury after returning to play. Despite the increased conditioning in professional athletes, the increased speed and intensity of play leaves them more likely to experience injuries. Certain injuries may be preventable with proper care and training, which reiterates the importance of a comprehensive understanding of common injuries for both providers and participants.

**CLINICAL RELEVANCE:** These findings are useful to guide clinical treatment and risk education for young athletes. They also provide insight into which injuries are most preventable, which can inform safe training procedures.



**Abstract Title:** Current Literature Support and Opposition for Therapeutic use of Selenium Supplementation in Autoimmune Thyroid Conditions

**Authors:** Shahzaib Chughtai, Victoria Wilson, Neli Ragina

**Abstract Category:** Population Health

**Advisor/Mentor:** Neli Ragina, Ph.D.

**Background:**

This systematic review investigates the correlation between selenium status and thyroid conditions, specifically focusing on autoimmune thyroid diseases (AITD) including Hashimoto's Thyroiditis (HT) and Graves' Disease (GD). Historically, the literature has indicated a variety of roles selenium could play in thyroid health, as well as varying correlations between selenium and the measures of AITDs, depending on which papers are selected for review. For example, HT patients, in particular, seem to be described as experiencing consistent improvement with selenium supplementation, suggesting its potential as a therapeutic agent. However, the effect of selenium on GD was not as clear, with inconsistent findings across different studies. This inconsistency in the literature demonstrates why there is currently such limited guidance for practitioners on how to use selenium supplementation clinically for the treatment of AITD. To address the ambiguity of past findings, this review seeks to compile the most current literature on how selenium affects autoimmune thyroid conditions and elaborate on whether the evidence supports that patients could benefit from selenium supplementation in their treatment regimen, and in which conditions.

**Methods:**

We conducted a systematic review, analyzing 15 research studies to explore the impact of selenium levels and and/or selenium supplementation on thyroid-specific parameters used to evaluate autoimmune thyroid conditions and their progression.

**Results/Conclusion:**

GD showed an association with low selenium levels in most studies however, Graves ophthalmopathy (GO) did not show an association. Other conditions such as HT, hypothyroidism, and AITD were found with low plasma selenium. Selenium supplementation was found in one study to have a significant negative correlation between selenium supplementation and TPOAb levels. Another study showed a significant enhancement of LT4 treatment with selenium supplementation. Overall these studies support a correlation between selenium status and GD, HT, and AITD but not GO. They also support a correlation between selenium supplementation in reducing TPOAb and increasing the effectiveness of LT4 treatment.

**Discussion:**

These results are limited because there are relatively few papers in this subject area, and those that exist each have too narrow a focus to be generalized and applied clinically. Some examples included specific patient populations, disproportionate number of investigations for each condition, and lack of elaboration on how selenium intake correlates with AITD patients' selenium levels, among others. Therefore, while these results suggest there is clinical benefit from selenium supplementation, the variability in outcomes points to a need for more investigations into these specific areas to further elaborate on the clinical efficacy of selenium supplementation. Additionally, while several of these results suggest selenium as a promising addition to AITD treatment regimens, providers still must rely heavily on clinical judgment to develop individualized treatment plans for each patient, while the data is still too limited to guide specific dosing and administration strategies.

**Abstract Title:** A Comparison of Colorectal Screening between Veterans Affairs and Non-Veterans Affairs Healthcare Centers

**Authors:** Mikelina Djekovic, Abdulghafoor Alani, Blair Burnette, Samantha Hahn

**Abstract Category:** Population Health

**Advisor/Mentor:** Samantha Hahn, Ph.D.

**Background:** Colorectal cancer (CRC) is one of the leading causes of death from cancer in the United States. However, if screening is done early and effectively, this can vastly improve the outcomes of patients diagnosed with colorectal cancer. Given the unique nature of the Veterans Affairs Healthcare Systems (VA) compared to non-VA care settings, we wanted to ascertain the differences in CRC screening between these two healthcare systems. In the current literature, there are few studies that evaluated disparities in CRC screening rates and effectiveness between these two populations.

**Objective:** We aimed to ascertain any differences in the efficacy of CRC screening in VA vs. Non-VA health systems via a systematic review of the current literature.

**Methods:** We conducted a systematic review that included eight papers. Papers were selected based upon criteria including but not limited to: a comparison between the two healthcare systems, patient population over the age of 50, and studies conducted within the United States. We then evaluated findings for screening and completion rates, the stage at diagnosis, and age at screening.

**Results:** From our review, we concluded that the VA was more likely to screen for CRC at a higher rate and detect CRC at an earlier stage when compared to non-VA sites. However, the VA was more likely to begin screening at an older age and more likely to have an incomplete colonoscopy performed.

**Conclusions:** The differences in early-stage cancer detection we observed may be a product of the VA's standardized and regulated approach to CRC screening. However, non-VA care centers screened patients at an earlier age and had better quality of their colonoscopy screenings. This may be due to fewer experienced endoscopists within the VA systems and inadequate patient education.

**Significance:** The improvement in early-stage cancer detection due to the VA's new standardized approach to screening shows that these policies may be effective in improving health outcomes. These policies set a standard that non-VA centers can follow in order to improve CRC screening for the civilian population as well. However, our findings also show the importance of recruiting and retaining well-trained endoscopists to VA health centers to ensure veterans are getting the same quality of care as the civilian population.

**Abstract Title:** Cross-Sectional and Longitudinal Associations between Weight Perception and Cardiometabolic Outcomes Among Adolescents

**Authors:** Mikelina Djekovic, Abdulghafoor Alani, Blair Burnette, Samantha Hahn

**Abstract Category:** Population Health

**Advisor/Mentor:** Samantha Hahn, Ph.D.

**Background:** Several public health and clinical initiatives are specifically aimed at notifying adolescents of their weight status in efforts to encourage healthy behaviors such as exercise and eating a balanced diet. However, recent studies have found that not only is perceiving oneself as “overweight” associated with engaging in fewer healthy behaviors, but it is also associated with more harmful behaviors. Though studies have been done to examine the associations between weight perception and health behaviors, there is a lack of research on the effects of perceiving “overweight” on cardiometabolic markers of health.

**Objective:** We sought to assess the cross-sectional and longitudinal associations between weight perception and markers of cardiometabolic health.

**Methods:** Data came from waves 4 (Mage =19.20.04 ) and 7 of the NEXT PLUS Generation Health Study, a yearly longitudinal study of a nationally representative sample of adolescents (n=454). To assess cross-sectional and longitudinal associations between weight perception (perceived “overweight” vs. did not perceive “overweight”) and cardiometabolic outcomes (fasting blood glucose, HbA1c, hs-CRP, triglycerides, total cholesterol, HDL, LDL, systolic blood pressure, diastolic blood pressure, and waist circumference), linear regressions adjusting for sociodemographic variables were performed.

**Results:** Cross-sectionally, those that perceived “overweight” had higher average hs-CRP (=1.14, p< 0.001), triglycerides (=27.7, p=0.012), cholesterol (=18.5, p=.005), LDL (=13.4, p< 0.001), diastolic blood pressure (=3.6, p=0.002), and waist circumference (=18.4, p< 0.001) and lower HDL (=-5.4, p=0.018). Longitudinally, the perceived “overweight” group had a higher average HbA1c (=0.08, p=0.050) and a lower LDL (=-9.4, p=0.010).

**Conclusions:** Among a nationally representative sample of young people, perceiving one’s weight as “overweight” was associated with worse cardiometabolic health both cross-sectionally and longitudinally. Future studies are warranted to explore the causal pathway of this relationship, as well as how the effects may differ based on sex, race, ethnicity, and socioeconomic status.

**Significance:** Policies aimed at informing adolescents of their BMI status should critically examine whether such practices are in fact harmful. Our findings can help guide the decisions of both policy makers and clinicians alike when caring for this population.

**Abstract Title:** The Use of Risankizumab in Crohn's Disease and Ulcerative Colitis: A Review

**Authors:** Sarah Ecenbarger, Udit Thawani, Nick Chiaramonti, Ryan Flaherty, Nathan Klausner, Olivia Miller, Zachary Skeen, Stephen Tryban, Samantha Hahn

**Abstract Category:** Population Health

**Advisor/Mentor:** Samantha Hahn, Ph.D.

**Background:** Within the last 10 years, numerous biosimilars and other biologic medications indicated for the treatment of inflammatory bowel disease (IBD) have been introduced, expanding the therapeutic repertoire and impacting patient outcomes. One such medication is risankizumab, a fully human IgG1 monoclonal antibody that selectively targets the IL-23 p19 subunit and inhibits its interaction with the IL-23 receptor complex, first approved by the FDA for the treatment of plaque psoriasis in 2019. Since that time, there have been investigations into the efficacy and safety of risankizumab in treating other autoimmune conditions, including IBD.

**Objective:** This study systematically reviews the available literature on how remission and response rates for patients with IBD treated with risankizumab compare to those treated with placebo, non-biological regimes, or biologics that target a different protein, for the purpose of understanding the medication's relative success as treatment for IBD.

**Methods:** The review was performed according to the Preferred Reporting Items for Systematic reviews. A search was conducted using PubMed, CinAHL, and SCOPUS databases for information surrounding the use of risankizumab in patients with IBD. After the removal of duplicate studies, pairs of medical student authors screened the remaining studies using Rayyan to establish the eligible articles. Exclusion criteria removed articles that did not compare the efficacy of risankizumab to placebo or established treatments of IBD; articles that assessed efficacy of risankizumab for diseases other than IBD; and articles not presenting primary data or novel analysis

**Results:** Through our review of the eligible articles (n=10), we found that in all published studies, a correlation is found between treatment with risankizumab and partial or complete resolution of symptoms during induction and/or maintenance therapy compared to placebo, including patients who were previously unresponsive to anti-TNF-  $\alpha$  or other IBD therapies. Symptom improvements were measured by, but not limited to, Simple Endoscopic Score for Crohn's Disease (CD), CD Activity Index, and CD Endoscopic Index of Severity.

**Conclusion:** These studies suggest that risankizumab is efficacious and well tolerated for not only inducing clinical response but maintaining response over longer durations of time. As the field continues to advance, comparisons of risankizumab to other biologic and non-biologic medications will provide a clearer picture of its potential relative to more established treatments. A study limitation is that the majority of studies compared risankizumab treatment to placebo groups only for the use of CD (not ulcerative colitis).

**Significance:** Based upon current evidence, the use of risankizumab in CD is an effective treatment for many patients who are unable to enter remission or experience disease symptom regression treated with other biologic medications or other mechanisms of treatment. Clinical trials evaluating the efficacy of the use of risankizumab in ulcerative colitis are currently underway. This study works to provide guidance for optimal treatment of the IBD patient population as physicians consider a more personalized approach to medicine.

**Abstract Title:** Identity-challenging events during adolescence and ethnic identity outcomes in MENA emerging adults

**Authors:** Habeba Elmadauy, Robert Ty Partridge

**Abstract Category:** Population Health

**Advisor/Mentor:** Robert Ty Partridge, Ph.D.

### Background

Middle Eastern / North African / Arab (MENA) adolescents experience identity development in a cultural crucible. What it means to be MENA American is a challenging process of negotiating two cultures (Jassem, 2018); a challenge exacerbated in a post 9/11, post 2016, American context with increasing experiences of racism and anti-Muslim/MENA attitudes. This presents a substantial challenge for MENA adolescents who must navigate these complexities while creating a multifaceted sense of self and ethnic identity. While there is limited research on MENA American identity development, existent research on narrative identity suggests that the emotional valence with which individuals resolve identity challenging narratives is associated with differential resilience and wellbeing outcomes.

### Objective

In this study we examine the relationships between lesson learning and negative experience narrative resolution in adolescence to identity attributes and life satisfaction in emerging adulthood.

### Method

We employed a mixed-method design in which participants provided narrative descriptions of specific events in which their race or ethnicity was salient, at the following development periods: 1) earliest childhood memory of such an event; 2) early- to mid-adolescence; and 3) within the last 2 years. Participants also responded to several quantitative measures including: a measure of perceived race/ethnic integration (1=complete separation, 7=complete overlap); The Multigroup Ethnic Identity Measure (Phinney, 1992); and were asked to pick 5 adjectives to describe their feeling about their ethnic identity. Qualitative narrative experiences were analyzed through grounded theory and critical inquiry methods (Charmaz, 2017). Reflexive qualitative reactions were also collected, which situate the researcher in the narrative coding context (Berger, 2015). Lesson learning was also coded from these narratives in response to the question, "Did you learn anything about yourself from this experience". Responses were coded as 0=no lesson, 1 = concrete lesson, 2 = abstract lesson. Lesson learning was also coded in terms of positive lesson (e.g., I am a strong person) v. negative lesson (e.g., I became distrustful). This investigation is focused on the adolescent narrative descriptions given their centrality to identity development. The sample was comprised of n=38 individuals who self-identified as MENA American. The sample was predominantly female (57%) with an average age of 20.8 years (range =18 – 29 years). The age at which the adolescent narrative experience occurred was 15.3 years (range = 13 – 19 years).

### Results

The majority of respondents (93%) reported negative and/or conflict experiences in their adolescent narratives. Chi-Sq analyses indicated that participants who reported abstract lessons were significantly more likely to report a positive lesson and that positive lessons were significantly associated with adjective themes of embracing their identity and being resilient.

### Conclusion

These findings suggest that positive framing of experiences of conflict and racism among MENA American adolescents may serve as a protective factor in promoting a positive sense of self and ethnic identity. Moreover, being able to link these experiences to the broader context of being a MENA

individual in an American context may facilitate more resilient outcomes and has prevention implications.

**Abstract Title:** The Influence of May-Thurner Syndrome on the Pregnant Population: A Systematic Review

**Authors:** Patrick Fakhoury, Alan Ross, Yousif Gariaqoza, Abdulghafoor Alani, Hyungee Ha, Hannah Yang, Pauline Do, Lisa Mun, Nathaniel Stine, Beth Bailey

**Abstract Category:** Population Health

**Advisor/Mentor:** Beth Bailey, Ph.D.

**Background:** May-Thurner Syndrome (MTS) is a condition characterized by compression of the left common iliac vein due to the overlying right common iliac artery. The exact incidence and prevalence of MTS remain uncertain, and existing studies suggest that the condition is likely underdiagnosed. The aim of this systematic review is to consolidate existing research and information on the influence of MTS in the pregnant population.

**Objective:** The goal of this systematic review was to highlight the clinical impact of MTS on pregnancy. The examination of presentations, interventions, and risks of MTS in pregnancy can inform and improve clinical practices, suggesting a foundation for establishing a standard of care for the pregnant population.

**Methods:** Comprehensive searches were conducted in PubMed/MEDLINE, Scopus, CINAHL, and Web of Science. Utilizing both MeSH terms and key phrases relevant to MTS and pregnancy, an initial pool of 431 studies were reviewed. Our inclusion criteria for this systematic review focused solely on case reports or case series of pregnant women with MTS that have been published. 22 of the original 431 studies were deemed eligible and included. These 22 eligible studies focused on pregnant women diagnosed with MTS, with an emphasis placed on clinical presentations, interventions, and risks. A qualitative synthesis of findings was conducted.

**Results:** Clinically, MTS most commonly manifests as edema in the left lower extremity (76.9%) and associated pain (65.4%) predominantly in the first trimester of pregnancy. This study demonstrated that the most common comorbidities that mothers with MTS faced were thrombotic vascular disease (71.4%) and cardiovascular disease (26.9%). Ultrasound (US) was found to be the most common initial diagnostic tool (61.5%) to explore the symptoms of MTS while magnetic resonance imaging (MRI) including imaging angiography and venography (26.9%) and computed tomography (23.1%) were the most common as definitive diagnostic modalities. Heparin was the drug of choice for initiating treatment upon identifying poor circulation in the lower extremities, with or without a diagnosis of MTS. Management of symptoms continued with heparin until the delivery of neonates where patients were bridged into warfarin treatment. In more complex cases, or those at higher risk for thrombotic events, the use of an inferior vena cava filter (IVCF) and stent placement were also indicated.

**Conclusions:** This study displays a crucial insight into the relationship between MTS and pregnancy. There are opportunities for providers to familiarize themselves with the risk factors, signs, and symptoms of MTS in their pregnant patients to mitigate further complications.

**Significance:** This systematic review emphasizes the critical need for awareness and early diagnosis of MTS in pregnant women, given its potential to detrimentally complicate pregnancy with venous thromboembolism. As much of MTS is still unknown, educating physicians on the most common symptoms, along with potential primary comorbidities of MTS, could aid in early detection and prompt further diagnostic analysis to mitigate risks in the pregnant population. Future research should aim to expand on the efficacy of treatment modalities, explore immediate fetal and neonatal adverse outcomes, and explore long-term outcomes for both mothers and children.

**Abstract Title:** Multidisciplinary Care for Healthy Aging: A Scoping Review of Integrated Models of Care and Their Impact on the Elderly Population

**Authors:** Payton Wolbert, Yousif Gariaqoza, Jyotsna Pandey

**Abstract Category:** Population Health

**Advisor/Mentor:** Jyotsna Pandey, M.D. Ph.D.

**Background:** There has been global demographic landscape shift towards an aging population, creating challenges for healthcare systems worldwide. Older adults over the age of 60 are projected to constitute 22% of the global population by the year 2050. This shift necessitates multidisciplinary healthcare solutions focused on the elderly, utilizing the concept of healthy aging as a vital approach to meet the multifaceted needs of this demographic.

**Objective:** This scoping review aims to provide a detailed understanding of the benefits, drawbacks, and variations in the implementations of existing multidisciplinary care models to promote healthy aging. It seeks to highlight the effectiveness of integrated models of care and identify gaps in current practices, providing insights for future research and policy development.

**Methods:** A comprehensive search was conducted in PubMed, CINAHL, and Scopus Search databases from January 2000 to April 2023, focusing on integrative models of care and interdisciplinary interventions supporting healthy aging. 33 studies were included after the screening process.

**Results:** The results highlighted the effectiveness of a multidisciplinary care service in improving the overall wellbeing and quality of life for older individuals. Coordinated home care teams demonstrated the potential to prevent avoidable hospital admissions and improve outcomes for frail older adults. Furthermore, various interprofessional education approaches showcased the value of collaborative efforts and holistic care in addressing the complex healthcare needs of geriatric patients.

**Conclusion:** Integrated care interventions tailored to the aging population demonstrate significant benefits in enhancing well-being, quality of life, and healthcare outcomes. Additionally, there is an evident and a critical role of interprofessional teams and outcome evaluations in optimizing elderly care. However, there is a notable gap in understanding the healthcare challenges faced by rural elderly populations and the use of integrated models of care to address it, indicating a need for further research on this area.

**Significant:** This review highlights the importance of adopting collaborative, multidisciplinary, and person-centered care models to address the unique needs of the aging population. Moreover, it signifies a need for further research to explore the impact of these interventions across different contexts and to develop specific strategies, aiming to improve care quality and promote equitable healthcare outcomes for older adults.



**Abstract Title:** Exploring the role of environmental sources of stress and violence on adolescent dietary and exercise behaviors

**Authors:** Shannon Irvine, Rica Generoso, Simone Rhodes, Samantha Hahn

**Abstract Category:** Population Health

**Advisor/Mentor:** Samantha Hahn, Ph.D.

**Background:** Dietary and exercise behaviors are important, adaptable indicators of long-term health (Ness et al., 2005; Bennett et al., 2009). The efficacy of these behaviors may be impacted by adverse childhood experiences (ACEs), experiences such as abuse, neglect, and violence which can induce stress and impact an individual's life long-term (Felitti et al., 1998). With roughly one-fourth of children reporting some form of exposure to violence during their youth, the effect of exposure to violence on health and behavioral outcomes is a growing area of interest (Felitti, 2018).

**Objective:** To investigate the relationship between environmental sources of stress and violence on health-related behaviors in adolescents.

**Methods:** A nationally representative sample of 45,154 high school students aged 14-18 years were included in this cross-sectional study (YRBS; 2017-2021). Descriptive analyses were conducted to characterize the pooled sample. Binary logistic regressions were performed among the pooled sample to estimate the associations between violence score (included reports of physical, sexual, interpersonal, and weapons-related violence) and healthy behaviors (fruit and vegetable servings, breakfast, soda and sports drinks, daily physical activity, screen time, and sleep).

**Results:** The results of this study revealed several associations between positive violence scores and various health and lifestyle behaviors. Reporting a positive violence score decreased the likelihood of eating breakfast every day (OR = 0.36, 95% CI [0.28, 0.47],  $t=-7.81$ ,  $p=0.00$ ), watching 2 or less hours of television every day (OR = 0.44, 95% CI [0.34, 0.58],  $t=-6.05$ ,  $p=0.00$ ), getting at least 8 hours of sleep every night (OR = 0.35, 95% CI [0.28, 0.45],  $t=-8.43$ ,  $p=0.00$ ), and exercising at least one hour every day (OR = 0.82, 95% CI [0.69, 0.98],  $t=-2.26$ ,  $p=0.03$ ). Reporting a positive violence score increased the likelihood of consuming at least 2 cups of vegetables per day (OR = 1.51, 95% CI [1.37, 1.66],  $t=8.52$ ,  $p=0.00$ ) and drinking soda-pop/sports drinks at least once per day (OR = 1.73, 95% CI [1.51, 1.99],  $t=7.93$ ,  $p=0.00$ ).

**Conclusions:** Exposure to environmental stress and violence may modify the likelihood of healthful behaviors such as sleep, breakfast consumption, and intake of certain food groups and beverages among adolescents. Further investigation into how certain types of violence may account for specific adverse health effects in adolescents is an important next step in addressing growing health disparities and improving adolescents' health in the long-term.

**Significance:** Environmental sources of stress and violence are a serious concern for adolescents as they have been linked to worsened physical and mental health outcomes. Further research addressing factors that influence the success of health-promoting behaviors in adolescents may help guide future policy change and resource allocation, with special consideration of schools and communities that are more significantly impacted by ACE-like factors such as environmental sources of stress and violence.

**Abstract Title:** Evaluating Mental Health Screening Practices for High School Athletics Participation Across the United States

**Authors:** Rica Generoso, Hussein Hamade, Presley Sylvester-Omorodion, Vish Vasudevan, Michael Wolohan

**Abstract Category:** Population Health

**Advisor/Mentor:** Michael Wolohan, M.D.

**Background:** The mental health of high school athletes is an area of increasing concern, with rates of adolescent depression and suicide rising nationwide (Pappas, 2023; Sabo et al., 2005; Veliz & Mutumba, 2024). Though team sports participation has been identified as a protective factor for mental health, this time period is also rife with pressures around academic performance, social competition, and personal identity development, underscoring the importance of addressing and preventing mental health issues among this at-risk demographic. Despite growing recognition of the significance of mental health in the context of high school athletics, there exists a notable lack of nationwide standardization in mental health screening practices.

**Objective:** To assess the landscape of mental health screening practices among high school athletes on a nationwide basis and investigate associations between current state screening practices with rates of adolescent depression and suicide.

**Methods:** Publicly available pre-participation forms for high school athletics participation were examined to rate the extent of mental health screening performed prior to clearance for participation in each state. A Likert scale was used to evaluate the quality of mental health screening (0 for no evaluation, 1 for superficial evaluation, 2 for suggested or optional evaluation, and 3 if evaluation was required). The presence of questions about dieting behaviors and/or a Patient-Health Questionnaire-4 (PHQ-4) were noted. Visual maps were produced to examine the national landscape of practices and to compare our team's ratings with objective components of the forms (questions regarding dieting behaviors and the PHQ-4). Additionally, data from the Youth Risk Behavior Surveillance System (YRBSS) measuring depression and self-harm behaviors among high school students was collected. ANOVA tests were used to analyze the relationship between positive responses to depressive and self-harm behaviors and the extent of mental health screening across the fifty states.

**Results:** We identified a diverse range of practices across the United States, with some states lacking any acknowledgement of mental health measures and other states requiring screening and providing further guidance if necessary. Extent of screening ranged from none to required. ANOVA revealed that states that did not screen with questions on eating and weight management behaviors were more likely to have students who planned how they would attempt suicide ( $p=0.036$ ) and actually attempt suicide ( $p=0.040$ ).

**Conclusion:** Given the prevalence of mental health crises among high school athletes, a nationwide standardization of mental health and wellness screenings should be considered including protocols that promote transparency between the athlete, caregiver, school, and clinical providers and access to resources for intervention and support as needed. This approach will prioritize comprehensive evaluation while ensuring seamless communication and access to necessary resources for intervention and support.

**Significance:** High school student-athletes represent a demographic that is increasingly vulnerable to adolescent depression and suicide. The identified diverse range of mental health screening practices across the United States highlights the need for standardization where rising depression and suicide rates can be better addressed.

**Abstract Title:** What Happened to Asperger's Syndrome?

**Authors:** Madeleine Hoke, M. Ariel Cascio

**Abstract Category:** Population Health

**Advisor/Mentor:** M. Ariel Cascio, Ph.D.

### Background

Autism has long been a “classification in motion” (Hacking, 2010) and a contested category. The 1994 fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) listed autistic disorder and Asperger's syndrome as separate diagnoses under the category “autism spectrum disorders” (ASD). Nineteen years later, the 2013 fifth edition (DSM-5) removed the distinct diagnosis of Asperger's syndrome. This change was controversial in the time leading up to it, particularly among online autistic communities. Studies at the time consistently reported community concerns about potential loss of services, enhanced stigma associated with the label “autism” over “Asperger's syndrome” or “Aspie,” and loss of a distinct Asperger identity.

### Objective

This paper investigates how online autistic and Asperger's communities responded to the removal of Asperger's from the DSM-5 over the past decade. Ten years after the removal of Asperger's syndrome, we have an opportunity to see if the fears of the community or any unanticipated effects have occurred. This work categorizes community responses using three social theories that have been proposed to explain what happens when a diagnosis “disappears”: a “transient mental illness” (Hacking, 2010), a “diagnosis you have to fight to get,” (Dumit, 2006) and demedicalization (Conrad and Angell, 2004). It additionally considers how people in the Asperger's community discuss the eponym in light of Hans Asperger's involvement with the Nazi party.

### Methods

This paper reviews posts on WrongPlanet.net, one of the leading online Asperger's community forums. The posts fell between 1/1/2013-11/30/2022 and were identified based on the search terms ‘Asperger’ and ‘DSM.’ Three authors independently reviewed these posts and categorized them with deductive thematic analysis based on the arguments reviewed above related to what happens when a diagnosis “disappears.” If two or more coders agreed, the majority vote determined the code. If not, the PI acted as a tie breaker and deliberated with the authors to affirm the choices. A qualitative analysis was then used to summarize the opinions of the Wrong Planet community on each of these themes.

### Results & Conclusions

This research concludes that Asperger's remains “a way to be a person,” with both medicalized and demedicalized identity practices. Some view it as a ‘diagnosis you have to fight to get,’ with the medical label of Asperger's syndrome giving access to services but also contributing to identity formation. Others view it as an unnecessary label, and argue that no diagnosis is necessary to have an Asperger's identity. It does not appear that the diagnosis was niche or transient, as it has not faded away over the last decade. This paper shows that within the same community, there exist parallel practices of fighting for a diagnosis and demedicalizing it.

### Significance

Theorists and providers should be aware that although AS is no longer listed in the DSM-5, many autistic people continue to engage with the Asperger's concept in a variety of ways. Allies should use the results of this study to listen proactively and non-judgmentally to the range of ways autistic individuals may relate to Asperger's.

**Abstract Title:** Positive Outcomes of Gender Affirming Care for Adolescents and Children: A Systematic Review

**Authors:** Abigail Howell, Paige Bernard, Madeleine Hoke, Aleah Gillenkirk, Danielle Calimente, M. Ariel Cascio

**Abstract Category:** Population Health

**Advisor/Mentor:** M. Ariel Cascio, Ph.D.

**Background:** Gender affirming care (GAC) ensures that transgender and gender non-conforming youth (TGNC) receive medical care that supports them in their gender identity when it doesn't align with their sex assigned at birth. This encompasses medical treatment, inclusive therapy and assistance with social transitions. United States national medical organizations such as AACAP and AMA agree that GAC is the standard of care for transgender and gender non-conforming (TGNC) youth while also establishing guidelines to assist health care providers with best practices, further evidencing their support for GAC. Despite this, multiple state legislatures continue to propose restrictions on GAC, presenting a vulnerable TGNC population with even greater barriers to comprehensive health care, and efforts are also being made to criminalize healthcare providers who offer GAC to their patients.

**Objective:** This systematic review sought to investigate the benefits of gender affirming care by evaluating the reported positive outcomes on the quality of life of transgender and gender non-conforming youth. This is in contrast to existing studies that focus on how gender-affirming care can decrease negative outcomes in the lives of TGNC youth.

**Methods:** Database searches were conducted using PubMed, PsychINFO, Cochrane Library and CINAHL Plus with Full Text (EBSC) during September – October 2022 to accomplish this review. The search yielded 1,787 discrete articles, of which only two met the inclusion criteria. These studies were conducted in the United States on individuals 18 years old or less that identify as transgender or non-binary and receive GAC in their youth, and have reported outcomes that increased with GAC. Any papers studying surgery as GAC were excluded as surgery is not typically offered to minors.

**Results:** Positive outcomes of gender-affirming care were self-reported by the transgender and gender non-conforming youth involved in the studies. One study exhibited improved executive function of TGNC, including impulse and emotional control, working memory, planning, and flexibility. The other study presented a statistically significant increase in quality of life scores from TGNC participants who received hormone treatment.

**Conclusion:** Current literature is focused mostly on risk reduction, studying only the avoidance of negative outcomes: lower rates of trauma and mental health concerns. The current literature falls short in revealing the exclusively positive outcomes of GAC for TGNC by failing to measure quality of life in terms of actual benefit and improvement that GAC provides.

**Significance:** More studies need to be conducted on the positive outcomes of GAC to illustrate to a wide variety of stakeholders including political figures, healthcare workers and educators the need for and benefits of gender-affirming treatment of TGNC youth. Children and youth services scholars and providers would benefit from greater research on positive impacts of GAC, to incorporate into LGBTIQ+-affirming service provision.

**Abstract Title:** Prevalence and Associated Factors for Non-Alcoholic Fatty Liver Disease among U.S Adults in Urban vs. Rural populations from 2007 - 2019: An Emerging Public Health Crisis

**Authors:** Judy Huynh, Asef Raiyan Hoque, Sethu Reddy

**Abstract Category:** Population Health

**Advisor/Mentor:** Sethu Reddy, M.D.

**Background:** Non-alcoholic fatty liver disease (NAFLD) is the most common liver disease worldwide, with an overall estimated prevalence of 32.4%. Unfortunately, this prevalence continues to increase at an alarming rate. Despite rising cases in the US, there is a lack of insight comparing NAFLD incidence in urban and rural populations. Our investigation aims to explore the prevalence, trends, and outcomes of NAFLD hospitalizations in both US rural and urban populations. NAFLD is now referred to as MAFLD (Metabolic Associated Fatty Liver Disease) to better reflect the range of underlying metabolic conditions, including risks of diabetes mellitus and cardiovascular disease.

**Objective:** Our study aims to explore the prevalence, trends, and outcomes of NAFLD hospitalizations in both US rural and urban populations.

**Methods:** This study analyzed Healthcare Cost and Utilization Project (HCUP) National Inpatient Sample (NIS) data from 2007 to 2019 to identify NAFLD cases. Of the total cases, 847,165 (0.8%) were recorded, and 370,131 (0.5%) met the inclusion criteria. The study used Pearson's chi-square tests, independent samples t-tests, and Mann-Whitney U tests to analyze differences between urban and rural NAFLD cases. Multivariate analysis was performed using binary logistic regression models to identify factors associated with NAFLD diagnosis.

**Results:** Our study found that the number of adults hospitalized due to NAFLD has significantly increased over time in both urban and rural regions. Urban NAFLD cases make up 0.37% (n=312,035) of total urban hospital admissions, while rural NAFLD cases make up 0.31% (n=55,396) of total rural hospital admissions from 2007-2019. The two groups differ significantly in demographics, hospital characteristics, insurance, income, and outcomes. Pearson's chi-square test results showed that patient comorbidities, specifically co-diagnoses of metabolic syndrome were significantly different between urban and rural areas. After adjusting for all factors, several factors are significantly associated with NAFLD diagnosis. The odds of NAFLD diagnosis were higher in fringe counties of metro areas (O. R=1.074, 95% CI=1.044-1.105), counties with populations of 250,000-999,999 (O. R=1.146, 95% CI=1.114-1.179), counties with populations of 50,000-249,999 (O. R=1.182, 95% CI=1.140-1.226), and rural regions (O. R=1.279, 95% CI=1.233-1.327) compared to central counties of metro areas. Furthermore, after stratifying for urban and rural regions, our analysis revealed that patients who are females, aged 35-49 years, aged 50- 64 years, or white were significantly affected in both urban and rural areas. In addition, patients who also had diabetes, metabolic syndrome, and obesity had higher prevalence of NAFLD.

**Conclusion:** The prevalence of NAFLD may portend other metabolic diseases as well as cardiovascular diseases. Further studies are needed to stratify younger adults at risk of NAFLD, in both urban and rural environments. With more rural hospitals closing, we may see more rural patients with NAFLD admitted to urban centers. Early detection and diagnosis should help prevent long-term complications of NAFLD.

**Significance:** Our study aims to contribute to a better understanding of the epidemiology and public health implications of NAFLD in both urban and rural contexts.

**Abstract Title:** Compulsive exercise and alcohol misuse among college students: findings from the Healthy Minds Study, 2016-2022

**Authors:** Shannon Irvine-Marsh, Sarah Lipson, Samantha Hahn

**Abstract Category:** Population Health

**Advisor/Mentor:** Samantha Hahn, Ph.D.

### Background

Compulsive exercise and alcohol misuse are highly prevalent on college campuses. Compulsive exercise is a compensatory disordered eating behavior triggered by feelings of guilt surrounding consumption. Literature suggests a possible dose-response relationship between compulsive exercise and alcohol misuse on college campuses. We theorize that associations may differ based on gender and student status.

### Objective

To determine whether gender or student status moderate associations between alcohol misuse and compulsive exercise among college students.

### Methods

Data come from US undergraduate and graduate students participating in the Healthy Minds Study (2016-2022; n=4,556). Zero-inflated negative binomial regression analyses were performed to determine associations between alcohol misuse (binge drinking, alcohol-related guilt, AUDIT score) and compulsive exercise, and examine whether gender and student status (undergraduate vs graduate) moderate associations.

### Results

Among females, compulsive exercise was higher among those who experienced guilt ( $B=21.5$ ,  $SE=0.72$ ,  $p<0.01$ ) or had higher AUDIT scores ( $B=0.34$ ,  $SE=0.11$ ,  $p<0.01$ ). Men, however, reported lower levels of compulsive exercise with alcohol-related guilt ( $B=-18.0$ ,  $SE=0.72$ ,  $p<0.01$ ) or higher AUDIT scores ( $B=-0.21$ ,  $SE=0.02$ ,  $p<0.01$ ). No moderation by student status was found.

### Conclusion

Results suggest that women may be more likely than men to compulsively exercise to cope with guilt surrounding alcohol use. Future interventions aimed at minimizing harms of alcohol use on college campuses should target women, who are often left out of collegiate alcohol interventions.

### Significance

Compulsive exercise is a harmful behavior common on college campuses that can be triggered by guilt surrounding alcohol misuse, particularly among undergraduate and female students. Further research exploring the complex psychological mechanisms between alcohol misuse and compulsive exercise is needed to best inform collegiate interventions.

**Abstract Title:** The Role of Mental Health Status as a Predisposing Psychosocial Factor for E-Cigarette Use in Adolescents and Young Adults: A Systematic Review

**Authors:** Margaret Beyer, Pranjali Gaur, Eunji Jeong, Mark Langley, Eleanor Nguyen, Vishrudh Vasudevan, Beth Bailey

**Abstract Category:** Population Health

**Advisor/Mentor:** Beth Bailey, Ph.D.

**Background:** E-cigarette use among adolescents has greatly increased in the last few years, leading to concerns about its long-term impact on health. Previous research has suggested that psychosocial factors such as diagnoses of anxiety and depression may contribute to the initiation and maintenance of e-cigarette use among adolescents in the United States. If this relationship can be corroborated by the research available, early intervention may curb adolescent e-cigarette use and contribute to addressing mental health issues in this population. We aimed to systematically review the literature on adolescent mental health status and assess the reported risk of e-cigarette use along with risk factors for poor outcomes. **Methods:** A systematic review was performed in November 2023 in accordance with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. An exhaustive search of the PubMed database was conducted for peer-reviewed literature between 2013 and 2023. Eight reviewers filtered the results, looking for articles in English and regarding populations in the United States. Primary outcomes were the age of onset, usage escalation, and likelihood of usage. **Results:** The initial search yielded 1,622 studies. Following review, 13 studies were included. Seven out of the thirteen studies reviewed found a direct positive correlation between the presence of depressive symptoms and increased susceptibility to E-cigarette usage in adolescents. Notably, one study reported a decreased rate of e-cigarette use escalation (AudrainMcGovern et. al) in students with anxiety. The remaining studies reported a correlation between the presence of depressive symptoms and E-cigarette use but did not specify one variable being a predicting factor of the other. **Conclusions:** Despite being limited to heterogenous and retrospective case series, the evidence reviewed in this study supports the current belief of a high risk of e-cigarette use among adolescents struggling with depression/anxiety. **Level of Evidence:** Level IV—systematic review of level IV studies. **Keywords:** E-cigarette, Young adults, Adolescents, Mental Health, Anxiety, Depression

**Abstract Title:** Comprehensive and Culturally Competent Preventive Care in Native American Communities: Challenges and Opportunities (a Literature Review)

**Authors:** Katharine Keener, Rachel DeBoer, Sarah Beeharry, James Chung, Eagan Ingrody, Chloe Looman, Suveeksha Naidu, Kush Patel, Beth Bailey

**Abstract Category:** Population Health

**Advisor/Mentor:** Beth Bailey, Ph.D.

**Background:**

American Indian/Alaska Native (AI/AN) patients are disproportionately affected by deleterious health outcomes when compared to their non-indigenous counterparts in many categories of preventable disease (i.e. diabetes, hypertension, cirrhosis). It is, therefore, paramount to gain a greater understanding of the unique barriers faced by the AI/AN community to better serve their medical needs as healthcare professionals. The profound impact of long-standing inadequate access to basic healthcare coupled with historical generational trauma have contributed to community distrust of Western medicine and Western healthcare professionals.

**Objectives:**

By investigating the utilization of primary care resources and associated contributing factors, the authors aim to assess the efficacy of current approaches, better inform future public health initiatives, and improve health outcomes in this historically medically marginalized community.

**Methods:**

The authors conducted a systematic literature review and included articles published in English-language peer reviewed journals from 1978 until 2023. PubMed, CINAHL and SCOPUS were searched, and articles focused on AI/AN populations were included if they addressed: condition prevalence, perceived need for treatment, health service utilization, alternative medicine usage, perceived barriers to obtaining care, perception of health care providers, lifetime experience of racial discrimination, or the role of historical trauma in patient decision-making.

**Results:**

868 articles were initially identified and upon review against study inclusion criteria, 57 articles were selected for final analysis. The results of this review suggest AI/AN patients utilize primary care resources at a lower rate than their non-AI/AN counterparts, despite significantly higher rates of health concerns. Greater degrees of cultural competence (as demonstrated by the medical care team) were associated with higher rates of AI/AN patient utilization of primary care services. Greater efforts by the medical care team to facilitate patient access to healthcare (consideration of financial, educational, historical, and geographical factors) were associated with higher rates of primary care service utilization.

**Conclusion:**

The literature reveals that there are clear, persistent disparities in primary/preventive healthcare access and quality for AI/AN individuals. Limitations to this review include excluding unpublished or non-English language studies that could have provided valuable perspectives to the analysis. Future investigations may adopt a widened inclusion criterion, as well as explore the effectiveness of telemedicine within AI/AN communities.

**Significance:**

Administering comprehensive, culturally competent preventive care in AI/AN communities has the potential to improve health outcomes by increasing patient engagement but will require a commitment to integrating historical and cultural practices in everyday patient care.



**Abstract Title:** Using Youth Risk Behavior Surveillance System (YRBSS) to Assess Indicators of Risky Sexual Behaviors in Adolescents

**Authors:** Julia Kwapiszewski, John Byrne, Isabel Young, Alexander Forrest, Beth Bailey

**Abstract Category:** Population Health

**Advisor/Mentor:** Beth Bailey, Ph.D.

**Background:** Safe-sex education is an important part of the adolescent curriculum as adolescents are at high risk of deleterious health consequences such as unplanned teenage pregnancies and sexually transmitted infections (STIs). Previous studies have established that certain behaviors, such as substance abuse, have been correlated with risky sexual behavior in adolescence<sup>1,2</sup>.

**Objective:** Our objective was to investigate the relationship between mental health and in-school behaviors and risky sexual behaviors by developing a scale in which to quantify risky sexual behavior utilizing information provided by the YRBSS. We posit that poor mental health and in-school behaviors are potentially significant indicators of likelihood to engage in risky sexual behaviors and can help compare specific populations for targeted safe-sex education.

**Methods:** Utilizing the 2021 Youth Risk Behavior Surveillance System (YRBSS) survey, we used SPSS v.28 to analyze 17,232 12–18-year-old students across seven survey criteria previously established to assess adolescent risky sexual behavior<sup>3</sup>. These risk assessment metrics included sexual activity, sexual activity in the past three months, age of initiation, number of partners, contraceptive use for pregnancy, condom use for STI prevention, and substance use during sexual activity. Point values were assigned to answer choices from 0 (least risky) to 10 (most risky), modeled off the previously validated Risky Sex Scale<sup>4</sup>. Mental health correlations were established through assessment of feelings of sadness and difficulty concentrating. In-school behaviors were examined based on sports team participation and can be expanded to other values such as grades, excluded in 2021 survey but included in 2019 and 2023 surveys (2023 to be released in spring 2024).

**Results:** The sexually active population ( $n = 3,793$ ) was categorized using overall scores into the approximate quartile groups high risk (21-49), moderate risk (15-20), low risk (8-14), and no risk (0). In a preliminary statistical analysis, we found having feelings sadness or hopelessness and sports team participation to be significantly correlated with engaging in high-risk sexual behavior ( $N=11,132$ ,  $p=0.009$ ;  $N=11,292$ ,  $p< 0.001$ ).

**Conclusions:** Our preliminary data has shown that adolescents are more likely to engage in high-risk sexual behavior if they reported having feelings of sadness or hopelessness or do not participate on a sports team. Further statistical analyses will be done to better isolate additional metrics of adolescent behavior that correlate to risky sexual behavior that can be used to identify individuals who may benefit from intervention. We plan to update our statistical analysis using the most up to date versions of YRBSS as it becomes available.

**Significance:** An analysis of both 2019 and 2021 data has shown differences in in-school behaviors that correlate with increasing risk scores indicating that groups at higher risk of things like teen pregnancy and STIs change over time. Equipped with this tool, organizations such as schools, medical facilities, and public health departments can use these methods to discover, each year, which students should be identified for increased and targeted intervention to prevent risky sexual behaviors.

**Abstract Title:** Investigating the Relationship Between COVID-19 Hospitalization and Deep Vein Thrombosis Incidence among Patients in the United States

**Authors:** Nathaniel Lahr, Arlene Chan, Wing Lee Cheung, Yosef Mansi, Catherine Xie, Beth Bailey

**Abstract Category:** Population Health

**Advisor/Mentor:** Beth Bailey, Ph.D.

**Background:**

Exploring and describing the relationship between COVID-19 hospitalization and deep vein thrombosis (DVT) incidence in the United States is vital to aiding the early identification of at-risk patients, allowing physicians to be more aware of their patients' risk-profiles and ensure better health outcomes.

**Methods:**

Studies including randomized controlled trials (RCTs) and retrospective studies were included in this systemic review, while systematic reviews, animal studies, and case reports were excluded. The inclusion criteria comprised of patients diagnosed with COVID-19 who were hospitalized and/or non-hospitalized in the United States. A comprehensive review of literature from CINAHL, Scopus, Cochrane Library, and PubMed discovered 9 pertinent studies conducted exclusively in the United States. The findings are descriptive, and statistics are presented in a summary format.

**Results:**

DVT incidence in COVID-19-positive patients exhibited wide variability across studies, ranging from 0.91% to 47.8%, highlighting the heterogeneity in reported rates. Notably, male sex emerged as the predominant positive predictor for DVT, achieving statistical significance in four of the included articles. However, significant findings from studies directly comparing COVID-19-positive versus negative patients were contradictory. One study revealed no statistically significant difference in DVT rates between COVID-positive and negative patients ( $p=0.0423$ ). Interestingly, despite similar DVT incidence, the COVID-positive cohort exhibited higher rates of ICU admission ( $p< 0.0001$ ), prolonged length of stay ( $p< 0.0001$ ), and increased mortality ( $p=0.001$ ). Conversely, another study reported a greater DVT incidence in the COVID-positive cohort ( $p=0.005$ ) but found no association between DVT and mortality ( $p=0.94$ ). These findings underscore the complexity of COVID-19-related DVT dynamics and emphasize the importance for ongoing observation of hospitalized COVID-19 patients.

**Conclusion:**

This study demonstrated an intricate relationship between COVID-19 hospitalization and DVT, underscoring the critical need for nuanced understanding and tailored interventions among hospitalized American patients in the United States. Despite variations in reported DVT incidence and contradictory findings regarding its association with mortality, the heightened risk of DVT among COVID-19-positive patients demands vigilant risk assessment and proactive measures to mitigate complications. By integrating these essential insights into hospital and ICU protocols, healthcare providers can optimize patient care, minimize adverse outcomes, and uphold safety standards amidst the ongoing pandemic. Moving forward, continued research and collaborative efforts will be paramount in refining our understanding of COVID-19-related thrombotic complications and advancing strategies for early detection and management in hospitalized patients.

**Significance:**

Physicians must remain vigilant in risk assessment and prophylactic measures to mitigate DVT risk in COVID-19 hospitalized patients. Integrating these insights into hospital and ICU protocols is imperative to optimize patient outcomes and uphold safety standards amidst the evolving pandemic landscape.

**Abstract Title:** Public sector collaboration in healthy aging initiatives: a missing link

**Authors:** Hunter Li, Jyotsna Pandey

**Abstract Category:** Population Health

**Advisor/Mentor:** Jyotsna Pandey, M.D., Ph.D.

**BACKGROUND:** As mean life expectancy increases, adults will need geriatric care for longer periods of time. A significant number of aging populations have multiple comorbidities and a greater need for measures to ensure wellbeing and healthy aging: in fact, all 73 million baby boomers will be 65 years old by the year 2030 (1). Research into improving healthy aging for our elderly population has skyrocketed over the years with emphasis on a multidisciplinary approach, including public sector involvement with aging communities.

**OBJECTIVES:** The purpose of this project is to investigate the public sector's influence on healthy aging at the community level, and if there was effective cooperation between public sector, specifically federal/state/local government, and communities at implementation level.

**METHODS:** A literature search was done for the public sector's involvement in promoting healthy aging across several databases. The search was limited to US and Canadian programs, and included manuscripts written in English published before June of 2023. We analyzed for: (1) implementation of policy, if at all; (2) effectiveness of implemented interventions; and (3) interventions that led to improvement of the living standard and activities of daily life for the elderly.

**RESULTS:** Aside from the CAPABLE program by the Center for Medicare and Medicaid Innovation and the programs of the Healthy Aging Research Network (HAN) enacted by the CDC, most of the research done was descriptive and ended with a call to action rather than implementing a model for public sector involvement. Studies as recently as 2022 have reiterated the same calls to action as papers from 15 years prior. Effectiveness of implemented interventions was reported only for the CAPABLE program.

**CONCLUSIONS:** Research regarding the involvement of state, local, and federal government in developing improved healthy aging communities has remained stagnant. Our findings suggest that cooperation between the public sector and local communities is lacking in the sense that effective programs or policies in some areas are not being rigorously evaluated and implemented in other cities.

**SIGNIFICANCE:** To improve healthy aging for the elderly in the United States, we need to build and test implementable "models" where public sector and local communities work together. There needs to be a greater emphasis on healthy aging outcomes research on the public sector's involvement. Much of this stems from the need to enact policy changes or implementation at the local government level. Research should be measuring quality of life before and after initiation of the policy or program and should be continued well after to ensure stable progress.

1: America Counts Staff. (2019, December 10). By 2030, All Baby Boomers Will Be Age 65 or Older. The United States Census Bureau. <https://www.census.gov/library/stories/2019/12/by-2030-all-baby-boomers-will-be-age-65-or-older.html>

**Abstract Title:** Understanding Maternal Mortality: Race, Geography, and Intersectional Dynamics in the US

**Authors:** Alexia Lucas, Danielle Janowicz, Nicole Burmeister, Mahreen Anwar, Payton Wolbert, Deepti Sanku, Cade Cantu, Neehar Haryadi, Beth Bailey

**Abstract Category:** Population Health

**Advisor/Mentor:** Beth Bailey, Ph.D.

**BACKGROUND:** Despite ongoing advances in obstetric and gynecological medicine, maternal mortality (MM) rates have continued to rise in the United States. Several studies have been conducted to understand and reduce the risk factors that contribute to MM. Existing studies suggest a correlation between MM and racial background, geographical location, and post-partum (PP) insurance changes.

**OBJECTIVE:** To understand the intersectionality of race, geographical location (rural vs. urban), and PP insurance changes as risk factors for MM.

**METHODS:** This study was a systematic review of peer-reviewed articles. Following well-established inclusion criteria, eight studies with data collected from the United States were identified via PubMed, CINAHL Plus with Full Text (EBSCO), Scopus, and Google Scholar. Maternal mortality was defined using ICD-10 codes for adverse maternal health events indicative of severe maternal mortality.

**RESULTS:** Eight articles (100%) found higher MM rates in Black, Indigenous, and People of Color (BIPOC) women as compared to White women. Six (75%) of the articles agreed that women residing in rural areas were at higher risk for developing risk factors for MM compared to their urban-dwelling counterparts. Two studies investigated the intersection of demographic data and PP insurance changes. Of these, two (100%) reported women who identified as BIPOC were significantly more likely to experience PP insurance changes, and one study (50%) found that BIPOC women who reside in rural geographical areas are significantly more likely to be uninsured during the PP period than both BIPOC women residing in urban areas and white women residing in both rural and urban areas.

**CONCLUSIONS:** MM is most strongly associated with racial and ethnic background. Racial and ethnic identities compound with rural vs. urban geographical location to incur a greater risk for developing MM than either risk factor alone. Current literature suggests that PP insurance changes, primarily to non-private insurance or uninsured status, could be a main contributing factor for MM development. This study supported these findings, noting that women who identified as BIPOC, as well as those located in rural areas, were more likely to experience PP insurance changes. To combat these risk factors and decrease maternal mortality rates, insurance coverage for PP women as well as training programs to promote culturally aware, location specific healthcare approaches should be implemented.

**Abstract Title:** How are Contemporary Advocacy Approaches Implemented to Promote Healthy Aging

**Authors:** Hannah Metcalf, Jyotsna Pandey

**Abstract Category:** Population Health

**Advisor/Mentor:** Jyotsna Pandey, M.D., Ph.D.

Advocacy for healthy aging in our aging society takes diverse forms, depending on stakeholders and interventions. This review explores the link between healthy aging and advocacy for older adults. The objective of this study was to quantitatively and qualitatively assess the different ways of advocating measures to promote and enhance healthy aging. The study seeks answers to questions about advocacy approaches in effective age-friendly communities, intervention outcomes, and overarching goals of age-friendly initiatives for the past 10 years in the United States.

A literature search on advocacy and healthy aging conducted in February 2023 yielded a total of 1652 publications. Searches were performed on CINAHL (EBSCOhost), Scopus, and PubMed using terms such as aging in place, healthy aging, older adult, community advocacy, stakeholder, and reform. Rayyan was utilized to manage search results and eliminate duplicate records. Prior to the screening process, the screening team established the inclusion criteria (between 2013 and 2023, within the United States, and involving individuals aged 65 and above) and exclusion criteria (excluding physical recovery programs for elderly with chronic illnesses and falls). Decisions for the initial 50 search results were annotated as a team. Subsequently, two reviewers independently screened all remaining titles and abstracts. Following screening and subsequent full-text review of 24 articles, 15 articles were included for the final analysis.

Several emerging and uniting themes existed that connected to advocacy between the final 15 articles included for this study. The largest proportion of articles addressed effective aspects of age-friendly communities (N = 7) and reported on various sub-topics related to the collected data. The most common method for advocacy qualitative interviewing (N = 8) and subsequent analysis with age-friendly community stakeholders.

The findings reveal a somewhat limited range of advocacy approaches employed in the United States, reflecting a growing awareness of the necessity to evaluate advocacy strategies in existing healthy aging programs. The predominant use of qualitative approaches for evaluation in the included studies highlights the relevance and utility of such methods for selecting and tailoring advocacy approaches. The topic of this scoping review is not commonly found in the literature, making the exposure this paper gives to the topic uniquely relevant.

**Abstract Title:** Association in Accelerometer Physical Activity Measures and All-cause mortality in the National Health and Nutrition Examination Survey (NHANES) 2011-2012

**Authors:** Anthony Mufarreh, Felipe Lobelo, Beth Bailey

**Abstract Category:** Population Health  
Ph.D.

**Advisor/Mentor:** Felipe Lobelo, M.D., Ph.D., Beth Bailey,

**Background:** The Life Essential 8 from American Heart Association (AHA) focuses on eight steps for ideal cardiovascular health, including healthy diet, avoiding tobacco products such as cigarettes and vapes, 7-9 hours sleep daily, low non-HDL cholesterol (LDL < 190), low fasting blood sugar (FGS < 100), blood pressure below 140/90, and adequate physical activity. However, current studies to assess physical activity rely on quick and inaccurate self-reported questionnaires, limiting use of the AHA guidelines. Accelerometer measures are the gold standard in measuring accurate, non-biased, recreational, and non-recreational physical activity. Using objective physical activity measures, validation of the AHA guidelines can be used to assess its effects on all-cause and cause-specific mortality.

**Objective:** This study utilizes the National Health and Nutrition Examination Survey (NHANES) accelerometer data linked to all-cause and cause-specific mortality to evaluate relationship between objective physical activity and mortality, in the context of AHA Life Essential 8.

**Methods:** Data abstracted from NAHNES study year included subset of participants who wore accelerometers for 9 days, collecting intensity of movement in 3-plane view. Raw frequency converted to Monitor-Independent Movement Summary Units (MIM-units) for analysis. Using linked mortality data, multivariable logistic regression analysis with 95% confidence intervals comparing physical activity quintiles and mortality status were evaluated, controlling for socioeconomic, behavioral, and metabolic variables. Area-Under-the-curve (AUC) analysis was used to elucidate predictability of physical activity on all-cause and cause-specific mortality. Logistic regression comparing AHA Life Essential 8 and all-cause mortality were calculated across physical activity cut-off points.

**Results:** NHANES data contained 114.9 million participants 2011-2012 study cycle, with males 56.4 million (49.1%), white 76.5 million (66.6%), college or above 66.9 million (62.5%). Mortality was linked for 9.4 million (8.5%) participants, with a majority due to cardiovascular 1.9 million (20.2%) and 2.4 million (25.5%) malignant neoplasm causes. On logistic regression analysis, higher physical activity quintile was associated with a lower risk of all-cause mortality (OR 0.43, 95% CI: 0.36, 0.52), with attenuation in adjusted models (OR 0.86, 95% CI: 0.43, 1.7). Female sex (OR 0.53 95% CI: 0.3, 0.95) and income  $\geq 75,000$  (OR 0.34 95% CI: 0.16, 0.72) were protective, but not statistically significant in adjusted models. AUC analysis showed concordance between physical activity and all-cause mortality of 0.746, but not significant when stratified to cause-specific mortality. AHA Life Essential 8 was associated with a lower risk of all-cause mortality at all physical activity cut offs (OR 0.77 95% CI: 0.68, 0.88)

**Conclusion:** Objective physical activity measures and AHA Life Essential 8 are strongly associated with protection against all-cause mortality; however, this association is blunted with health behaviors and metabolic factors are controlled for. Physical activity was also predictive of all-cause mortality, but not cause-specific mortality. This study is limited by the translation of MIM-units commonly used physical activity measures such as steps or activity time.

**Significance:** Objective physical activity measures are required to elucidate relationships with health outcomes in the context of risk scores such as AHA Life Essential 8. Further analysis is needed using objective measures to evaluate its effects on health.

**Abstract Title:** Building Age Friendly Communities: Evaluating the Implementation of the “WHO Age Friendly Cities Framework”

**Authors:** Udit Thawani, Eleanor Nguyen, Jyotsna Pandey

**Abstract Category:** Population Health

**Advisor/Mentor:** Jyotsna Pandey M.D., Ph.D.

**Introduction:** In 2007, the World Health Organization established a framework of eight domains to identify and address barriers for older adults within urban communities. These domains include health care, transportation, housing, social participation, outdoor spaces, social inclusion, civic participation, and access of information. Since the advent of this framework, communities around the world have looked to intervene in these different domains with the goal of improving social, medical and mental health outcomes of their older adults in the effort to obtain a more “Age Friendly” community. The goal of this scoping review was to investigate the interventions that are being pursued at the community level elsewhere in the effort to support healthy aging, and other ways in which age friendliness could be pursued. With this background, we hope to discover what kind of interventions would be most fruitful to implement in a rural community.

**Methods:** A scoping review was performed involving a comprehensive search of three electronic research databases (PubMed, Scopus, and CINAHL) from January 2007 to May 2023. Through this review of the literature, our goal was to identify the most effective ways in which an intervention, or interventions, can make a community more age friendly. Articles were included that detailed the qualitative or quantitative impact of interventions or deficiencies and how they impacted age friendliness. Two independent reviewers screened the abstracts obtained from the literature search using Rayyan, and reached consensus on the abstracts they initially disagreed upon.

**Results:** Initial database search yielded 588 articles, with 22 being eligible for review. Methodology and data composition consisted of eight qualitative reviews, ten quantitative reviews, and four mixed reviews.

Common themes garnered through the articles were predominantly ease of access (seven articles), green space presence (eleven articles), and housing/living infrastructure (two articles). Within the ease of access and green space presence categories there existed related subcategories of road infrastructure/walkability (three articles) and transportation (three articles), and physical health (five articles) and social interaction (three articles), respectively.

**Conclusion:** In survey related studies, older adults most commonly stated their desire for ease of access related interventions (for example: road infrastructure, safer walking conditions, transportation, etc). In studies that had quantified the impact of initiatives on quality of life, access to green spaces, social interaction, and housing infrastructure had the most significantly reported improvements.

**Significance:** Further investigation should be pursued to investigate the efficacy of interventions in these desired domains. Many of these studies were performed in urban communities, leading to limited generalizability to more rural communities. Despite this, it may still be practical to model these interventions as a starting point to developing age-friendly community initiatives in rural communities.

**Abstract Title:** COVID19 and Mental Health Telehealth Usage in the Rural United States

**Authors:** Riley O'Keefe, Joshua Jolly, Austin Basso, Joel DeJonge, Samantha Hahn

**Abstract Category:** Population Health

**Advisor/Mentor:** Samantha Hahn, Ph.D.

**Background:** Adults in rural areas of the United States (US) have long faced barriers to accessing mental healthcare services. There is a paucity of literature examining whether the shift toward telemedicine services due to the COVID-19 pandemic altered access to mental health care services among adults residing in the rural US.

**Objective:** This study explores usage trends in telemedicine services for mental health care among adults in the rural US before and after the onset of the COVID-19 pandemic.

**Methods:** A systematic review was performed in accordance with the Preferred Reporting Items for Systematic Reviews (PRISMA) guidelines to explore the question of whether adults in rural areas of the US experienced increased access to and usage of mental healthcare services after the abrupt shift to telemedicine in March 2020, versus pre-pandemic (prior to March 2020). Records were retrieved from PubMed and stored in Rayyan for screening of abstracts and titles. Records were excluded if population, study design, or timeframe of investigation did not align with the research question. Abstracts and articles were screened by two reviewers, with a third reviewer resolving disputes.

**Results:** Eight studies met inclusion criteria. Six (75%) studies included rural populations only. Five (62.5%) found a statistical increase in telemedicine visits for mental health care after the onset of the COVID-19 pandemic. Four studies (50%) noted improved mental health outcomes and increased telemedicine utilization for mental health care. Two studies (25%) examined rural versus urban differences in mental health telemedicine utilization before and after the onset of the COVID-19 pandemic. Both studies found a statistical increase in utilization of telemedicine services for mental health care after the onset of the pandemic versus before the pandemic in all areas of the US, but to a lesser extent in rural than in urban areas.

**Conclusion:** The onset of the COVID-19 pandemic led to increased utilization of telemedicine services for mental health care among adults residing in rural areas of the United States. The increase in rural telemedicine usage during the pandemic highlights the necessity of efforts to address the barriers that contribute to health disparities in rural US communities. These include upgrading infrastructure to ensure regular and reliable visits, thus maintaining access to telemedicine for mental health services as a viable option in rural communities.



**Abstract Title:** A Cross-Sectional Analysis of Suicide Methodology in Saginaw, Michigan from 2021-2023

**Authors:** Bahar Salehi, Abishek Bala

**Abstract Category:** Population Health

**Advisor/Mentor:** Abishek Bala, M.D.

Suicide remains one of the leading causes of death in the United States, and unfortunately that rate rises with each passing year. A major public health concern is to analyze what the leading methods of suicide are in order to determine if it is a problem that can be tackled at the root causes, rather than caught in the moment. As a part of this evaluation of suicide and its causes in the US, the leading methods of suicide in Saginaw, Michigan were analyzed and evaluated as to how this insight can contribute to preventative strategies.

A cross-sectional examination of suicide deaths in Saginaw, Michigan over the past 3 years was performed. Suicide data was acquired from the coroner's office from the years 2021-2023 and Microsoft Excel/SPSS was used to perform a basic analysis of suicides during time period as well as to create a graphic display of different modalities of suicide.

This analysis showed that the number of suicides increased each year. Percentage wise, 50% of the 74 total suicides in the county were performed using a firearm, with the other 50% of methods being, in order of prevalence, asphyxiation, drug related death, blunt force, and death via a sharp object. The data demonstrates that overall, firearms are the most commonly used method to complete suicide. Whether this is due to the ease of accessibility of firearms or the lethality of using a firearm in a suicide attempt, the implications of the data suggest that firearms could be a leading risk factor of completed suicide. Using these findings, policies reducing access to firearms in the context of mental health could potentially lead to a reduction in the rate of suicides that are completed. This data does have some limitations, however, especially given that it was geographically focused in Saginaw and that the sample size was relatively low compared to that of larger cities; however, the importance of the data in the context of the role of public health in addressing the problem of increasing suicide rates in the US cannot be understated.

**Abstract Title:** Immune Checkpoint Inhibitors and Immune Mediated Diabetes Mellitus: Meta-Review of Case Reports

**Authors:** Samantha Silvers, Aiden VanLoo, Adil Mohammed, Manthan Patel, Rami Ebrahim, Jun Hwan Kim, Hunter Li, Tiara Bolton, Chad Martin, Nicholas Haddad, Sethu Reddy

**Abstract Category:** Population Health

**Advisor/Mentor:** Sethu Reddy M.D.

**Background:**

Use of Immune checkpoint inhibitors (ICIs) is an increasingly popular antitumor immunotherapy targeting immunoreceptors on T lymphocytes, enhancing the anti-neoplastic immune response. ICIs are becoming first line therapy options for non-small cell lung cancer and gastric adenocarcinoma and can be used as second line for variety of others. Various endocrinologic adverse events have been reported with use of ICIs. Of these, new onset Type-1 diabetes mellitus (T1DM) is of particular interest given its significant morbidity and noted frequency of 1-5% of patients who receive ICIs. There is limited consolidated information about symptomatic presentations, risk factors, and demographics of patients developing Type 1 DM in relation to ICI use. We performed a systematic review of published case reports to identify commonalities between patient disease presentation, ICI use, and development of immune-mediated diabetes mellitus.

**Methods:**

A comprehensive systemic literature search from PubMed Web Science, CINAHL, and Google Scholars was performed identifying case reports showing development of new onset diabetes mellitus in patients using immune checkpoint inhibitors. Descriptive analysis was performed to better identify characteristics and presentation of patients.

**Results:**

Based on our parameters, 130 reports with 149 cases were included. Primary tumors among the patients comprised lung cancer (34.9%) and melanoma (31.5%). Amongst all the cases, about 88% of the patients were treated with anti-PD-1 (program cell death) receptor, with nivolumab alone (34.9%) and pembrolizumab alone (26.2%) being the most common agents. Cases were more commonly found to be males (61.7%) and of Asian (36.6%) or North American (35.6%) background. Patient ages ranged from 14-95 with a mean of 62.3. Presentation most commonly started after the third cycle (13.4%) and was noted to occur between 1-50 doses. Autoantibody data was largely missing; however, anti-GAD antibodies were noted to be present in 29.5% of cases. 34.2% of patients had coexisting endocrinopathies with thyroiditis being the most common, occurring in 20% of patients. 1.3% of patients did not survive the initial hospitalizations, with the vast majority (95.3%) remaining on insulin and a select few (2%) were eventually able to discontinue insulin.

**Conclusions:**

New onset diabetes is a rare but a potential life-threatening metabolic urgency. Thus, it is paramount that clinicians maintain close monitor of blood glucose and endocrine function when a cancer patient who recently started ICIs gets admitted for hyperglycemia. Further research is warranted to understand onset of diabetes mellitus at molecular level.

**Abstract Title:** Inaccurate Perceptions Toward Elderly Adults: A Scoping Review

**Authors:** Andrew Stevens, Jyotsna Pandey

**Abstract Category:** Population Health

**Advisor/Mentor:** Jyotsna Pandey M.D., Ph.D.

**Background:**

Due to the expected increase in aging population in the next ten years, a call for reformation of healthy aging (>65 years of age) has been proposed by the World Health Organization and confirmed based on data analysis in the recent 2020 Census. Proposition for initiatives that address older adults has been proposed in six sections with the sixth section, inaccurate perception of elderly members in the community, being the basis for this Scoping Review. Focusing on what interventions and actions have been taken nationally and internationally were investigated and several themes were found within published data that needed reformation to address inaccurate perceptions society holds toward its older adult group members.

**Methods:**

Of 335 articles, 21 English language articles from 2010-onward fulfilled our inclusion criteria covering perceptions/ageism towards seniors. Exclusion criteria were pre-2010 articles, non-English, or lacking relevance. Included were 11 cross-sectional studies, 4 case studies, and 6 longitudinal studies.

**Results:**

We identified ten underexplored themes including modifying elder perceptions through product adjustment and social media, Student Health Professionals Related Studies, Health Professional Perceptions, Caregiver perceptions, Studies involving Mental Health, Marijuana Perception, Place of Care Preference, Centenarian and Self-Perception, Elderly Perception of Medical Conditions and Intergenerational Focused Studies. Proposed interventions ranged from consistent school programs nurturing positive youth views of aging to periodic anti-ageism workshops for healthcare workers to remove subliminal biases.

**Conclusions:**

While some education efforts temporarily improved attitudes, further research and initiatives are urgently needed targeting healthcare professionals, caregivers, and youth. Reframing mentality through evidence-based education programs could positively impact perceptions of older adults in the long-term. As elderly populations expand, reducing prejudice by better understanding unique needs and increasing community connections is crucial for enabling healthy, dignified aging.

**Abstract Title:** Exploring COVID-19 Information Outlets: Sources and Their Impact on Attitudes, Knowledge, and Vaccine Outcomes

**Authors:** Maya Takagi, Nicholas Haddad, Ciara Brennan, Zain Waheed, Neli Ragina

**Abstract Category:** Population Health

**Advisor/Mentor:** Neli Ragina, Ph.D.

**Background:** The COVID-19 pandemic presented challenges in ensuring the distribution of accurate health information amidst an abundance of sources and a lack of verification. Understanding the sources individuals use to access COVID-19 information is crucial for addressing misinformation and promoting public health initiatives effectively.

**Objective:** This study aimed to investigate the information sources individuals utilized to learn about COVID-19 and examine whether these sources correlated with attitudes and knowledge regarding the virus and its vaccines.

**Methods:** A cross-sectional study was conducted between July and December 2021, surveying 234 participants on various aspects related to COVID-19 information. Participants provided demographic information and reported their usage of different information sources such as television, radio, print media, social media, websites, healthcare providers, personal relationships, religious leaders, and governmental authorities. Additionally, participants rated the reliability of these sources and answered questions regarding their knowledge, attitudes, and acceptance of COVID-19 vaccines. Mean scores assessed source reliability. Independent t-tests examined differences in COVID-19 knowledge, vaccine acceptance, concern, and attitudes across source types.

**Results:** Social media emerged as the most frequently used source (N=95), while healthcare providers were deemed the most trustworthy (N=57,  $\bar{x}=4.26$ ). Users of television and websites exhibited a higher propensity for vaccination ( $p=0.04$ ,  $p=0.03$ ). Participants accessing information through websites demonstrated greater knowledge of vaccine side effects ( $p=0.01$ ) compared to television and radio ( $p=0.02$ ,  $p=0.002$ ). Print/newspaper and website users exhibited enhanced knowledge of vaccine safety ( $p=0.05$ ,  $p=0.03$ ), positive attitudes towards vaccine testing ( $p=0.03$ ,  $p=0.03$ ), and reduced concerns regarding vaccine development speed ( $p=0.0007$ ,  $p=0.002$ ). Those informed by healthcare providers displayed greater awareness of vaccine limitations ( $p=0.01$ ) and reduced concerns regarding vaccine development speed ( $p=0.003$ ). Users of websites and religious sources expressed heightened concern about contracting COVID-19 ( $p=0.04$ ,  $p=0.01$ ).

**Conclusions:** Individuals relying on print, websites, and healthcare providers for primary COVID-19 information demonstrated greater knowledge and positive attitudes towards COVID-19 topics compared to those who did not utilize these sources. The findings highlight the importance of promoting reliable sources of COVID-19 information to enhance public understanding and support for vaccination efforts.

**Significance:** This study demonstrates the importance of understanding the impact of various information sources on public attitudes and knowledge regarding COVID-19. Identifying trustworthy sources and addressing misinformation is critical for promoting public health initiatives, such as vaccination campaigns and mitigating the spread of the virus. The insights gleaned from this study can inform targeted communication strategies aimed at improving health literacy and fostering positive attitudes towards prevention measures. Ultimately, collective efforts are essential for safeguarding public health.

**Abstract Title:** Pandemic Perspectives: Examining COVID-19 Knowledge and Attitudes in Central Michigan's American Indian Communities Before and After an Educational Intervention

**Authors:** Maya Takagi, Angela Sasaki Cole, Simone Rhodes, Jun Kim, Maxwell King, Stephanie Sokar, Chad Martin, Neli Ragina

**Abstract Category:** Population Health

**Advisor/Mentor:** Neli Ragina, Ph.D.

**Background:** The COVID-19 pandemic has disproportionately impacted American Indian and Alaska Native communities across the United States. As of January 2022, the vaccination rate among American Indians in Michigan stood at 52%, falling short of the recommended 70% threshold crucial for community-wide protection against disease. Addressing vaccine hesitancy remains a challenge due to limited research on effective interventions.

**Objective:** This study aims to investigate COVID-19 vaccination concerns and attitudes among American Indians, provide educational materials, and evaluate the effectiveness of infographic and video interventions.

**Methods:** Data from 273 participants were gathered at a central Michigan clinic serving American Indian communities between Spring 2022 and Winter 2024. Utilizing validated pre- and post-survey tools, participants underwent an educational intervention, randomly assigned to either video or infographic format. Post-intervention, changes in knowledge and attitudes were assessed through paired t-tests. Independent t-tests compared interventions, and demographic influences were analyzed via additional tests and one-way ANOVA.

**Results:** After the intervention, participants significantly increased their knowledge in key areas such as protection against COVID-19 transmission ( $p < 0.001$ ), understanding how vaccines work ( $p = 0.008$ ), and awareness of COVID-19 vaccine development ( $p < 0.001$ ). Significant changes were also observed in attitudes, with heightened trust in the vaccine ( $p < 0.001$ ), increased belief in its benefits ( $p = 0.012$ ), and greater confidence in its testing ( $p = 0.012$ ). Negative misconceptions reduced, including concerns about rapid vaccine development ( $p = 0.016$ ) and potential side effects ( $p = 0.01$ ), indicating a positive shift in perception. Demographic factors played a role, with females showing improved knowledge of post-vaccine behaviors ( $p = 0.014$ ), while Republicans exhibited enhanced belief in vaccine efficacy ( $p = 0.029$ ). Individuals affected by pandemic-related employment changes displayed heightened awareness of vaccine efficacy ( $p = 0.043$ ). Regarding vaccination status, unvaccinated and hesitant individuals showed significant knowledge gains in vaccine effects ( $p = 0.004$ ) and efficacy ( $p < 0.001$ ), alongside increased belief in vaccination benefits ( $p = 0.011$ ). The infographic intervention reduced concerns about the vaccine ( $p = 0.036$ ), and adherence to CDC precautions correlated with increased vaccine acceptance ( $p = 0.03$ ).

**Conclusions:** Educational interventions significantly enhanced COVID-19 knowledge and attitudes across diverse demographic groups, underscoring the importance of targeted approaches in promoting public health awareness.

**Significance:** This study is the first to explore COVID-19 perspectives among Michigan's American Indian population. It underscores the vital role of targeted educational interventions in countering misinformation, promoting positive vaccination attitudes, and ultimately mitigating COVID-19 impacts in marginalized communities.

**Abstract Title:** The effects of physical activity on the well-being of healthcare students: A systematic review

**Authors:** Varun Vadnala, Moussa Chehab, Shofikur Shuhag, Shahzaib Chughtai, Mishaal Malik, Arya Tavakoulnia, Neli Ragina

**Abstract Category:** Population Health

**Advisor/Mentor:** Neli Ragina, Ph.D.

## BACKGROUND

Previous studies have shown that graduate students in healthcare fields often neglect physical activity during their rigorous education and training. In addition, various research projects in the past have shown the positive impacts of physical activity and exercise on well-being by analyzing its effects on sleep quality, mental health, and academic performance.

## OBJECTIVE

This review aims to examine the role of exercise on factors that affect the lifestyle of graduate-level healthcare students. To accomplish this, a systematic review was conducted looking at articles listed in the PubMed database.

## METHODS

Articles were filtered through the PubMed database using specific MeSH terms and a total of 437 articles of interest were then isolated. All 437 articles were thoroughly screened through the Rayyan software program for specific inclusion and exclusion criteria, which resulted in four articles that were included in this systematic review. Three of these articles focused on physical activity and its impact on quality of life.

## RESULTS

Results from these articles showed that medical students who engaged in physical activity had an increase of 7.99% in their questionnaire score for quality of life. Meanwhile, two of these articles observed the impact of physical activity on perceived stress levels. Compared to the control group, medical students who engaged in physical activity had a 20.80% decrease in perceived stress level scores according to these articles. The last article demonstrated the relationship between physical activity and academic stress in nursing students. Students who engaged in exercise 2-3 days a week had a 6.93% decrease in academic stress questionnaire scores, and students who engaged for 6-7 days a week had a decrease of 10.92%.

## CONCLUSION

The results of these studies suggest that physical activity may be associated with several potential benefits for medical students and nursing students. Three of the studies suggest that physical activity may be associated with an improvement in quality of life. Specifically, the physical activity group had approximately 15 times higher quality of life scores than the control group at the post-PT program assessments. This suggests that participation in physical activity may have a positive impact on overall well-being and may be an important aspect of maintaining good health. Secondly, the studies suggest that physical activity may be associated with a reduction in stress levels. This is because the physical activity group had a significantly lower stress score at the post-program assessment compared to the control group. This suggests that participation in physical activity may help manage stress and promote mental well-being. This suggests that participation in physical activity may be beneficial for managing the demands and challenges of academic life.

## SIGNIFICANCE

Ultimately, quality of life, perceived stress, and academic stress are important factors that drastically impact academic performance. Though our review did not find a direct correlation between physical activity and specific academic performance metrics such as GPA or academic standing, our results do show that other important contributing factors are positively impacted by physical activity levels.

**Abstract Title:** EXPLORING HOW CANCER-RELATED FATIGUE VARIES BY RACE IN A DIVERSE GROUP OF ADULT CANCER SURVIVORS

**Authors:** Varun Vadnala, Suzanna Zick

**Abstract Category:** Population Health

**Advisor/Mentor:** Suzanna Zick, N.D., M.P.H.

**BACKGROUND:** Cancer-related fatigue (CRF) is a burdensome and common side effect. Prior research points to an association between race/ethnicity and CRF with Black and some Latinx cancer survivors having more severe fatigue, however, this has only been seen in small samples with limited cancer types and stages.

**OBJECTIVE:** Our goal is to investigate the association between CRF and race in large cancer survivor samples.

**METHODS:** We texted the National Comprehensive Cancer Network (NCCN) Fatigue Measure (0-10 within the past week, with higher scores more fatigue) to adult cancer survivors diagnosed from April 1st, 2019, to March 31st, 2021, at the University of Michigan (UM) Tumor Registry (n=19,752). We explored the association between race and fatigue via logistic regression models with NCCN fatigue severity (yes = >4/no = < 4) as the dependent and race as the independent variable, adjusted for ethnicity, gender, cancer type, cancer stage, and current age. Odds ratio (OR) and 95% confidence intervals (95% CI) are reported.

**RESULTS:** 2562 (13%) responded. 2184 provided both fatigue and race data including 2000 Whites (8%), 115 Blacks (5%), 12 American Indians or Alaskan Natives (0.1%), 46 Asians (2%), and 13 Multiple Race (0.1%). 75% (n=1844) of responders reported clinically significant fatigue (NCCN scale  $\geq 4$ ). Average fatigue  $4.0 \pm 2.8$  (mean, standard deviation). Blacks reported the highest average fatigue  $6.4 \pm 2.9$  (84% fatigued, unadjusted OR 1.81, 95% CI [1.08-3.03] vs. White), followed by Multiple Race  $5.8 \pm 3.0$  (85%, 1.89 [0.42-8.54]), White  $5.3 \pm 2.8$  (75%), Asian  $5.0 \pm 3.0$  (70%, 0.78 [0.42-1.48]), and American Indian/Alaskan Natives  $4.8 \pm 2.7$  (75%, 1.03 [0.28-3.81]). In the adjusted model race was not significantly associated with fatigue, women reported higher fatigue levels (1.52 [1.18-1.96],  $P=0.014$ ) vs males, age (B-0.17  $P < 0.001$ ), and GI cancer had the least fatigue with leukemia (0.51 [0.33-0.79]), penile/testicular (0.59 [0.39-0.91]), CNS (0.50 [0.28-0.89]), and lymphoma (0.37 [0.20-0.69]) cancers having significantly less likelihood of fatigue vs. GI cancers.

**CONCLUSIONS:** While Black cancer survivors report higher fatigue, however, differences in gender, age, and cancer diagnosis explained fatigue differences. Future studies should explore race and fatigue in larger more diverse populations.

**Abstract Title:** What's New with the Old?: Identifying Themes in the Structural Motifs of Successful Healthy Aging Initiatives

**Authors:** Victoria Wilson, Jyotsna Pandey

**Abstract Category:** Population Health

**Advisor/Mentor:** Jyotsna Pandey, M.D., Ph.D.

**Intro:**

Healthy aging is a currently prominent topic in worldwide public health efforts, as modern medical advancements allow the global population to reach advanced age in greater numbers than ever before. Initiatives to improve quality of life for aging populations now exist at every scale, from small, local community efforts to international level projects. Notable among these is the inclusion of healthy aging in the UN's sustainable development goals, and the establishment of the UN "Decade of Healthy Aging" initiative. The Decade of Healthy Aging (DoHA) now serves as a central hub for most of the participating countries' healthy aging initiatives and offers informational resources and a degree of standardized goals and guidelines for such projects. This central status positions the DoHA to identify projects that have been particularly successful and, to this end, have recognized the "Healthy Aging 50" (HA50), a list of individuals whose work has been particularly impactful. Due to the number of participating countries and the unique position of the DoHA initiative to evaluate projects' success, the projects described in this list can be considered something of a de facto gold standard among healthy aging projects globally.

**Objectives:**

Because of their acclaim, this descriptive review seeks to analyze the projects described by the HA50 list, to identify prominent themes in the projects' structures that contribute to their success and compile them such that they can be used to inform future healthy aging projects and to map potential areas for future research on the methodologies that support successful healthy aging projects.

**Methods:**

For this analysis, we individually reviewed each profile from the HA50 and identified structural themes across the group as a whole that appeared notably prominent, whether quantitatively or qualitatively. We also investigated the background of each theme, explored whether similar themes appeared in existing healthy aging literature, and compiled this information to map how it falls in with the current landscape of wellness-related discourse and developments for aging populations.

**Results/Discussion:**

This review found seven particularly prominent themes across the HA50 profiles: 1. Adapting environments to the aging population, 2. Intersectoral involvement, 3. Integrative models of care, 4. Contextualized interventions, 5. Advocacy . 6. Addressing inaccurate perceptions about the elderly, 7. Emphasis on Technology. These were those, among many others, that stood out as particularly frequent, having a significant background in public health efforts or healthy-aging literature, or for their current developments or otherwise notable ongoing relevancy. It was observed during this analysis that every theme appeared in widely varying forms. They were not applied in a "cookie cutter" fashion and instead were adapted per the needs of each project. This variability opens an equally wide array of potential future areas for research, to investigate the methodologies behind each successful application in more detail. Additionally, these themes were only those deemed currently most notable by this project's investigators, and there were many others in the profiles which the healthy aging academic community could investigate as well to glean further insights.



**Abstract Title:** Redefining Elderly Care: The Living FREE Journey to Fall Freedom in Rural Michigan

**Authors:** Payton Wolbert, Krista King, Jyotsna Pandey

**Abstract Category:** Population Health

**Advisor/Mentor:** Jyotsna Pandey, M.D., Ph.D.

**Background:** Central Michigan University's, Living FREE: Fall Reduction, Education, and Empowerment program, aims at empowering rural older adults in central Michigan post-fall through a personalized prevention approach to minimize future falls and enhance overall well-being and independence. This free community-based program includes an introductory interview, home safety assessment, and a tailored fall reduction plan. The Living FREE program targets individuals who (1) experience a fall, (2) visit the ER at regional hospitals, and (3) are determined to have no medical reason for the fall or injury and (4) are not eligible for physical therapy interventions. Typically, these patients lack follow-up care post-discharge, making them vulnerable to future falls.

**Objectives:** Living FREE aims to provide personalized fall prevention strategies for older adults in Central Michigan, aiming to reduce the risk of recurrent falls, enhance health and quality of life, and support continued independent living.

**Methods:** We monitored the participation rates of all referred individuals, classifying them into four categories: 1) participants who did not engage with the program; 2) participants who did not respond; 3) participants who actively participated and engaged; and 4) participants deemed ineligible during initial contact and evaluation.

Based on preliminary results, two additional strategies are being implemented: (a) EMS personnel will distribute an educational brochure, conduct a brief survey, and encourage participants to make contact, and (b) upon ER discharge and with the patient's approval, Living FREE will share their information with the patient's primary care physicians (PCPs) to involve them in the ongoing dialogue.

**Results:** Our findings indicate a significant portion of referred older adults were reluctant to participate in the fall reduction program. Between September 2021 and November 2023, out of 923 referrals, 296 (32%) chose not to engage, 479 (52%) did not reply, 65 (7%) actively participated, and 83 (9%) were deemed medically ineligible. These rates of non-engagement align with existing research on comparable efforts. Factors such as transportation and financial limitations, along with a skepticism towards free services among rural older adults, are believed to influence their willingness to engage with the program.

**Conclusion:** Our study highlights the considerable obstacles faced in enrolling older adults into fall prevention and health empowerment initiatives. Addressing these challenges necessitates the formation of strong collaborations with primary care physicians (PCPs) and EMS staff, capitalizing on their trusted relationships with patients to enhance program participation. Moving forward, our strategy involves reconfiguring the program to integrate PCPs as key partners, aiming to boost engagement in the fall prevention measures we provide.

**Significance:** Living FREE illustrates a crucial effort to reduce fall risks among rural older adults, enhancing their well-being and independence through personalized prevention strategies. Despite facing challenges in participant engagement, the program underscores the importance of integrating community resources and healthcare professionals to improve outreach and effectiveness, highlighting a path forward for similar initiatives.

**Abstract Title:** Identification of Veteran Patients in the ED: Implications for Service Utilization

**Authors:** Catherine Barrington, Matthew Holtz, Micheal Cannova, Derek Schaller

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:** Derek Schaller, M.D.

Michigan has the 11th highest veteran population in the USA, (VA, 2020). Encompassing 589,326 veterans, of which only 39.36% are enrolled in VA Healthcare. As of 2020 Saginaw County has 11,727 veterans (VA, 2022), accounting for approximately 6% of the population. When looking at where veterans receive their healthcare, 86.9% reported not using VA services at all (Nelson, 2007). Furthermore 78.8% of care they received at civilian medical facilities was for mental health concerns (Wooten, 2018). 40% of primary care providers reported not screening for veteran status at all (Mohler, 2017).

Our aim is to identify gaps in recognition of veteran status when patients seek care at Covenant ECC. **Methods:** Population information from patients seen in Covenant's Emergency Department will be collected from electronic medical records (EMR). All patient identifying information will be removed from recorded data. The following information will be collected: number of patients seen in the emergency department from January to December 2022, veteran status, gender, and presenting chief complaint.

**Results:** From January 1st to December 31st 2022 the Covenant ECC had 76,836 patient encounters. Of these, 75,690 patients had no information documented for military service. Of the remaining 418 patients were documented as veterans, 718 indicated no prior service and 10 declined to answer. Gender stratification showed 407 males and 11 females indicating veteran status, with 294 males and 424 females indicating no prior service. For 33,151 males and 42,530 females there was no documentation of prior service in the EMR.

**Conclusion:** The number of veterans accessing care at Covenant ECC is likely to be vastly underrepresented, as only 0.54% of all patients seen were identified as veterans. This has a much broader impact than simply being able to generate an accurate representation of the patient demographic accessing the ED. When a screening item was implemented in the electronic medical record the number of veterans identified in one federally qualified center increased by over 800% (Howren, 2020). If screening of veteran status can be standardized as part of patient intake in the ED it has the potential for improving utilization of veteran-centric resources and initiatives.

When veterans are in a mental health crisis, they are more likely to present to civilian EDs (Wooten, 2018). To combat this crisis the VA has increased its mental health focus. According to the results from the 2019-2020 National Health and Resilience in Veterans Study, only 35.5% of veterans with current suicidal ideation were engaged in mental health treatment. To address the issue surrounding veteran suicide care provided in non-VA emergency departments, congress passed the Veterans COMPACT Act on December 5th, 2020. The act will cover the costs for inpatient treatment for up to 30 days and outpatient care for up to 90 days for any veteran that receives care at a community ED (COMPACT Act, 2020). Moving forward, accurate identification of veteran status at Covenant ECC will allow for not only increased accuracy when looking at the demographic served, but allocation of specific resources earmarked for this population.

**Abstract Title:** Understanding Medical Students' Knowledge and Attitudes about Cerebral Palsy

**Authors:** Brianna Callahan, Andrea Janis, Swetha Reddi, Andrew Nowak, Ronald Thomas, Karin Przyklenk, Charles Pelshaw, Christina Santia

**Abstract Category:** Quality Improvement/Medical Education  
Christina Santia, D.O.

**Advisor/Mentor:** Charles Pelshaw, M.D.,

**Objectives:** Cerebral palsy (CP) is a common childhood physical disability. Individuals with disabilities face many barriers in accessing equitable medical care. Historically, physicians have lacked knowledge, experience, and skills when caring for patients with disabilities and likely contributes to this healthcare disparity. The purpose of this survey-based study was to understand medical students' knowledge and attitudes about CP, and assess the impact of viewing an informational video on their knowledge. Elucidating medical students' knowledge of CP could help medical schools enhance their curriculum to develop physicians that are more prepared to treat disabilities.

**Methods:** All medical students from Wayne State University School of Medicine and Central Michigan University College of Medicine (years M1 through M4) were invited to participate in the study. The protocol was conducted in 3 sequential steps: 1) knowledge regarding the definition, prevalence, and clinical presentation of CP was assessed at baseline by asking 9 multiple choice question developed in consultation with Physical Medicine & Rehabilitation physicians at the Children's Hospital of Michigan; 2) participants viewed an informational video produced by Cerebral Palsy Alliance; and 3) the same 9 questions were re-administered after viewing the video.

**Results:** A total of 221 surveys were submitted, of which 55% (121/221) were complete and 45% were incomplete. At baseline (pre-video), the % correct responses, averaged for the 9 survey questions, was 45+15% (mean + SD). The informational video was effective in improving short-term knowledge regarding CP, as indicated by an increase in % correct responses to 68+11% ( $p < 0.01$ ). Baseline knowledge in the M1/M2 cohort tended to be lower than the M3/M4 group (% correct responses of 39+16% and 51+15%, respectively;  $p=0.13$ ), while post-video knowledge was comparable for all students (65+11% and 67+13%). The majority (77%) of respondents indicated that the video was a helpful instructional tool.

**Conclusions:** Our results reveal that medical students' knowledge of cerebral palsy is generally limited, and that implementation of a structured CP lesson may mitigate this gap in knowledge. These data may potentially have broader implications beyond cerebral palsy: i.e., dedicated educational modules on disabilities for physicians in training may help to reduce health disparities.

**Abstract Title:** Collaborate to Innovate: Revolutionizing Healthcare with Interprofessional Education

**Authors:** Arlene Chan, Andrew Stevens, Jyotsna Pandey

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:** Jyotsna Pandey, M.D.,

Ph.D.

**Background:** Effective healthcare delivery relies on seamless integration of various health professionals, emphasizing a synergistic approach among physicians, social workers, nurses, and other health professionals. Recognizing the historical absence of teamwork instruction in medical school curricula, Interprofessional Education (IPE) has emerged to bridge this gap, fostering collaborative learning and peer interaction across diverse professions.

**Objective:** Our project aimed to explore the current landscape of IPE, evaluate the effectiveness of our program, identify gaps in our exercises and evaluation methods, and provide recommendations for other universities.

**Methods:** We employed the Interprofessional Attitudes Scale (IPAS) and open-ended questions to assess the impact of IPE training on students' attitudes and collaboration skills. For analysis, we categorized students into four groups: medical (MD) students, students from various allied health programs, students from physical therapy and athletic training programs, and students from social work programs.

**Results:** A total of 233 students participated from various healthcare programs: 86 medical students, 61 students from physician assistant, speech and language pathology, audiology, and nursing programs, 55 students from physical therapy and athletic training programs, and 31 students from social work programs. Significant increases in average scores for recognizing interprofessional bias were observed at PostW1 ( $p = 0.003$ ) and PostW2 ( $p < 0.001$ ) compared to pre-training assessments. The recognition of interprofessional bias across all specialties improved from 3.519 at pre-intervention to 3.691 at postW1 and 3.847 at PostW2, with a P value of  $< 0.001$ .

Qualitative analysis revealed evolving themes among MD students, highlighting role clarity and the recognition of the role of referrals and collaborative practice. Analysis of physical therapy and athletic training programs indicated a shift in focus from sports and emergency care to rehabilitation, injury prevention, and evaluation. Responses from social work programs showed a shift in their evaluation of their career path from merely helping people to advocacy, providing resources, and making referrals.

**Conclusions:** These findings underscore the positive impact of IPE training on students' biases and the value of interprofessional collaboration in healthcare delivery. The study supports the continued integration of IPE programs into healthcare education to foster interprofessional competencies and enhance teamwork skills among diverse healthcare disciplines.

In conclusion, our comprehensive IPE program demonstrates its efficacy in improving attitudes towards interprofessional collaboration among healthcare students. By addressing gaps in current training methodologies and emphasizing the importance of teamwork, our findings contribute to the ongoing enhancement of healthcare education. Implementing IPE programs across universities can further cultivate a culture of collaboration, ultimately benefiting patient care quality and healthcare outcomes.

**Significance:** This study is significant as it demonstrates the positive impact of Interprofessional Education (IPE) on fostering collaboration among healthcare students. By addressing gaps in training and emphasizing teamwork, it contributes to improving patient care quality and outcomes. The findings advocate for the widespread implementation of IPE programs, promoting a culture of collaboration in healthcare education and practice.

**Abstract Title:** Interprofessional Teamwork within Rehabilitative Medicine: Practices, Pitfalls and Future Directions

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**Abstract Category:** Quality Improvement/Medical Education  
Ph.D.

**Advisor/Mentor:** Jyotsna Pandey, M.D.,

**Background:** Effective healthcare requires collaboration among various health professionals. This is especially true in Physical Medicine & Rehabilitation (PM&R), which often requires physicians, therapists, nutritionists, social workers, and others to coordinate care and transition points to avoid gaps in patient care. Importantly, interprofessional teamwork leads to improved patient outcomes and satisfaction. However, there are no guidelines outlining methodology for implementing interprofessional teams or improving collaboration among members in PM&R.

**Objective:** To evaluate the depth and breadth of the current literature regarding interprofessional teamwork within PM&R, map available insights on practices and pitfalls of interprofessional teamwork within PM&R, and investigate directions for future research.

**Methods:** Following PRISMA-ScR guidelines, a systematic search of PubMed, SCOPUS, and CINAHL was conducted using keywords “interprofessional,” “interdisciplinary,” “physical medicine and rehabilitation,” “physiatry,” and “PM&R.” Duplicate articles were removed, leaving 2296 articles for review. A Boolean web search using these keywords was also conducted. No additional articles were uncovered. Two reviewers independently reviewed each article. Inclusion criteria for articles included: 2 or more different health professions studied, one of which was a physiatrist; patients were seen within the rehabilitative care setting; licensed healthcare professionals (i.e., no students) were represented on teams; published within the past 10 years; and performed within the U.S. healthcare system. Articles were excluded if they did not meet these inclusion criteria, if they used the telehealth setting, or were not published in the English language. Disagreements regarding article inclusion or exclusion were adjudicated by 4 team members. After these criteria were applied, 18 articles remained. Each remaining article was reviewed in full by 4 reviewers to ensure inclusion criteria were met. After this final screen, 5 articles remained for analysis.

**Results:** Within these studies, teams ranged from 3 to 7 members. All teams included a licensed physiatrist and occupational therapist. Physical therapy was represented in 80% of teams. Nursing, speech language pathology, social work, and rehabilitation psychology were each represented in 40% of teams. All teams implemented regular meetings between professions to facilitate collaboration. Other reported practices included multidisciplinary analysis of patient conditions (60%), discussion of problems impeding rehabilitation (40%), decentralization of decision-making (20%), and retrospective analysis of patient outcomes to optimize future treatment (20%). Regarding outcomes, 80% of included articles reported positive outcomes following interprofessional care team implementation. However, most articles reported complications in enacting interprofessional teams due to communication challenges among team members (80%) and physician dominance in meetings (40%).

**Conclusions:** Interprofessional team-based care is a necessary component of PM&R to provide care and improve patient outcomes. However, there is a paucity of research investigating the practices and pitfalls of successful team functioning, as demonstrated by the limited number of manuscripts available for this review. Despite the limited literature, this analysis identifies several positive practices and challenges with interprofessional teamwork within PM&R.

**Significance:** This review offers valuable insights regarding the limited depth and breadth of current literature on interprofessional teamwork within PM&R and identifies the need for future research to create a foundation of successful team practices and pitfalls to avoid.

**Abstract Title:** Improving Healthcare for People with Disabilities Through Patient-Centered Medical Education: The Healthcare Education Engages Disability Studies Program (H.E.E.D.S.) Program

**Authors:** Pauline Do, Christa Deban, Ariel Cascio, Shay Dawson, Natalie Hamilton, Sarah Yonder, Neli Ragina

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:** Neli Ragina, Ph.D.

**BACKGROUND:** People with disabilities represent a large, underserved population that experience significant disparities in rates of chronic conditions, mortality, and morbidity compared to people without disabilities. One common barrier faced by people with disabilities that can contribute to these disparities is negative stigmatization from healthcare providers. This project will help to address identified gaps through an innovative curriculum intervention.

**OBJECTIVE:** The purpose of study is to change students' perception and beliefs about patients with disabilities through a series of educational interventions. The objectives include: 1) to educate healthcare students on the medical science, awareness, and psychosocial aspects of disability through didactic sessions and 2) to provide hands-on experiences working with people with disabilities through mock patient encounters and volunteering opportunities embedded in the curriculum.

**METHODS:** A pilot program (HEEDS) was implemented during the 2021-2023 academic years. The program consists of the following interventions: 1. Structured standardized patient (SP) encounters with SPs with lived experiences of the disabilities they portrayed and community volunteering with disability groups and organizations 2. Didactic sessions presented by faculty members with extensive knowledge in topics related to disability 3. Objective Structured Clinical Examination (OSCE) cases to evaluate the long-term retention of knowledge in practice. The outcomes of the educational interventions were assessed using a mixed method approach consisting of quantitative (pre- and post-surveys) and qualitative (debrief sessions) measures developed based on validated survey instruments. Questionnaires were administered to attendees prior to the first session and at the end of the seminar series. The Cronbach alpha for pre- and post-surveys were both  $0.7 < \alpha < 0.8$ , indicating strong internal validity and reliability. Mean and median scores, Wilcoxon Sign-Rank test, and paired t-test were used to analyze results. Following the SP sessions, students attended a debrief session with the SPs, caregivers, and faculty to discuss key experiences throughout the SP encounters. Debrief sessions were recorded on Webex and Panopto, transcribed, and reviewed to identify relevant themes through inductive thematic analysis.

**RESULTS:** Preliminary results include data from 2021-2022 and 2022-2023 academic years. Participants were connected using unique IDs from pre- and post-surveys to analyze the impact of the seminar series. Results from the paired t-test indicated a statistically significant increase in mean total scores from the pre-survey to the post-survey following attendance of the seminar series ( $p < 0.001$ ). Debrief sessions' transcripts revealed that lack of medical students' exposure to people with disabilities was a prominent topic. Students also described feeling more comfortable working with people with disabilities after program attendance.

**CONCLUSIONS:** Results indicate decreased negative stigmatization about patients with disabilities and improved attitudes toward disability after participation in the HEEDS program.

**SIGNIFICANCE:** The results suggest that expanding medical school curricula to include disability-specific training may help improve medical students' attitudes towards future patients with disabilities. Existing undergraduate medical curriculum on disability is limited and often delivered from a narrow perspective despite more than a quarter of U.S. adults identifying as having a disability. Programs such as the one described in this abstract help address these gaps.

**Abstract Title:** Medical students and individuals with disabilities: Assessing medical students' attitudes on caring for those with disabilities through a community outreach program in Michigan

**Authors:** Katlyn Droke, Andrew Nowak, Gabrielle Kennelley, Chin-I Cheng, Noshir Amaria, Rebecca Northway, Melissa Tinney, Adam Lewno

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:** Adam Lewno, D.O.

**Background:**

One in four adults in the U.S. lives with a disability. Yet, only roughly 2.5% of medical graduates identify as having a physical, mental, or other type of disability. With such a vast difference in the representation of disabilities between physicians and patients, it is imperative that medical education helps students learn how to care for individuals with disabilities. Previous studies showed that medical students are more comfortable approaching patients with disabilities in clinical settings after completing an educational session wherein they learn more about this population.

**Objective:**

To investigate Central Michigan University College of Medicine (CMU) medical students' perspectives on working with individuals who have disabilities through a CMU student-created Michigan outreach program at "A Day in Sports Medicine" program.

**Methods:**

Medical student volunteers (MS1–MS4, n=14) from CMU were asked to complete the 17-item (Likert scale) "Disability Attitudes in Healthcare Survey" before and immediately following engagement with individuals with disabilities at "A Day in Sports Medicine." Pre- and post-survey responses were compared using a mixed-design ANOVA model. Responses were also analyzed based on student gender and medical school class.

**Results:**

A total of 13 medical student volunteers completed both surveys. Overall, there was no statistically significant change in attitudes toward caring for individuals with disabilities across the two time points ( $p=0.079$ ), although there was a positive trend. There were also no differences between pre- and post-event responses between genders. However, when individual medical student class cohorts were considered, the MS3 student volunteers had a statistically higher average score in attitudes (both pre- and post-event) regarding caring for individuals with disabilities than each of the other class cohorts ( $p < 0.001$ ).

**Conclusions:**

Overall, medical student volunteers had no significant attitude changes regarding caring for individuals with disabilities. However, attitudes toward individuals with disabilities in healthcare did trend in a positive direction for all medical student mentor participants. Given how the M3 class scores were significantly different, there may be an element of clinical learning that may have contributed to improved perspectives. A lack of overall change may also have been due to some disabilities not being outwardly apparent. Pre-event medical school curriculum or volunteers' personal experiences may have also provided a higher attitude score at baseline.

**Significance:**

Medical student exposure to individuals with disabilities is important to career preparation. While no significant attitude changes were seen here, in light of the positive attitude trends, we hypothesize students may require additional in-person exposures for significant changes to be seen.

**Abstract Title:** Apprising medical students' attitudes regarding interprofessional teamwork, roles, and responsibilities at a sports medicine community outreach event.

**Authors:** Katlyn Droke, Andrew Nowak, Gabrielle Kennelley, Chin-I Cheng, Noshir Amaria, Rebecca Northway, Melissa Tinney, Adam Lewno

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:** Adam Lewno, D.O.

**Background:**

Medical education has seen recent improvements in incorporating interprofessional education into their curriculum with a focus on early introductions to interprofessional experiences. This has been shown to better prepare students to join interdisciplinary workforces after graduation. While traditional classroom learning may be effective in teaching medical students more about interprofessional collaboration, community outreach events may also help improve medical students' attitudes in working on interprofessional teams.

**Objective:**

To investigate Central Michigan University College of Medicine (CMU) medical student volunteers' attitudes toward interprofessional teamwork and individual professions' roles and responsibilities after working with physicians, athletic trainers, physical therapists, recreational therapists, nutritionists, and coaches at the Michigan community outreach event, "A Day in Sports Medicine."

**Methods:**

Medical student volunteers (MS1–MS4, n=14) were asked to complete the 9-item (Likert scale) Teamwork, Roles, and Responsibilities (TRR) section of the Interprofessional Attitudes Survey before and immediately after the event to evaluate attitude changes regarding work with interprofessional teams. A mixed-design ANOVA model was used to compare pre- and post-event survey responses.

**Results:**

A total of 13 CMU student volunteers completed both surveys. There was a significant increase in the average attitudes score toward interprofessional teamwork, and individual roles and responsibility in the post-event survey ( $p=0.002$ ) compared to the pre-event survey. The increase was irrespective of the gender ( $p=0.372$ ). When attitude changes towards interprofessional teamwork, roles, and responsibilities were assessed based on volunteers' medical school year, there was again a significant change overall from pre- to post-event ( $p=0.007$ ). However, there was no meaningful difference in responses between medical school years ( $p=0.751$ ).

**Conclusions:**

Medical students had improved attitudes toward interprofessional teamwork, roles, and responsibilities after participating in the "A Day in Sports Medicine" event. There were no significant changes in attitudes based on gender or year in medical school. This implies that interprofessional work is important for improving medical students' attitudes towards interprofessional teamwork regardless of gender or class cohort.

**Significance:**

The improvement in TRR Interprofessional Attitudes Survey scores indicates that CMU medical students should have more opportunities to engage in interprofessional team events within the community to improve their attitudes toward working with other health professionals.



**Abstract Title:** Pedagogical Utility of Youtube Videos in a Human Cadaveric Dissection-based Anatomy Course

**Authors:** Yousif Gariaqoza, Abdulghafoor Alani, Vishrudh Vasudevan, Joydeep Chaudhuri

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:** Joydeep Chaudhuri, M.D.

## Introduction

Curricular changes in healthcare education have led to the curtailment of human cadaveric dissection (HCD) within the anatomy curriculum. This is detrimental as the cognitive and sensory experiences during HCD are critical for an appreciation of the intricacies of human structure. However, HCD is challenging for students since it requires procedural skills, recognition of complex anatomical relationships and the emphasis on self-directed learning. Hence, it is predictable that students would explore videos available on the YouTube (YTVs) to prepare for HCD. However, research on their utility in preparing students for HCD is still in the nascent stage. Further, following reports of inaccurate information, educators are concerned about the appropriateness of YTVs for anatomy training.

## Aim

The aim of this study was to analyze the general characteristics and utility of YTVs in training in HCD.

## Methods

Google Chrome browser was used in incognito mode to locate YTVs using the terms “human cadaveric dissection” and “human anatomy dissection”. Using a simple, naturalistic search strategy, only English language YTVs were located according to the YouTube algorithm on the day of the search. The aesthetical quality of these YTVs was ranked based on the image clarity, sound quality and use of visual cues. The utility of the YTVs in learning anatomy was scored on their instructional capacity for HCD and demonstrate the complex anatomical relationships. The YTVs were rated on a Likert scale with 1-5 (very poor-excellent). The comments of viewers about the videos were also examined. All assessments were performed by three medical students and three anatomy educators.

## Results

Based on predetermined criteria, a total of 79 YTVs were analyzed. Their average aesthetical quality was  $4.31 \pm 0.21$  and their utility in learning anatomy was  $3.04 \pm 0.32$ . The interrater reliability for aesthetical quality and the utility of the YTVs in learning anatomy were 0.827 and 0.836 respectively. The positive comments from viewers focused on the audiovisual presentation and utility of YTVs in learning anatomy. Most of the negative comments highlighted the need for more accurate descriptions of dissection, and difficulty in locating relevant information.

## Discussion:

Due to diminishing opportunities for HCD, anatomy teaching is becoming increasingly reliant on multimedia-based teaching initiatives. Therefore, the capacity to combine audio, video, text-based comments in YTVs represents a significant opportunity to enhance anatomy learning. However, since these approaches have been largely piecemeal, current YTVs are limited in their capacity to assist students in the acquisition of anatomical knowledge. Therefore, YTVs needs to be leveraged to provide new avenues for student training

**Abstract Title:** Let's Talk 3D: Increasing Community Health Literacy about Delirium, Depression and Dementia in high schoolers

**Authors:** Nathan Klausner, Sarah Beeharry, Caroline Cassidy, Jyotsna Pandey

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:** Jyotsna Pandey, M.D., Ph.D.

**Background:** Delirium, depression, and dementia are very similar and easily confused common diseases, especially in older adults. Given that high school students may witness these conditions in their loved ones, educating students about distinguishing between these diseases aims to improve health literacy, reduce caregiver distress, and enhance the well-being of older adults in these communities.

**Methods:** We conducted presentations on delirium, depression, and dementia at high schools in Mt. Pleasant, Michigan, administering pre- and post-session surveys to assess understanding and demographics. Six months later, participants will undergo follow-up assessments to gauge the long-term retention of the health information. To analyze the data collected we used Pearson's chi-square tests and Likelihood Ratio tests.

**Results:** Out of the 51 students the median age was 17, 74% (n=37) female, and 78% (n=40) white and 53% (n=26) identified as living in a rural area. Pre-survey results showed 33% (n=17) of participants marked they are involved as a caregiver for an older adult. 51% of the participants (n=26) were familiar with the term delirium, while 98% and 96% were familiar with the terms depression(n=50) and dementia(n=49), respectively. As for recognizing these conditions, 10% said they could recognize delirium, while 80% and 71% could recognize depression(n=41) and dementia(n=36), respectively. 6% felt they knew what to do if someone had delirium(n=3), compared to 57% for depression(n=29) and 41% for dementia(n=21). 41% of the participants(n=21) said they did not know what to do for any of these conditions. 0% reported knowing or living with someone diagnosed with delirium, 57% for depression(n=29), and 31% for dementia(n=16). For rural and non-rural group, significant differences exist in familiarity with the term delirium. 73% participants(n=19) from rural areas compared to 26% participants(n=6) from non-rural areas said they heard the term delirium ( $P=0.001$ ). In the post-survey, 98% of the participants(n=50) correctly identified the difference between delirium, depression, and dementia in the vignette-style questions provided. We have yet to collect the six month retention data.

**Conclusions:** We accomplished our goal of improving community literacy of delirium, depression, and dementia among high school students in rural Michigan. Students initially had low familiarity with delirium and struggled to identify these conditions. But after the presentation they were able to correctly identify and become familiar with all three. Given that 10.2% of the participants live in multigenerational homes and 33% reported being involved with the care of an older adult, presenting the 3Ds to high school students is an important step in reducing caregiver burden and enhancing the well-being of elderly adults.

**Abstract Title:** Impact of the COVID-19 Lockdown on the Mental Wellbeing of U.S. Medical Students

**Authors:** Merlin Kochunilathil, Makayla Brunt, Brady Bush, Judy Huynh, Hunter Li, Jack White, Beth Bailey

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:** Beth Bailey, Ph.D.

**BACKGROUND:** The COVID-19 pandemic and subsequent stay-at-home quarantine caused an unprecedented change in the mental well-being of students at all levels across America. One such group significantly affected was US 1st-4th year medical students. To our knowledge, there have been no reviews encapsulating all the quantitative data regarding medical student's mental well-being during the lockdown period.

**OBJECTIVE:** The goal of our project was to review studies examining the mental well-being of US medical students during the lockdown. This was done to provide insight into medical student stress, anxiety, and burnout and highlight the importance of mental health advocacy for an already tumultuous group of students.

**METHODS:** Literature was searched using relevant search terms and multiple databases to identify studies between 2020-2022, which signify the COVID-19 lock down, completed in the United States. Two papers which met our inclusion criteria were included, and a third was included after the review of a systematic review found in our original search. These papers measured 1st-4th year US medical students' mental wellbeing, both quantitatively and qualitatively.

**RESULTS:** Our systematic review examined 260 medical students across 3 different US medical schools. Three major themes associated with changes in mental wellbeing were apparent: (1) The pandemic caused increase sleep duration with simultaneous decrease in sleep quality and mental health; (2) Student performance did not change due to lowered attendance, but actually the lack of attendance improved wellbeing; (3) Students had a diverse social adjustment to the pandemic, including spending more time with family which improved wellbeing, while others found themselves worrying more about the state of the national public health as future practitioners.

**CONCLUSIONS:** Our findings highlight the multifaceted nature of the pandemic's effect on the mental wellbeing of 1st-4th year medical students in the United States. Student adjustment towards the lockdown also varied, which seemed to influence individual mental wellbeing levels.

**SIGNIFICANCE:** The pandemic's effect on medical students underscores the importance of continued advocacy for the mental health of medical students and the need for personalized support systems. Medical students already have a heavy burden to carry throughout their lengthy training; thus, it is important that these future leaders in health care also have training in mental wellbeing that adequately suits their individual needs.

**Abstract Title:** Self Determination Theory: A Key to Success in Peer Observation of Teaching Programs

**Authors:** John Lowry, Judy Blebea, Andrew Bazakis, Nicole Wright

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:**

**BACKGROUND:** Medical faculty want to teach well, but many lack formal training. Peer observation programs have been shown to be effective in developing instructional competency.

**OBJECTIVE:** To improve medical educator teaching practices and effectiveness we designed a peer observation of teaching program heavily rooted in self-determination theory. The processes were designed to maximize faculty autonomy, competence, and relatedness, as well as provide positive feedback about teaching.

**METHODS:** Faculty member participants in the peer observation of teaching program were provided training on the process before starting. The majority of the faculty were medical educators in foundational sciences. Paired peer observers were often from different content areas. Participants were given a program evaluation survey at the end of the program. They were asked to rate how much they agreed with statements relating to the experience and answer open-ended questions about both positive and negative experiences.

**RESULTS:** A survey was distributed to all 20 participants. A total of 12 participants completed the survey for a response rate of 60%. Participants were evenly divided between all ranks with 33% assistant professors, 33% associate professors, and 33% professors. Half of the participants identified as males. [Add what % were female vs other} The majority of the participants (67%) had a PhD/EdD as their terminal degree, and the rest had MD or DO degrees. Faculty universally rated the program as having a positive impact on their competence in teaching and professional development. All respondents indicated they valued the program's structure and engagement with peers. Participants also agreed that it was easy to work with their colleague; peer observers provided constructive feedback and communicated well during the process; and that engaging in the process helped them reflect on their own teaching practices. Open comments indicated that faculty enjoyed working with someone with whom they felt comfortable, they enjoyed getting insights from people who could see things they could not see about their own pacing, and that this program gave an opportunity to get to know colleagues better. While faculty enjoyed seeing different teaching styles and receiving feedback, it could feel intimidating, and it was sometimes a challenge to set up observation appointments around busy schedules. Only 44% of participants agreed that participating would improve their ability to get promoted.

**CONCLUSIONS:** Participation in a peer observation of teaching program that maximizes faculty autonomy and relatedness can be very effective and received well by faculty.

**SIGNIFICANCE:** This study demonstrates aspects of a successful peer observation of teaching program. As in patient care, there is a need for continuous quality improvement. Faculty will feel supported and engaged when they have a high degree of autonomy in the process and when they are connected to others with a sense of belonging which is well-aligned with the principles of self-determination theory.

**Abstract Title:** Increasing Guideline Directed Medical Therapy for Heart Failure in CMU Health – Colony: A Root Cause Analysis

**Authors:** Brandon Snel, Ghassan Hamadeh

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:** Ghassan Hamadeh, M.D.

### Background

Heart failure (HF) in the United States is one of the leading causes of morbidity and mortality. Within Michigan, there is county-county differences in heart disease, where the central-eastern areas have increased hospitalization rates for heart disease, including Saginaw Michigan, tied for the highest rate. The most common subtype of HF is heart failure with reduced ejection fraction (HFrEF). For HFrEF, there are Guideline Directed Medical Therapy (GDMT) that reduces mortality, hospital visits, and improves quality of life outcomes. First line GDMT for heart failure includes five medications: neprilysin inhibitor (Ni), angiotensin converting enzyme inhibitor (ACEi) or Angiotensin Receptor Blocker (ARB, also commonly in combination with Ni as ARNi), Mineral Aldosterone Antagonist (MRA), sodium glucose transporter 2 inhibitor (SGLT2) and a beta blocker (BB). Each of these five medications has found to independently reduce mortality and improve health outcomes, and in combination, can reduce mortality by 37%. It is reported that only about 1.1-13.2% of people in heart failure are treated with all five at target doses.

### Objective

In this quality improvement project, we are looking into how our multi-physician primary care clinic, CMU Health – Colony, compares with the general population for GDMT treatment and finding/managing reversible causes within our clinic to increase GDMT.

### Methods

A de-identified patient list was created on EPIC, with any patient with an active diagnosis of HFrEF. The patient list was then tallied to give the percentage on neprilysin inhibitors, angiotensin converting enzyme inhibitor or angiotensin receptor blocker, mineralocorticoid recenter antagonist, sodium glucose transporter 2 inhibitors, beta blocker and compared to national data. Dosages are then included to determine how many of the medications are properly titrated to minimum acceptable doses.

The patients that are inadequately treated by not including all five medications, or those that are underdosed of any of the medications were reviewed to determine potential reasons for the under prescribed. Factors that were analyzed from each undertreated patient included blood pressures, potassium levels, other hypertension medications less associated with mortality benefit, and creatinine levels.

### Results

21/122 (17%) were on an ARNi, 100/150 (67%) were on an ACEi or ARB (including Entresto ARNi), 110/150 (73%) were on a BB, 29/122 (24%) were on an MRA, 31/122 (25%) were on an SGLT2. In total, 4/122 (3%) were on all five medications of GDMT

There are three identified factors that have been discovered from analyzing the patient lists. Of those not on adequate GDMT, 72% had hypotension where 60% were on antihypertensives other than first line GDMT, 8% had hyperkalemia as a contraindication of MRA, 13% were under-dosed where 22% had no found reason (some patients overlap).

### Conclusions and Significance

CMU Health—Colony matches national data in GDMT prescriptions. With three identified significant factors, potential solutions include withdrawing non-mortality benefit hypotensive medications, SGLT2 trials for hyperkalemia, education/reminders, primary care titration. With these changes we have the potential to improve up to 96 of the 122 patients' mortality risk.

**Abstract Title:** Trends in Virtual Anatomical Education: Course Correcting After COVID-19

**Authors:** Udit Thawani, Hunter Li, Pauline Do, Joydeep Chaudhuri

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:** Joydeep Chaudhuri, M.D.

**BACKGROUND:** Before COVID-19, experimentation with digital and virtual methods of anatomy instruction was being conducted in part to help programs struggling with the high costs of maintaining in-person instruction methods. The COVID-19 pandemic provided a unique opportunity to implement these innovative ideas in anatomical education. Post-pandemic, medical schools have transitioned back to in-person instruction and parts of anatomical laboratory instruction that were adapted to virtual learning have reverted to in-person modalities.

**OBJECTIVE:** The purpose of our project is to investigate the trends in research literature regarding virtual and online instruction of anatomical sciences before, during, and after the pandemic. The objectives include: (1) identify the trends in education research based on the most frequently occurring words and (2) determining whether the COVID-19 pandemic itself was a catalyst event that accelerated the use of online technology in anatomical education or if it was already trending towards that direction.

**METHODS:** A narrative review was undertaken utilizing literature published in the “Anatomical Sciences Education” journal. Using PubMed as a database, abstracts published between 2018-2022 were included in the review. Abstracts were sorted by digital publication date and reviewed for use of the words “digital” and “virtual”. A Python script was developed to identify the most frequently occurring words within the retrieved abstracts, and the context of their usage was analyzed to note trends and investigate how the anatomical community perception of online teaching has changed over time.

**RESULTS:** During 2019, authors discussed how different educational platforms and technological innovations were already being trialed in classrooms as alternatives to maintaining expensive cadaver-based labs. Trends in discourse in the years of calendar years 2020 and 2021 gauged student perspectives on the switch from in-person anatomical learning to modes of online learning, and how the change was impacting student grades and outcomes. The years 2022 and 2023 showed a partial regress of online teaching with a greater emphasis on in-person teaching, while maintaining some aspects of virtual delivery of information. The focus in more recent times centered around the transition back to in-person, while maintaining that some aspects of virtual delivery of information acts well as a supplement.

**CONCLUSIONS:** COVID-19 expedited exploration of virtual and online mediums of instruction, but the trends in research suggest that feedback from students and instructors have informed the field to move towards hybrid teaching. The literature is trending towards educational models that incorporate a strategy that utilizes the strengths of both virtual mediums and in-person, cadaveric based instruction with the goal of facilitating the best student outcomes.

**SIGNIFICANCE:** The discussion surrounding the high costs of maintaining an in-person cadaver-based lab has brought about the argument that virtual mediums would be beneficial; however, this research demonstrates that hybrid models of anatomy education are being more widely adopted. The advancements of technology should be used to enhance traditional anatomy education.

**Abstract Title:** Integration of Point of Care Ultrasound (POCUS) in a Human Cadaveric Dissection Based Anatomy Program: Advantages and Challenges

**Authors:** Payton Wolbert, Austin Basso, Joydeep Chaudhuri

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:** Joydeep Chaudhuri, M.D.

## Introduction

Point-of-Care Ultrasound (POCUS) has transcended clinical medicine and is emerging as a fundamental aspect of undergraduate medical education. It helps develop factual and procedural anatomical knowledge through visualization of internal organs. Hence medical schools are incorporating POCUS in their preclinical curriculum, while others are contemplating this notion. These decisions appear to be based mainly upon perceptions of the medical school leadership, rather than student opinions. While the virtues of POCUS have been extolled, there is limited empirical research related to challenges in its incorporation in a human cadaver dissection-based anatomy program. This information is essential to develop a holistic anatomy curriculum.

Therefore, this study aimed to assess the opinions of medical students regarding the advantages and challenges of incorporation of POCUS within the curriculum. The eventual aim was to examine the feasibility of the systematic implementation of POCUS in the anatomy curriculum.

## Methods

This approved study reports on the findings of Cohort 1 (Summer-2022) and Cohort 2 (Summer-2023) medical students. The study was carried out during a six-week extra-curricular dissection program between their first and second years. Each student worked with their peers (3-4 members) to dissect a cadaver.

## Results

The results are based on 24 and 31 demographically similar students in cohorts 1 and 2 respectively, none of whom had any previous experience of cadaveric dissection or POCUS. Thematic analysis of student responses revealed that POCUS had the ability to highlight anatomical relationships in a hands-on, low stress learning environment, and had a wide breadth of clinical utility. However, the major pedagogical challenges identified were the increased cognitive load of acquiring and interpreting POCUS images and aligning them with spatial relationships. The major academic concern was that the integration of POCUS would overwhelm an already congested curriculum. Further, since POCUS is not an intuitive skill, the major logistical barriers were the need for additional equipment and faculty.

## Conclusion

While exposure to POCUS in medical education is not novel, there is variable evidence regarding its formal integration within the anatomy curriculum. Hence, this study presents relevant information as institutes initiate steps to implement POCUS. Based on student responses, the solutions for an optimal learning environment include identifying short periods of curricular time, greater availability of POCUS equipment, and recruiting residents for small group learning. Therefore, future medical education should focus on the controlled integration of POCUS to address the misperceptions of students in using this learning tool.

**Abstract Title:** Shaping Tomorrow's Healthcare Heroes: Influence of the Health Careers Pipeline Program on Students from Rural and Underserved Areas

**Authors:** Payton Wolbert, Brady Bush, April Osburn, Jennifer Morneau-Wilson

**Abstract Category:** Quality Improvement/Medical Education  
Jennifer Morneau-Wilson

**Advisor/Mentor:** April Osburn,

**Background:**

The National Area Health Education Center Organization (NAO AHEC) program, established in 1971, aims to enhance healthcare in underserved areas by training a skilled workforce through community-academic partnerships. The Mid Central AHEC regional center, established in 2010, is a 501c3 non-profit organization partnered with and housed within the CMU College of Medicine. A significant initiative of AHEC is the Health Careers Pipeline Program, a program for 9th and 10th graders from underserved and underrepresented backgrounds to explore various health careers.

**Objectives:**

This initiative aims to introduce high school students to health careers and provide educational pathways and support networks, fostering a diverse and committed future healthcare workforce for underserved communities.

**Methods:**

We employed an online pre-program and post-program survey via Qualtrics to assess high school student's understanding of health careers, educational qualifications required for these careers, awareness of resources or programs providing relevant information, and their confidence in reaching out to health professionals for advice. Data analysis was performed using paired t-tests.

**Results:**

The survey results indicate significant improvements in high school student's understanding of health careers and the educational qualifications needed for these careers after an intervention, with mean scores increasing from 2.79 to 3.53 ( $p=0.004541$ ) and from 2.58 to 3.26 ( $p=0.01899$ ), respectively. Awareness of resources or programs providing information on health careers also saw a significant rise, from a mean of 2.37 pre-intervention to 3.11 post-intervention ( $p=0.01184$ ). However, while there was an increase in students' confidence in reaching out to health professionals for advice, from a mean of 3.11 to 3.42, this change was not statistically significant ( $p=0.3306$ ).

**Conclusion:**

The Health Careers Pipeline Program has effectively enhanced understanding of health careers, educational qualifications, and awareness of resources among high school students from rural and underserved backgrounds and first-generation college students, as evidenced by significant improvements in survey scores post-intervention. This supports the notion that the program successfully advances AHEC's mission to prepare these students for health careers.

**Significance:**

The Health Careers Pipeline Program by Mid Central AHEC significantly improves high school students' knowledge of health careers, qualifications, and resources in underserved communities. Survey results showed meaningful increases in understanding and awareness post-program, aligning with AHEC's mission to cultivate a diverse healthcare workforce for underserved areas.



**Abstract Title:** Student-Driven, High-Yield Histopathology Review in the Hematology/Oncology Course

**Authors:** Payton Wolbert, David Doyle, Arlene Chan, Allison Rakowski, Jyotsna Pandey

**Abstract Category:** Quality Improvement/Medical Education

**Advisor/Mentor:** Jyotsna Pandey, M.D.,

Ph.D.

**Background:**

Medical education is constantly evolving and seeks innovative teaching methods to enhance the understanding and application of complex subjects such as histology and pathology. Histology education is crucial for medical students and provides vital knowledge which forms the basis for understanding physiological function and the derangements that lead to pathological conditions. There are present challenges presented by the intricacies of histology education including dense terminology, high cognitive load, and limited teaching time. Therefore, we rely on effective educators and dynamic teaching strategies.

**Objective:**

We sought to improve the histology curriculum at CMU College of Medicine. Our objective was to enhance the grasp of histology within a clinical setting and propose educational improvements that emphasize its relevance in both clinical and pathological frameworks. This endeavor was driven by insights gathered from student feedback. Furthermore, based on student feedback, we sought to assess the effectiveness of implementing a student-driven, high-yield histopathology review in the hematology/oncology course.

**Methods:**

Phase 1: Data was gathered using a verified survey given to second-year students and two semi-structured focus group interviews with volunteers from the same group.

Phase 2: Students collaborated with faculty to create a laboratory session with clinical vignette style questions to learn histopathology through application. Effectiveness was assessed using a pre- and post-survey.

**Results:**

Of 108 second-year students, 50 (46%) responded to a survey indicating that histology is seen as useful for clinical education, with a preference for its modernization and emphasis on clinical orientation. In the focus groups, students expressed a preference for digital resources and a curriculum that aligns with clinical practice and USMLE Step 1 preparation.

Preliminary analysis of the pre- and post-survey questions for Phase 2 indicates positive findings and increased ratings across several areas of histopathology education. Participants reported enhanced confidence in diagnosing histopathological conditions, improved familiarity with clinical vignettes related to histopathology, and a belief that their training has prepared them for interpreting histopathological features. There was a clear understanding of the significance of histopathology in clinical decision-making and an increased ability to identify specific histological features. Further analysis will be carried out.

**Conclusion:**

This study aimed to enhance the histology curriculum through innovative teaching strategies, focusing on the clinical applicability of histology and pathology. We implemented a student-driven, high-yield histopathology review based on student feedback gathered. We engaged second-year medical students in a tailored histopathology review in the hematology/oncology course, evaluated the impact through pre- and post-surveys, and observed positive educational benefits.