UNIVERSITY OF WISCONSIN DEPARTMENT OF SURGERY

research summit 2026

Research Without Borders

THURS **JANUARY 29** 2026 | **HEALTH SCIENCES LEARNING CENTER** (HSLC)

program book

welcome

Welcome to the 17th Annual University of Wisconsin Department of Surgery Research Summit!

Research drives life-saving innovations, improves patient care and outcomes, and can yield massive economic returns by preventing illness, improving diagnostic and treatment efficacy and timelines, and reducing healthcare costs. Like the proverbial ripple in the pond, scientific advancements can have an impact that is felt not only locally or nationally, but can also carry to furthest edges of the globe. Thus, "Research Without Borders" is the theme of the 2026 Department of Surgery Research Summit. Today will not only be an opportunity to learn about the cutting-edge science in which our research faculty, staff, and trainees are engaged and that could ultimately impact surgical care, research, and education well beyond the borders of Wisconsin; we also hope it will facilitate collaborations within and outside of the department and inspire the next generation of surgery scientists.

We are thrilled to welcome Dr. Sandra Wong as this year's keynote speaker. Dr. Wong is the Dean of the Emory University School of Medicine, the Chief Academic Officer of Emory Healthcare, and the former Chair of the Department of Surgery at the Geisel School of Medicine at Dartmouth and Dartmouth Health. A surgical oncologist who specializes in the management of soft tissue sarcomas, melanoma, and non-melanoma skin cancers, she is also a world-renowned health services researcher with a strong interest in rural health disparities. This interest prompted Dr. Wong and colleagues to create Dartmouth Health's NIH P20-supported Center for Rural Health Care Delivery Science, which serves as a training ground for early-stage investigators who are committed to understanding and solving challenges associated with the provision of equitable healthcare. Her presentation today will focus on the application of delivery science as a means of improving access to equitable healthcare at our home institutions and around the globe.

The hard scientific work of the department will be on display during the Abstract Oral Presentations. A jam-packed session of ten talks will feature scientists, researchers, and undergraduate, graduate, and postgraduate trainees who are conducting impactful basic, translational, clinical, or health services science. The poster session in the HSLC Atrium at 11:30am will further highlight the breadth and depth of the research that is being conducted across the department; we strongly encourage you to engage with the poster presenters to hear about their innovative work.

Artificial intelligence (AI) has become ubiquitous in research, yet in a field that is so rapidly changing many of us are only scratching the surface of how it can help us in the lab. For our afternoon Skills Building Seminar, we'll be joined by Dr. Ben Rush, an Informatics Data Scientist in the UW Department of Radiology, and Dr. Jen Merems, a Scientific Editor in the Institute for Clinical and Translational Research (ICTR). Drs. Rush and Merems will be giving us a crash-course in how generative AI can be customized to best support our research productivity, including scientific writing and project management.

In our final session of the day, surgical innovators in the department who are looking for seed funding that can help them bring a compelling idea to fruition will have the chance to argue their case for support in our Department of Surgery Innovation Shark Tank Competition. Up to five faculty or PI-eligible labs will be presenting their cutting-edge research ideas to our panel of "sharks," which includes Dr. Jon Audhya, the SMPH Senior Associate Dean for Basic Research, Biotechnology, and Graduate Studies; Dr. Amy Kind, the SMPH Associate Dean for Social Health Sciences and Programs; Erik Iverson, JD, Chief Executive Office of the Wisconsin Alumni Research Foundation; and Dr. Alan McMillan, co-director of ICTR's Pilot Awards Program. Knowing the talent and creativity driving the scientists in our department, it's certain our judges will have their work cut out for them in selecting the winner.

Research without borders is at the heart of the Wisconsin Idea and it drives our innovators to generate scientific aims and solutions that can beneficially impact patients at the local, regional, national, and international levels. The 2026 Research Summit is a forum that allows the Department of Surgery's researchers and research trainees to showcase their contributions to the Wisconsin Idea. We hope you find today's speakers and program as immensely awe-inspiring as we do.

Mehreen Kisat, MBBS, MS and **Patrick Varley, MD, MS**
Program Co-Chairs

keynote speaker

Sandra Wong, MD, MS

Dean, Emory University School of Medicine
Chief Academic Officer, Emory Healthcare

Dean Wong is a surgical oncologist and health services researcher with a long record of research funding from the National Institutes of Health, the Agency for Healthcare Research and Quality, and the American Cancer Society.

Dean Wong completed her undergraduate studies at the University of California, Berkeley. After receiving her medical degree from the Northwestern University Medical School, she then completed a surgical residency at the University of Louisville School of Medicine and a surgical oncology fellowship at the Memorial Sloan-Kettering Cancer Center. Prior to joining Emory, Dean Wong was the Chair of the Department of Surgery at the Geisel School of Medicine at Dartmouth and Dartmouth Health, where she leveraged her collaborative skills to develop cross-disciplinary mentorship and research programs. She also developed an interest in studying and eliminating rural health disparities. Her efforts helped spur the creation of the federally-funded Center for Rural Health Care Delivery Science, which provides infrastructure to train early-stage investigators who focus on understanding and solving challenges associated with the provision of equitable health care.

Dean Wong is a Past President of the Society of University Surgeons, the Society of Surgical Chairs, and the Society of Surgical Oncology. She is passionate about training and mentoring the next generation of clinicians and investigators, and has been honored to have received numerous teaching awards.

guest speakers

Skills Building Seminar: AI as a Productivity Assistant

Ben Rush, PhD

Ben Rush, PhD, is an Informatics Data Scientist in the Department of Radiology. His research focuses on scaling CT-derived tissue biomarkers across a population-level dataset of over one million patients to model biological aging and predict chronic disease incidence. Additionally, he develops automated LLM pipelines and multi-agent workflows for research analysis and project management. He has led AI for Scientists, AI for Creativity, and Applied Improv for Scientists workshops and presents on the intersection of generative AI, creativity, and strategic science communication. He is a member of the Machine Learning + X Leadership Committee and uses AI in automation workflows for his LLC.

Jen Merems, PhD

Jen Merems, PhD, is a seasoned scientific editor with over eight years of experience supporting academic research. She specializes in editing and refining manuscripts, grant proposals, research protocols, posters, presentations, and digital and print media.

Driven by a passion for advancing science, Dr. Merems collaborates with research teams to amplify the impact of their work through clear and compelling storytelling. Dedicated to enhancing broad participation in clinical trials, she focuses on fostering accessibility and broad dissemination of research. Dr. Merems is committed to helping researchers effectively communicate their findings for greater visibility and success.

She is a graduate of the University of Arizona (BS), the University of Idaho (MS), and the University of Wisconsin-Madison (PhD).

guest judges

Shark Tank Pitch Competition

Amy Kind, MD, PhD

Amy Kind, MD, PhD, is Associate Dean for Social Health Sciences and Programs at the University of Wisconsin School of Medicine and Public Health. Her leadership role includes serving as Founding Director of the UW Center for Health Disparities Research, Executive Director of the $480 million Wisconsin Partnership Program, and CEO of the rural health-focused Orion Initiative. Dr. Kind is an internationally acclaimed expert in the field of disparities-focused exposome science, social determinants of health, and Alzheimer's disease. She leads a $40 million NIH-funded research portfolio, including "The Neighborhoods Study," an innovative 23-site national consortium linking ADRD neurobiology to life course social exposome exposures to advance precision health and prevention. Her development of the Area Deprivation Index (ADI) and the Neighborhood Atlas, a free data democratization tool that quantifies the social exposome for every neighborhood in the US including Puerto Rico, has had far-reaching impact on policy, clinical care, and research.

Alan B. McMillan, PhD

Alan B. McMillan, PhD, is a professor of clinical health sciences as well as the associate section chief of Imaging Sciences within the Department of Radiology at the University of Wisconsin-Madison. He has affiliate appointments in the Department of Medical Physics, Electrical and Computer Engineering, and Biomedical Engineering. He is currently the Lab Director of the Molecular Imaging/Magnetic Resonance Technology Lab (MIMRTL), where the team's focus is to integrate advanced modeling, data science, and physics-based approaches to improve medical imaging, particular for magnetic resonance imaging (MRI) and positron emission tomography. The group has a large focus on the development, application, and evaluation of artificial intelligence methods in medical imaging.

guest judges

Shark Tank Pitch Competition *cont'd*

Anjon (Jon) Audhya, PhD

Anjon (Jon) Audhya, Ph.D. earned his bachelor's degree from Brown University in 1997, received his Ph.D. in biomedical sciences at the University of California, San Diego in 2002, followed by postdoctoral studies at the Ludwig Institute for Cancer Research from 2003 – 2007. Dr. Audhya joined the faculty of the UW-Madison Department of Biomolecular Chemistry in 2008. During this period, he took advantage of genetic, biochemical, and microscopy-based approaches to dissect basic regulatory mechanisms that control protein trafficking and organelle dynamics. Since arriving in Madison, his laboratory has been committed to understanding the fundamental mechanisms by which membrane proteins, lipids, and other macromolecules are transported throughout eukaryotic cells. To do so, the Audhya lab uses a variety of experimental systems, ranging from animal models to human-induced pluripotent stem cells. They also aim to recapitulate individual steps of membrane transport in vitro, using recombinant proteins and chemically defined lipids. Although basic research is the cornerstone of his program, Dr. Audhya also seeks to define pathomechanisms that underlie human disease, focusing on the impact of mutations in key trafficking components that lead to neurodegeneration, cancer, and diabetes. Dr. Audhya was promoted to the rank of Professor with tenure in 2019. On December 1, 2021, he was appointed Senior Associate Dean for Basic Research, Biotechnology, and Graduate Studies in the School of Medicine and Public Health. He is a fellow of the American Society for Cell Biology, serves as the Director of the Center for Training in Pharmacology and Drug Development and co-leads the NIH-funded T32 graduate training program in Pharmacology.

Erik Iverson, JD

Erik Iverson is Chief Executive Officer of the Wisconsin Alumni Research Foundation (WARF), a nonprofit, mission-driven organization supporting scientific research within the UW–Madison community for nearly a century. He joined WARF in June 2016. WARF is the designated patent management organization for UW, partnering with university researchers on patenting and licensing their discoveries and providing grants to the UW to support further research.

Iverson has over 20 years of executive experience leading organizations and programs committed to entrepreneurial efforts that positively impact people worldwide. Prior to joining WARF, he served as a lead executive at the Infectious Disease Research Institute (IDRI), attorney at the Bill & Melinda Gates Foundation and within the law firm of Perkins Coie.

He holds a B.A. from Gustavus Adolphus College, J.D. from the University of North Dakota, and an LL.M. from New York University.

program

University of Wisconsin Department of Surgery

17th Annual Research Summit

Research Without Borders

Thursday, January 29, 2026

AM

7:30 **Registration & Continental Breakfast**, HSLC Atrium

8:00 **Welcome & Opening Remarks**, 1306 HSLC

- **Mehreen Kisat, MBBS, MS**, Program Co-Chair
- **Patrick Varley, MD, MS**, Program Co-Chair

8:15 **Keynote Address**, 1306 HSLC

"Better Health and Healthcare Through Research"

Sandra Wong, MD, MS
Dean, Emory University School of Medicine
Chief Academic Officer, Emory Healthcare

9:15 **Break**, HSLC Atrium

9:30 **Abstract Oral Presentations**, 1306 HSLC, 7 minutes + 3 minutes Q&A

- **Rebecca Busch**
  "Participation in a Surgical Quality Improvement Initiative Associated with Improved Opioid Stewardship"
- **Kate Telma**
  "Better Conversations for Better Informed Consent: A Pilot Study for Surgeon Training"
- **Chandler Annesi**
  "Time to Trauma Center for Hemodynamically Unstable Pediatric Trauma Patients: Where Do We Need to be 'Pediatric Ready'"
- **Nada Botros**
  "Comparative Analysis of Reference Retrieval Patterns Across Artificial Intelligence Models in Craniosynostosis Surgical Treatment Planning"
- **Daniel Rice**
  "Hypothermic Machine Perfusion Parameters are Associated with Donor Characteristics and Post-Transplant Outcomes in Deceased Donor Kidney Transplant"
- **Ligi Milesh**
  "Cold Atmospheric Plasma as a Selective Therapeutic Approach in Neuroblastoma: Mechanistic and In Vivo Validation"
- **Muhammad Talha Nawaz**
  "Tumor DNA Analysis In Peritoneal Fluid from Patients with Peritoneal Carcinomatosis"
- **Corinne Praska**
  "Introduction of Buccal Buprenorphine in Enhanced Recovery Protocol for Colorectal Surgery Patients"

cont'd

program cont'd

AM *cont'd*

- **Christopher DeCorte**
  "Engineering Immune-Evasive Endothelium via ICAM-1 Knockout in Human PSC-Derived 3D Vascular Models"
- **Reji Babygirija**
  "Sleeve Gastrectomy Improves Metabolic Health, Cognition and Reduces Plaque Pathology in an Animal Model of Alzheimer's Disease"

11:20 **Break**, HSLC Atrium

11:30 **Poster Session**, HSLC Atrium

PM

12:30 **Lunch**, 3110 HSLC (3rd Floor)

1:30 **Skills Building Seminar: AI as a Productivity Assistant**, 1306 HSLC

Guest Speakers
- **Jen Merems, PhD**
- **Ben Rush, PhD**

2:30 **Break**, HSLC Atrium ***Voting for the Surgery Science Image Contest ends at 2:30pm!***

2:45 **Shark Tank Pitch Competition**, 1306 HSLC

- **Jennifer Philip**
  "Split Deconstructed: Leveraging Non-Utilized Organs to Develop an Innovative Platform for Surgical Training and Simulation"
- **Makenna Ash**
  "FlapWise: Simulation Based Training in Microsurgical Decision Making"
- **Victoria Rendell**
  "Harnessing Artificial Intelligence for Quality Improvement in Ventral Hernia Repair Practices'"
- **Elise Dietmann**
  "Enabling At-home Monitoring of Kidney Allograft Rejection Using Dried Blood Spots"
- **Alexandra Helbing**
  "Paging Dr. Chatbot: Automating Follow-Up for Incidental Adrenal Nodules"
- **Riccardo Tamburrini**
  "Powering Backup Organs: Mitochondrial Transplantation as a Reconditioning Strategy for Ischemic Organs"

4:00 **Awards & Closing Remarks**, 1306 HSLC

- **Mehreen Kisat, MBBS, MS**, Program Co-Chair
- **Patrick Varley, MD, MS**, Program Co-Chair

4:15 **Reception**, HSLC Atrium

acknowledgements

We would like to thank the following individuals who served on the **2026 Research Summit Planning Committee** and made invaluable contributions to the planning of this event.

Hannah Clark
Luke Funk, MD, MPH
Angela Gibson, MD, PhD
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Megan Herdrich
Mehreen Kisat, MBBS, MS
Karen Lynch
Bhabna Pati, MS
JoAnne Vaccaro, CPA
Patrick Varley, MD, MS
Jennifer Zellner, PhD

We also wish to recognize the **abstract reviewers** who served on our Program Committee. The following individuals generously donated their time to review the 116 abstracts that were submitted:

David Aufhauser, MD
Andrea Axtell, MD, MPH
Courtney Balentine, MD, MPH
Anna Beck, MD
Julia Berian, MD, MS
Miloš Buhavac, MBBS
Connie Chamberlain, PhD
Daniel Cho, MD, PhD
Alex Chiu, MD
Aaron Dingle, PhD
Nick Druar, MD
Caitlin Finn, MD
Luke Funk, MD, MPH
Angela Gibson, MD, PhD
Rachel Godbout
David Harris, MD
Sarah Jung, PhD
Cynthia Kelm-Nelson, PhD
Mehreen Kisat, MBBS, MS
Hau Le, MD
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Ligi Milesh, PhD
Muhammed Murtaza, MBBS, PhD
Manabu Nukaya
Sudha Pavuluri Quamme, MD, MS
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John Scarborough, MD
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Kate Telma, MD
Carrie Thiessen, MD, PhD
Patrick Varley, MD, MS
Nabeel Zafar, MBBS, MPH

Finally, we would like to acknowledge the **abstract oral presentation judges** and **poster session judges**, who worked to determine the winners of the Bernhardt, Kent, and Rikkers Awards.

Julia Berian, MD, MS
Matthew Brown, PhD
David Foley, MD
Luke Funk, MD, MPH
Angela Gibson, MD, PhD
Dave Harris, MD
Sarah Jung, PhD
Cynthia Kelm-Nelson, PhD
Mehreen Kisat, MBBS, MS
Elise Lawson, MD, MSHS
Patrick Lee, MD, PhD
Ligi Milesh, PhD
Jenny Philip, MD
Sudha Pavuluri Quamme, MD, MS
Victoria Rendell, MD
Stephanie Savage, MD, MS
Patrick Varley, MD, MS
Nabeel Zafar, MBBS, MPH

List of Abstracts

Alphabetized by PI/Lab within each group.

Jump to any abstract by selecting “Ctrl” and clicking on the abstract title.

Group One: Basic and Translational Research

Al-Adra

Donor-Dervived Extracellular Vesicles Have Immunological Properties Dependent on Liver Age and Donor Type; *Molly da Silva, Heather Jennings, Peter Chlebeck, Bret Verhoven, David Al-Adra*

Aufhauser

Increased DNAse Activity in NRP Donors Mitigates Impact of mtDNA Release; *Nicole Marshall, Hilary Faust, Daniel Rice, Nai-Wen Liang, Tonela Qyli, Amy Kreak, Mackenzie JAckson, Jenny Philip, David Aufhauser*

Beck

Clinical and Demographic Reporting and Translational Utility of Breast Cancer Genomic Databases; *Alea Sabry, Jinan Sous, Jordan Petrick, Glen Leverson, Noelle LoConte, Lee Wilke, Wei Xu, Anna Beck*

RNA Sequencing of Normal Breast Tissue Identifies Downregulation of Apoptosis as Marker of Field Cancerization in Lobular Carcinoma In Situ; *Jordan Petrick, Madhuchhanda Roy, Wei Xu, Anna C Beck*

Transcriptomic Signatures in Normal Breast Tissue Correlate With Gail Model–Predicted Risk; *Amulya Suresh, Jordan Petrick, Lee Wilke, Wei Xu, Anna Beck*

Brown

Benchmarking Hematopoietic Engraftment Dynamics from Primary Cells of an Induced Pluripotent Stem Cell Donor; *Arista Whitson, Liupei Huang, Alexis Holm, Eric Ma, Jacob Mielke, Matthew Brown*

Derivation of Human Thymic-Derived Induced Pluripotent Stem Cells for Modeling and Therapeutic Development Studies; *Mireya Pimentel, Alexis Holm, Olivia Mabbot, Liupei Huang, Matthew Brown*

Engineering Immune-Evasive Endothelium via ICAM-1 Knockout in Human PSC-Derived 3D Vascular Models; *Christopher DeCorte, Sayandeep Saha, Adeel Ahmed, Kehinde Adebayo Babatunde, Sheena Kerr, Beebe David, Brown Matthew*

Functionally Competent Hypoimmune ICAM-1 Knockout Pluripotent Stem Cell Derived Endothelial Cells Evade Innate and Adaptive Immune Responses; *Sayandeep Saha, Abhiram Nettem, Alexis M. Holm, Liupei Huang, Matthew E. Brown*

Cho

Comparative Analysis of Reference Retrieval Patterns Across Artificial Intelligence Models in Craniosynostosis Surgical Treatment Planning; *Nada Botros, Jasmine Craig, Ferris Zeitouni, Jess Blum, Catherine Garland, Daniel Cho*

Maternal Age-Related Trends in Orofacial Cleft Incidence: A 32-Year Population-Based Study in Wisconsin; *Nada Botros, Marion McKinney, Gina Krause, Jasmine Craig, Jessica Blum, Catharine Garland, Daniel Cho*

Preclinical Testing of An Implantable Device for Long-Term Intracranial Pressure Monitoring in Patients with Craniosynostosis; *Jasmine Craig, Jessica Blum, Caroline Craig, Karina Buttram, Joseph Ho, Adrienne Simpson, Vivian Woo, Catharine Garland, Aaron Dingle, Daniel Cho*

Regional and Temporal Trends in Orofacial Cleft Incidence in Wisconsin: A 32-Year Population-Based Analysis; *Nada Botros, Catharine Garland, Daniel Cho*

Dingle

Current Evidence of Preservation Solutions for Minimizing Free Flap Ischemia Reperfusion Injuries in Rats: A Systematic Review and Meta-Analysis; *Alec Chen, Sakar Gupta, Lauren Feeley, Melanie Benito, Aaron Dingle*

Preclinical Advances in Peripheral Nerve Regeneration: A Systematic Review of Large Animal Model Interventions and Functional Outcomes; *Abigail Cichocki, Alec Chen, Braxton Druckery, Genevieve Simmons, Haley Mayer, Aaron Dingle*

Gibson

Defining early molecular and cellular responses to burn injury using spatial transcriptomics; *Aiping Liu, Lingxin Cheng, Mary Junak, Bailey Donahue, Di Yan, Christina Kendziorski, Angela Gibson*

Evaluation of Protoporphyrin IX Fluorescence Imaging for Burn Depth Diagnosis in Porcine Models; *Bailey Donahue, Aiping Liu, Marien Ochoa, Mary Junak, Brian Pogue, Angela Gibson*

Harris

Changes in air flow exhibit a sexually dimorphic effect on diet-induced obesity in mice; *Carolyn Winder, Grace Zhu, Fan Xiao, Twinkle Mathew, Dave A Harris, Dudley W Lamming*

Sleeve gastrectomy improves metabolic health, cognition and reduces plaque pathology in an animal model of Alzheimer's Disease.; *REJI BABYGIRIJA, Julia Illiano, Shelly Sonsalla, Grace Zhu, Tristan Molkentin, Meredith Peterson, Madison Grover, Carolyn Winder, Twinkle Mathew, Fan Xiao, Justin Wolter, Dudley Lamming, Dave Harris*

The synergistic impact of resistance training and altered protein diets in sleeve gastrectomy; *Grace Zhu, Luiz Lopez, Leah Braucher, Szczepan Olszewski, Julia Illiano, Twinkle Mathew, Samuel Saghafi, Isaac Grunow, Adam Konopka, Dawn Davis, Dudley Lamming, David Harris*

Kisat

Fragment end motif analysis to distinguish pathogens from contaminants in enriched plasma microbial DNA; *Haikun Zhang, Eddie Dominguez, Mary Junak, Muhammed Murtaza, Caitlin Pepperell, Mehreen Kisat*

Le

Cold Atmospheric Plasma as a Selective Therapeutic Approach in Neuroblastoma: Mechanistic and In Vivo Validation; *Ligi Milesh, Bindu Nair, Ha M. Nguyen, Taylor Aiken, J. Leon Shohet, Hau D. Le*

Murtaza

Cell free DNA fragmentation analysis in dogs with cancer; *Patricia Filippsen Favaro, Yinghua Wang, Bradon McDonald, Tammy Xiong Wang, Samanyu Jadhav, Han-Yun Hannah Cheng, Clayton Marcinak, Xuan Pan, Muhammed Murtaza*

Comparison of plasma DNA fragmentation patterns between paired blood collection tubes in patients with early and locally-advanced breast cancer; *Aqsa Khalid, Mila Gille, Kirsten Dennison, Michelle Stephens, Bradon McDonald, Barbara Pockaj, Muhammed Murtaza*

Inferring blood volume collected on plasma-separating dried blood spots using mass and imaging analysis; *Elise Dietmann, Michelle Stephens, Olivia Krebs, Everlyne Nkadori, Bradon McDonald, Pallavi Tiwari, Stephanie McGregor, Muhammed Murtaza*

Personalized minimal residual disease detection using tumor-derived structural variants in cell-free DNA; *Bradon McDonald, Kirsten Dennison, Amanda Schussman, Muhammad Talha Nawaz, Stephanie McGregor, Lee Wilke, Barbara Pockaj, Muhammed Murtaza*

Towards Early Detection: An Evaluation of Structural Variant Signal Across Sample Types; *Amanda L. Schussman, Bradon R. McDonald, Kirsten L. Dennison, Stephanie M. McGregor, Lee G Wilke, Barbara A. Pockaj, Muhammed Murtaza*

Murtaza & Raoof

Tumor DNA analysis in peritoneal fluid from patients with peritoneal carcinomatosis; *Muhammad Talha Nawaz, Muhammad Talha Waheed, Kirsten Dennison, Stephanie McGregor, Syed Nabeel Zafar, Bradon McDonald, Mustafa Raoof, Muhammed Murtaza*

Odorico

Use of Islet Vascularized Extracellular Matrix Organoids (IVEO) to Improve Transplantation and Survivability of Islets; *Deep Kapadia*

Philip

Development of an MRI Compatible Ex Vivo Hypothermic Machine Perfusion Platform for Evaluation of Deceased Donor Kidneys; *Daniel Rice, James Rice, Gregory Simchick, Leah Gober, Abigail Chase, Diego Hernando, Alejandro Roldán-Alzate, Jennifer Philip*

Ronnekleiv-Kelly

The DNAJB1-PRKACA fusion oncogene is a driver of pancreatic carcinoma; *Patrick Carney,* Manabu Nukaya, Austin Stram, Sean Ronnekleiv-Kelly

Wolter

Examining the effects of diet and sleeve gastrectomy on neuro transcriptional signatures.; *Christopher Jabbarpour, Twinkle Mathew, Grace Zhu, Justin Wolter, David A. Harris*

Group Two: Clinical and Outcomes Research

Afifi

Artery Averted: A Guide to Carotid-Safe Hemostatic Net Placement in Rhytidectomy; *Sakar Gupta, Aidan O'Shea, Armin Edalatpour, Ahmed Afifi*

Public Consensus on Lower Body Contouring: A Crowdsourcing Approach to Aesthetic Outcome Assessment; *Jace Boswell, Armin Edalatpour, Ellen Via, Peter Wirth, Ahmed Afifi*

Axtell

Can the CALGB 140503 Trial Support Choice of Segmental versus Wedge Resection for NSCLC? Sensitivity Analysis using the Robustness of Inferences to Replacement; *Benjamin Cher, Qinyun Lin, Courtney Balentine, Kenneth Frank, James Maloney, Andrea Axtell*

Increased Pack Years Is Associated With Risk of Tumor Spread Through Air Spaces; *Joshua Brady, Jocelyn Zajac, Daniel McCarthy, James Maloney, Malcolm DeCamp, Andrea Axtell*

Re-Evaluating MARS1 and MARS2: Should the Trials Guide Treatment Choice for Pleural Mesothelioma?; *Benjamin Cher, Qinyun Lin, Courtney Balentine, James Maloney, Andrea Axtell*

Bakke

Performing C-Sections: The Perspective and Experience of Wisconsin's Rural General Surgeons; *Katherine Bakke, Elia Careaga, Srishti Gupta, Randi Cartmill, Elise Lawson*

Balentine

How frequently does parathyroidectomy and adjuvant treatment lead to clinically meaningful changes in bone mineral density? A multi-institutional study; *Nicholas Druar, Caitlin Finn, Benjamin Cher, Rebecca Sippel, Naim Maalouf, Jorge Mosquera Izurieta, Patricia Lu, Dana Anderson, Megan Applewhite, Alexander Chiu, David Schneider, Simon Holoubek, Kristin Long, Louise Davies, Courtney Balentine*

Improved Quality of Life after Parathyroidectomy Compared to non-Operative Management: More than just Placebo?; *Benjamin Cher, Qinyun Lin, Elisa Marten, Melissa Thornton, David Schneider, Dawn Elfenbein, Alexander Chiu, Rebecca Sippel, Kenneth Frank, Courtney Balentine*

Morbidity After Lobectomy Versus Total Thyroidectomy for Differentiated Thyroid Cancer; *Benjamin Cher, Rebecca Sippel, David Schneider, Dawn Elfenbein, Alexander Chiu, Courtney Balentine*

A New Tool to Address Differential Loss to Follow-Up in Surgical Randomized Trials; *Benjamin Cher, Qinyun Lin, Courtney Balentine, Kenneth Frank*

Parathyroidectomy and Fracture Prevention: How Strong is the Evidence?; *Benjamin Cher, Qinyun Lin, Elisa Marten, Melissa Thornton, Dawn Elfenbein, Alexander Chiu, David Schneider, Rebecca Sippel, Kenneth Frank, Courtney Balentine*

Small sample size but still definitive, a secondary analysis of a randomized trial on central neck dissection for papillary thyroid cancer; *Benjamin Cher, Qinyun Lin, Kenneth Frank, Courtney Balentine*

Beck

CDH1 and TP53 Somatic Mutation Trends Across Invasive Breast Carcinoma Subtypes; *Jordan Petrick, Wei Xu, Lee Wilke, Anna C Beck*

Implementation of Multi-Disciplinary Guidelines in the Management of Lobular Carcinoma In Situ and Atypical Lobular Hyperplasia: Outcomes and Oncologic Safety of Selective Surgical Excision; *Vibhusha Kolli, Jordan Petrick, Madhuchhanda Roy, Mai Elezaby, Anna Beck*

Busch

Participation in a Surgical Quality Improvement Initiative Associated with Improved Opioid Stewardship; *Rebecca Busch, Tudor Borza, Elise Lawson, Sudha Pavuluri Quamme, Randi Cartmill, Manasa Venkatesh, Qiuyu Yang, Rebecca Minter, Jessica Schumacher*

Chiu

Navigating Barriers and Facilitators to Parathyroidectomy: Patient Perspectives on Communication and Care in Primary Hyperparathyroidism; *Alexandra Helbing, Elizabeth Cooper, Diana Gutierrez-Meza, Esra Alagoz, Nicholas Druar, Caitlin Finn, Simon Holoubek, Louise Davies, Kristin Long, David Schneider, Courtney Balentine, Rebecca Sippel, Alexander Chiu*

Cho

Evaluating the Evidence for Spring-Mediated Cranioplasty in Non-Sagittal Craniosynostosis: A Systematic Review of Techniques and Outcomes; *Jasmine Craig, Nada Botros, Catharine Garland, Daniel Cho*

Global Practices in Adult Primary Cleft Lip and Palate Repair: A Review of Techniques and Outcomes; *Camille LaLiberte, Myiah Quach, Emily Zona, Aidan O'Shea, Nada Botros, Sakar Gupta, Jasmine Craig, Catharine Garland, Daniel Cho*

More than Just Surgery: The Time Burden of Helmet Therapy after Strip Craniectomy in Craniosynostosis Care for Wisconsin Families; *Gina Krause, Melanie Benito, Jasmine Craig, Aidan O'Shea, Catharine Garland, Daniel Cho*

Surgical Needs, Outcomes, and Access Inequities in Adults Aging with Cleft Lip and Palate; *Alisha Khosla, Sakar Gupta, Daniel Chu, Manasa Kalluri, Catharine Garland, Daniel Cho*

What’s in the Water? Investigating Environmental Contaminants and Orofacial Cleft Incidence in Wisconsin; *Marion McKinney, Nada Botros, Gina Krause, Jessieka Knazze, Catharine Garland, Daniel Cho*

Dingle

A Dual-Species VCA Surgical Framework: High-Throughput Rat Model Adaptable to Swine for Translational Research; *Weifeng Zeng, Malibongwe Murapa, Natalie Furtado, Aaron Dingle*

Dingle & Poore Lab

Reported Patient Satisfaction and Complication Outcomes Following both Surgical and Non-Surgical Microtia Treatments: A Systematic Review.; *Lauren Feeley, Sarah Hu, Sakar Gupta, Emily Zona, Mary Hitchcock, Catherine Garland, Daniel Cho, Aaron Dingle, Samuel Poore*

Dunahoe

Co-Occurrence of Osteoporosis in Ankle Fracture Patients; *Christian Shepler, Kayla Nennig-Kniaz, Elizabeth Laning, Samuel Mosiman, Paul Whiting, Jacquelyn Dunahoe*

Hip Fracture Outcomes at University Hospital Over Ten Year Span; *Elizabeth Laning, Kayla Nennig-Kniaz, Christian Shepler, Samuel Mosiman, Paul Whiting, Jacquelyn Dunahoe*

Funk

Association of a Venous Thromboembolism Prophylaxis Protocol with Post-operative Bleeding After Bariatric Surgery; *Kate Lauer, Jamie Ho, Dawda Jawara, Mads Owen, Andre Acra, Megha Brahmbhatt, Glen Leverson, David Harris, Anne Lidor, Luke Funk*

Garland

Analysis of Facial Feminization Surgery Safety and Postoperative Adverse Events, *Madeline Chin MD, MSc, Allison Seitz MD, Alisha Khosla BS, Aidan O'Shea BS, Daniel Cho MD, PhD, Catharine Garland MD*

Safety Profile of Feminizing Facial Gender Affirming Surgery in Single vs. Multiple Stages; *Allison Seitz, Aidan O'Shea, Emily Zona, Alisha Khosla, Daniel Cho, Catharine Garland*

Hashmi

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Basic Science & Translational Research Abstracts

Donor-Dervived Extracellular Vesicles Have Immunological Properties Dependent on Liver Age and Donor Type

Molly da Silva, Heather Jennings, Peter Chlebeck, Bret Verhoven, David Al-Adra M.D., PhD

Introduction: Donor-derived extracellular vesicles (EVs) have been shown to influence post-transplant immune responses. Due to the ongoing organ shortage, clinicians are expanding the donor pool by using older donors or donation after circulatory death (DCD). Organs from these groups bring a higher risk of inflammatory responses and lower graft viability. Normothermic ex-vivo liver perfusion (NEVLP) is an organ preservation technique, simulating the physiological conditions of the body and allows for the collection of EVs. Our experimental goal is to determine the relative immune effects of EVs released from the standard, older, and DCD livers, and we hypothesize that the standard EVs will minimize the immune response and the DCD will enhance the immune response.

Methods: Lewis rats were randomly divided into the standard conditions (8-12 weeks), older (≥21 weeks), and donation after circulatory death (DCD; 8–12 weeks) groups. All livers underwent NEVLP for 4 hours. Perfusate samples were taken before the liver was placed on the machine (T=0) and at the end of perfusion (T=4). EVs were isolated utilizing size exclusion chromatography, quantified using nanosight tracking analysis, and verified with cryogenic electron microscopy. mRNA and miRNA from EVs were isolated using a Qiagen miRNeasy kit, sequenced and analyzed at the UW Biotechnology Center. Ultracentrifugation was used to isolate the EVs from the end perfusates and was added in a dose-dependent manner (5×10^7, 5×10^8, 5×10^9) to mixed lymphocyte reactions (MLRs).

Results: Cryo-EM confirmed no EVs in baseline perfusate and verified vesicle presence after 4 hours of NEVLP. DCD donor organs released the greatest amount of EVs, followed by the old group then the standard group. Principal component analysis indicated no significant differences between the experimental groups miRNA and mRNA profiles. In MLRs, when $5x10_9$ standard EVs were added it was statistically significant with a p-value <0.0001, whereas older and DCD EVs enhanced proliferation in all doses.

Conclusions: During NEVLP, it was observed that the DCD livers produced the largest amount of EVs. Analysis of the miRNA and mRNA profiles of all donor types showed no significant differences, however standard livers release EVs capable of suppressing T-cell proliferation in MLRs. Future studies will focus on replicating these findings using human liver samples to confirm translational relevance.

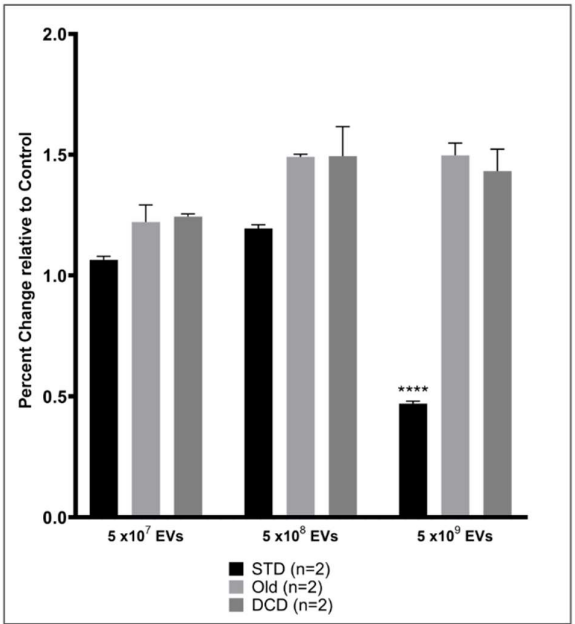


Figure 1. Mixed Lymphocyte Reactions EVs added in a dose-dependent manner showed lower immune response in standard donor (p-value <0.0001), and enhanced in DCD and old donors as EV amount increased

Increased DNAse Activity in NRP Donors Mitigates Impact of mtDNA Release

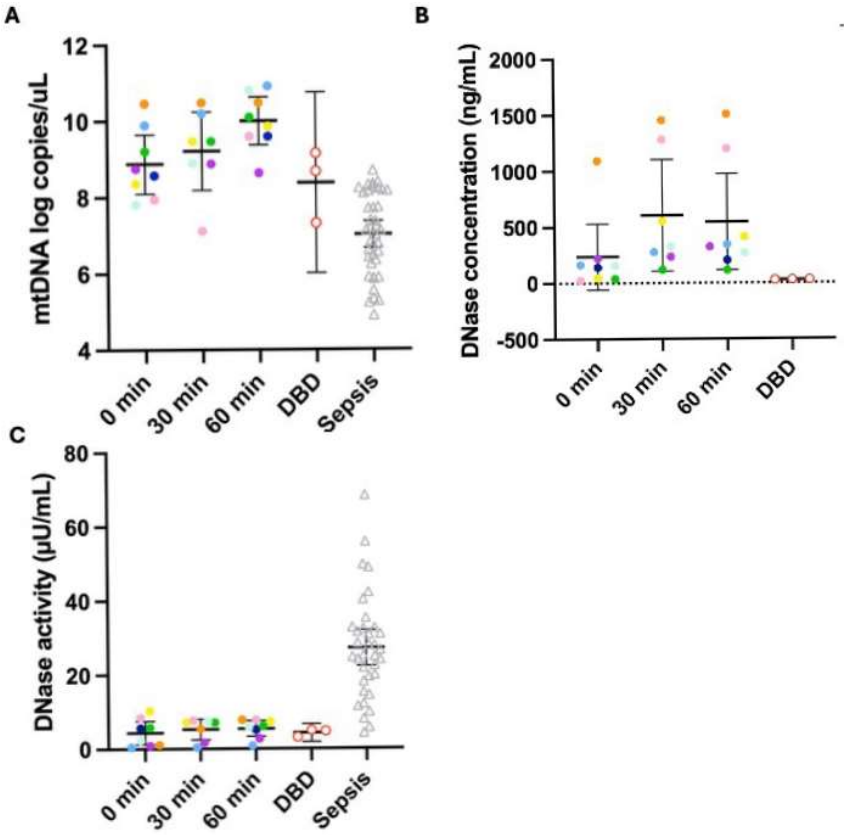
Nicole Marshall, Hilary Faust, Daniel Rice, Nai-Wen Liang, Tonela Qyli, Amy Kreak, Mackenzie JAckson, Jenny Philip, David Aufhauser

Introduction: Normothermic regional perfusion (NRP) techniques have improved organ utilization and outcomes after transplant from donation after circulatory death (DCD). Biomarkers that prognosticate response to NRP or reflect organ quality have not been identified and could help further increase organ utilization by increasing confidence in high-risk organs. Mitochondrial DNA is a damage-associated molecular pattern that activates innate immunity via multiple ligands, including toll-like receptor-9 and the NLRP3 inflammasome. We quantified mtDNA production, degradation and ligand activation in NRP perfusate at initiation, 30 and 60 minutes of NRP to determine the potential of mtDNA as a biomarker of organ quality during NRP.

Methods: DCD organs were treated with NRP per institutional protocol. Perfusate samples were collected at 0, 30 and 60 minutes of perfusion. We used qPCR to quantify mtDNA and cell-based TLR9 and IL-18 stimulation assays to determine perfusate activation of mtDNA ligands. We quantified sample DNAse I activity to assess capacity for mtDNA degradation. Comparison of biomarkers between DCDs and plasma from DBD donors and sepsis patients (as a critically ill control population) was performed using non-parametric univariate testing.

Results: Sample mtDNA quantities were elevated in NRP samples compared to DBD or control populations (Fig 1A, $p<0.05$ at all time points) and increased with time on NRP. NRP and DBD specimens did not produce TLR9 or IL-18 activation. DNase I concentration as equivalent to DBD samples at T0 (Fig 1B, $p=0.06$), rose throughout the duration of NRP, and exceeded DBD controls and T30 and T60 ($p=0.02$ and $p=0.01$). DNase I activity followed a similar trend (Fig 1C).

Conclusion: mtDNA is elevated in perfusate of DCD donors undergoing NRP but does not activate TLR9 or NLRP3. DNAse activity in perfusate is equal to DBD plasma, increases with perfusion time, and significantly exceeds critically ill control populations. Signaling through TLR9 and NLRP3 is likely prevented by this intact DNA degradation via DNase I, which may explain a mechanism of NRP-mediated ischemia-reperfusion injury protection.



Clinical and Demographic Reporting and Translational Utility of Breast Cancer Genomic Databases

Alea Sabry BS, Jinan Sous BS, Jordan Petrick BS, Glen Leverson PhD, Noelle LoConte MD, Lee Wilke MD, Wei Xu PhD, Anna Beck MD

Introduction: Genomic datasets from public repositories are critical tools in breast cancer precision oncology. Inconsistent reporting of clinical and demographic variables limits the discovery of clinically actionable findings from genomic analyses, as confounders may be obscured. As use of these datasets expands, we sought to evaluate the inclusion of clinical variables in breast cancer genomic datasets.

Methods: A systematic review was conducted of all publicly accessible genomic datasets including breast cancer patients in cBioPortal for Cancer Genomics, a widely used platform integrating genomic and clinical data from a robust cohort of published studies. Key domains captured were demographic, clinical and pathologic tumor characteristics, treatment, and survival outcomes. Datasets were assessed for completeness of variable reporting. Reporting patterns were compared between datasets with and without survival data using two-sided Fisher's exact tests (α=0.05) in IBM SPSS v29.

Results: Of 56 genomic datasets with breast cancer patients, at least one clinical outcome was reported in 26 (46.4%). Age (62.5%), race (46.4%), ethnicity (37.5%), menopausal status (12.5%), insurance status (0.0%), and urban vs rural residence (0.0%) were underreported. Clinical and pathologic variable reporting was also limited (Table 1). Datasets reporting survival outcomes were significantly more likely to report diagnosis age (80.8% vs 46.7%, p=0.013), AJCC stage (61.5% vs 20.0%, p=0.002), surgery (50% vs 6.7%, p<0.001), chemotherapy (53.8% vs 13.3%, p=0.002), endocrine therapy (38.5% vs 10.0%, p=0.024), radiation (42.3% vs 6.7%, p=0.003), lymph node status (69.2% vs 13.3%, p<0.001), and metastases (88.5% vs 50%, p=0.004). Hormone receptor, HER2 status, PAM50, and menopausal status reporting did not differ significantly. In datasets with clinical outcomes available, 19 (73.1%) reported ≥5 key clinical variables and one (3.8%) did not report any.

Conclusion: Clinical and demographic variable reporting is inconsistent across breast cancer genomic datasets. Those with outcome data were significantly more likely to report key variables with select datasets reporting comprehensive clinical data, providing the opportunity for researchers to assess associations and control for confounders. Quantifying these patterns in a widely used repository highlights the translational potential and current limitations of cancer genomics, underscoring the need for standardized clinical variable reporting to improve translational impact.

Table 1. Number of Publicly Available Genomic Breast Cancer Datasets Reporting Key Clinical Variables

Variable	Datasets Reporting (N, %) N=56
AJCC Stage	22 (39.29)
ER & HER2 Status Defined	26 (46.43)
Histologic Subtype	54 (96.42)
Surgery Type	8 (14.29)
Receipt of Chemotherapy	18 (32.14)
Receipt of Radiation Therapy	13 (23.21)

RNA Sequencing of Normal Breast Tissue Identifies Downregulation of Apoptosis as Marker of Field Cancerization in Lobular Carcinoma In Situ

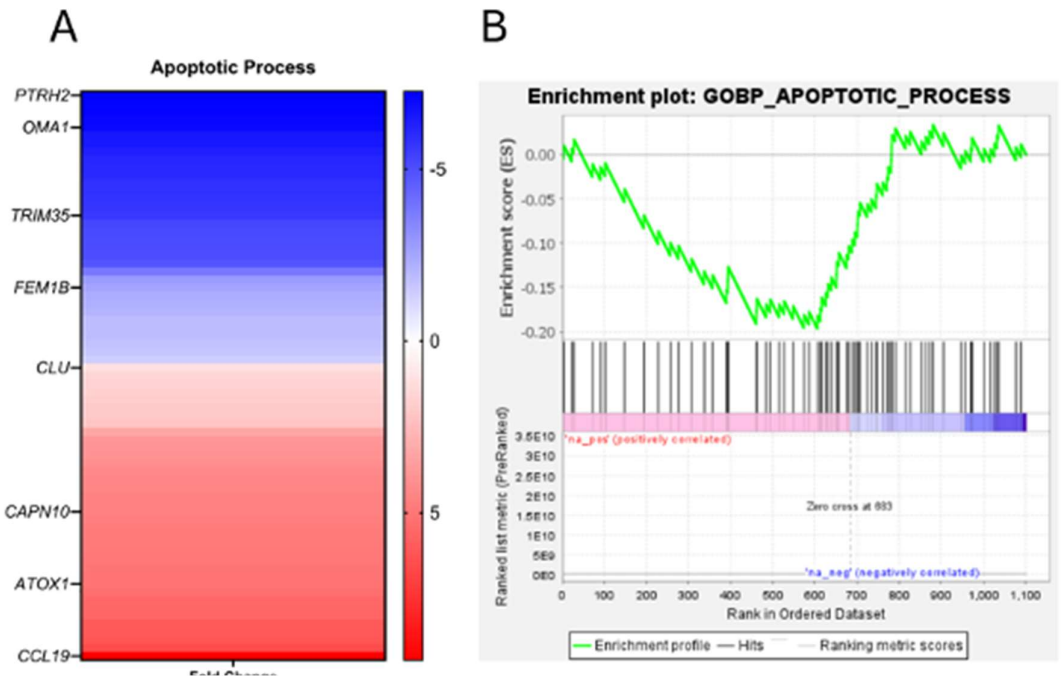
Jordan Petrick BS, Madhuchhanda Roy MD, PhD, Wei Xu PhD, Anna C Beck MD

Introduction: Lobular carcinoma in situ (LCIS) is a proliferative breast lesion associated with a greater than 20% lifetime risk of developing breast cancer, with the cancer developing in either breast at a similar frequency. We hypothesize that field cancerization in the normal breast tissue predisposes women with LCIS to develop cancer and sought to determine if there are transcriptomic changes that can be used to predict who develops breast cancer.

Methods: Transcriptomic differences were compared using normal breast tissue from women who underwent breast reduction and were incidentally found to have LCIS on final pathology. We compared differential gene expression between women who eventually developed invasive ductal carcinoma (n = 3) versus those with long term follow-up (>12 years) with no future breast cancer (n = 3). Patients in both groups were matched for age, menopausal status, race, and ethnicity. RNA was extracted from archived FFPE tissue from the breast contralateral to the incidentally identified LCIS, sample quality ensured and bulk RNAseq performed (Illumina TruSeq Stranded Total RNA). Ingenuity Pathway Analysis (IPA) and Gene Set Enrichment Analysis (GSEA) analyses were separately performed to identify cellular and molecular functions associated with LN and breast cancer development.

Results: A total of 372 genes were significantly up (279) or down (93) regulated in the breast tissue of women with LCIS who eventually developed breast cancer; 71 significantly differentially expressed genes were related to apoptosis (Fig 1A). Apoptosis-inhibiting gene *CCL19*, was upregulated with logFC value of 9.28, and apoptosis-promoter gene *OMA1* downregulated with a logFC value of –7.03 support overall downregulation of the apoptotic process. Pathway analysis of significant genes through GSEA identified that the apoptotic process had a significantly negative enrichment score (-0.196, p = 0.007), suggesting that the baseline level of apoptosis in the normal breast tissue is downregulated in women who developed a future cancer (Fig 1B). Significant upstream regulators involved in cell death and proliferation, including *IL1B* were identified in the IPA analysis.

Conclusions: Gene expression in normal breast tissue in women with LCIS differs in this pilot analysis between those who eventually develop breast cancer versus those who do not, specifically related to apoptosis. These pilot data support the hypothesis that field cancerization at the time of LCIS diagnosis exists in select women and provide the necessary preliminary data for expanded analysis aimed at individualizing risk stratification following a diagnosis of LCIS.



Transcriptomic Signatures in Normal Breast Tissue Correlate With Gail Model–Predicted Risk

Amulya Suresh BS, Jordan Petrick BS, Lee Wilke MD, Wei Xu PhD, Anna Beck MD

Introduction: Differential gene expression within ipsilateral normal breast tissue in individuals with a diagnosis of breast cancer has been associated with increased risk of recurrence. We hypothesized that these gene expression patterns associated with recurrence may also correlate with overall risk of developing breast cancer, even in histologically normal tissue from unaffected individuals.

Methods: Bulk RNA-seq data from histologically normal breast tissue (n = 151) in the Komen Tissue Bank, publicly available through the Benz et al. (2020) dataset accessed via the UCSC Xena platform (xenabrowser.net), were analyzed. Samples missing predicted Gail risk or RNA expression data were excluded. Breast cancer risk was predicted using the Gail Model; high risk was defined as 5-year risk ≥1.67%, and normal risk as <1.67%. Of the 128 genes identified by Gadaleta et al. (2020) as associated with recurrence in breast cancer patients, 94 were available in this dataset. Donors were stratified by age <55 vs. ≥55 years as a surrogate for menopausal status. Comparative gene expression analysis was conducted using the Mann-Whitney U test with $\alpha = 0.05$. Gene Ontology (GO) enrichment analysis was performed using Enrichr, and Connectivity Map (CMap) Touchstone database was queried to identify potentially therapeutic compounds.

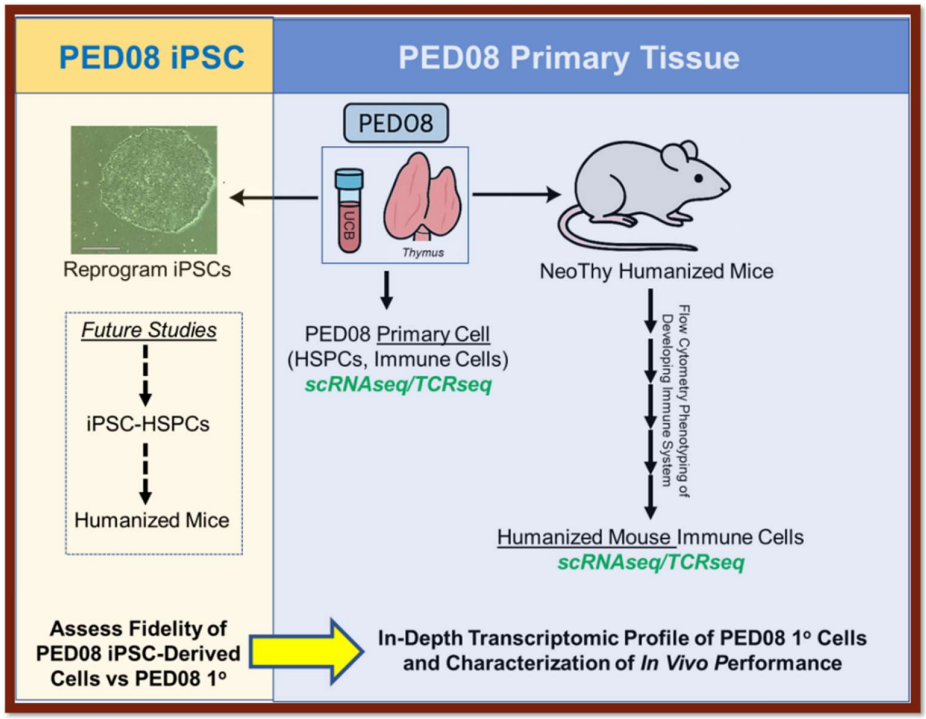
Results: Of the 126 donor samples analyzed, 25 were from individuals with high Gail Model risk and 101 from those with normal risk. Stratified gene expression analysis identified 27 differentially expressed genes in women aged ≥55 with high vs. normal risk, and 6 genes in women <55. Due to the limited number of significant genes in younger women, pathway analysis was not conducted for this group. In women aged ≥55, GO enrichment revealed biologic processes including “Response to Glucose” (GO:0009749) and “Biogenic Amine Metabolic Process” (GO:0006576), suggesting potential metabolic involvement in early cancer susceptibility. CMap analysis identified 15 small molecules that reversed the transcriptomic profile observed in high-risk women in MCF10A cells. These included estrogen receptor antagonists, androgen receptor agonists, and an IGF-1 pathway inhibitor.

Conclusion: Transcriptomic signatures previously associated with breast cancer recurrence also correlate with Gail-predicted risk in histologically normal breast tissue. These findings support the potential for transcriptomic profiling in risk stratification and highlight metabolic pathways and hormone signaling as relevant biological processes in early breast cancer susceptibility, particularly in postmenopausal women.

Benchmarking Hematopoietic Engraftment Dynamics from Primary Cells of an Induced Pluripotent Stem Cell Donor

Arista Whitson, Liupei Huang Dr., Alexis Holm, Eric Ma, Jacob Mielke, Matthew Brown Dr.

Hematopoietic stem and progenitor cells (HSPCs) are foundational to the lifelong generation of blood and immune cells. Currently, the clinical uses of HSPCs for treatment are limited to sources of bone marrow and cord blood, which can be restrictive. However, studies on induced pluripotent stem cell (iPSC) derived HSPCs show great potential for use in regenerative medicine and humanized mouse research. While some advances in the use of iPSC-HSPCs have been made, there are still issues regarding functionality and long-term engraftment of these cells as compared to primary HSPCs. By studying the primary HSPC profile of donor cord blood as well as the immune cell and T cell profiles of NBSGW mice, we sought to use humanized mouse models to compile standard values that can aid in future promising iPSC-HSPC studies. This work will serve as a resource for optimizing iPSC-HSPC differentiation and comparing these results to those of primary HSPC functionality. The dataset produced will provide benchmark values that can be used by future experiments as references to ensure the utility of results. The public availability of this data will aid in the widespread advancement of iPSC-HSPC research and its clinical applications.



Derivation of Human Thymic-Derived Induced Pluripotent Stem Cells for Modeling and Therapeutic Development Studies

Mireya Pimentel, Alexis Holm, Olivia Mabbot, Liupei Huang, Matthew Brown

Introduction: The thymus is a vital lymphoid organ where T lymphocytes are produced and mature, playing a pivotal role in shaping the immune system's development and function. Thymic epithelial cells (TECs), residing in the thymus's cortical and medullary regions, are essential for T cell selection and maturation. The therapeutic potential of TECs is substantial, which may aid in tolerance induction in solid organ transplantation. However, their rarity and difficulty in isolation pose significant challenges for experimental interrogation. To overcome these limitations, our research explores an innovative approach: reprogramming easily accessible thymic cells into induced pluripotent stem cells (iPSCs) using Sendai Virus-mediated reprogramming, followed by directed differentiation into thymic epithelial progenitors (TEPs). TEPs are bipotent progenitors that give rise to medullary and cortical TECs, playing a critical role in thymus development and function. Given the influence of epigenetic memory on cellular differentiation, we hypothesize that thymic-derived iPSCs will exhibit an enhanced propensity to differentiate into TEPs. Here, we have reprogrammed thymic fibroblasts and thymocytes into iPSCs, which has not been previously published. This new iPSC source, when used in future TEP/TEC differentiation experiments, may offer new opportunities for treating T cell-related disorders and inducing tolerance to solid organ transplants.

Methods: Thymic fibroblasts, thymocytes, and non-thymic umbilical cord blood T cells of the same donor were used as starting cell populations for reprogramming. Sendai virus-mediated reprogramming was employed to generate induced pluripotent stem cells (iPSCs) from these cell types.

Results: All donors were able to make morphologically normal iPSC lines, achieving> 90% pluripotency as shown by SSEA-4 marker expression

Conclusion: Our study demonstrates the successful reprogramming of thymic fibroblasts and thymocytes into iPSCs with high pluripotency rates. This innovative approach holds promise for generating iPSC-TEP/TEC and potentially advancing thymus-based therapies for multiple indications. Future directions will involve the directed differentiation of these iPSCs into TEP/TEC and assessing epigenetic memory of the input iPSCs.

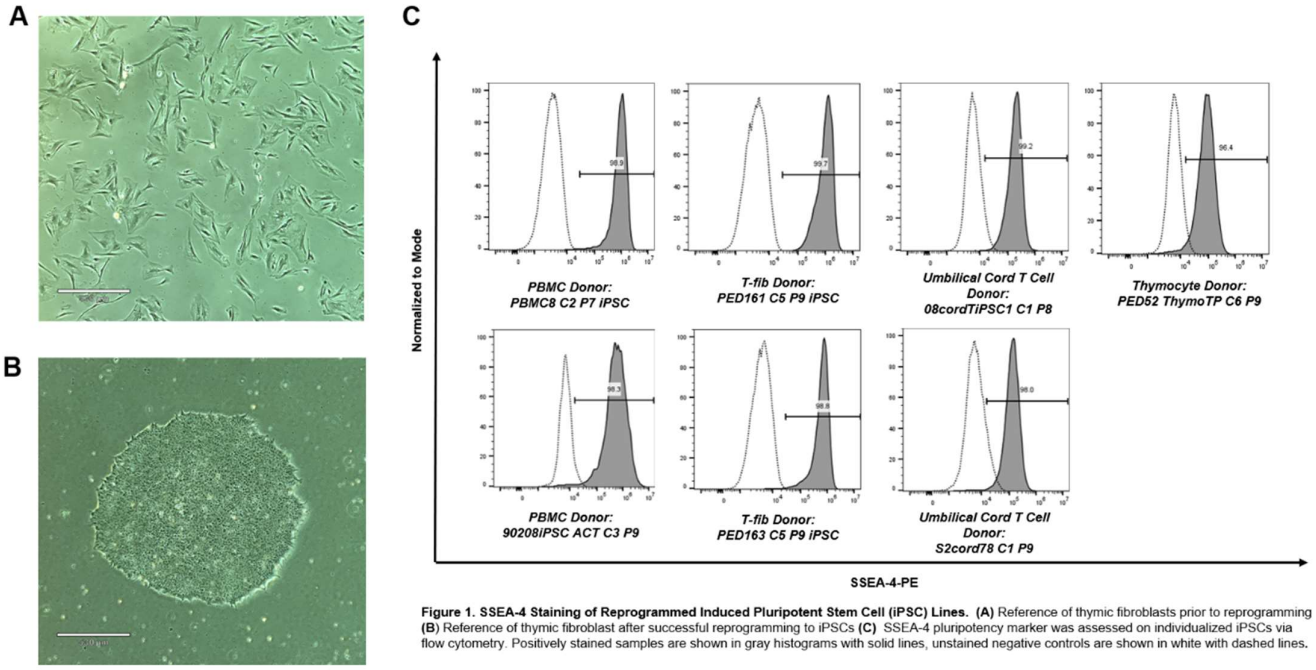


Figure 1. SSEA-4 Staining of Reprogrammed Induced Pluripotent Stem Cell (iPSC) Lines. **(A)** Reference of thymic fibroblasts prior to reprogramming **(B)** Reference of thymic fibroblast after successful reprogramming to iPSCs **(C)** SSEA-4 pluripotency marker was assessed on individualized iPSCs via flow cytometry. Positively stained samples are shown in gray histograms with solid lines, unstained negative controls are shown in white with dashed lines.

Engineering Immune-Evasive Endothelium via ICAM-1 Knockout in Human PSC-Derived 3D Vascular Models

Christopher DeCorte, Sayandeep Saha, Adeel Ahmed Ph.D., Kehinde Adebayo Babatunde Ph.D., Sheena Kerr Ph.D., Beebe David Ph.D., Brown Matthew Ph.D.

Introduction: Human pluripotent stem cell (PSC)-derived endothelial cells (ECs) hold great promise for regenerative medicine and vascularized cell therapies, but immune-mediated rejection remains a major barrier to clinical translation. In both solid organ transplantation and PSC-derived grafts, ECs are among the first targets of recipient immune cells, initiating alloimmune responses that drive graft injury. To address this challenge, we developed a PSC-based *in vitro* platform to model endothelial immune rejection and evaluate strategies for immune evasion. Building on prior 2D studies showing that intercellular adhesion molecule-1 (ICAM-1) knockout (KO) ECs exhibit reduced leukocyte adhesion and cytotoxic T cell activation, we extend this approach into a 3D vascular context. Using engineered lumens that recapitulate vessel geometry and microenvironmental organization, we investigated ICAM-1's role in neutrophil adhesion and transendothelial migration—key processes in early graft inflammation and acute rejection.

Methods: PSC-derived ECs were gene-edited using CRISPR-Cas9 to delete ICAM-1, a key mediator of immune synapse formation, leukocyte adhesion, and trafficking. To mimic native vascular architecture, ECs were cultured within 3D lumens fabricated by casting unpolymerized type I collagen (4 mg/mL) into PDMS devices containing 300 µm rods. After collagen polymerization, the rods were removed to create open cylindrical channels that were seeded with PSC-ECs to form confluent endothelial linings. These constructs were used for immunofluorescence staining, 70 kDa dextran permeability assays, and neutrophil transmigration studies using $CD66b^{+}$ neutrophils.

Results: ICAM-1 KO PSC-ECs successfully formed confluent, phenotypically stable endothelial linings within 3D collagen lumens. Barrier function, assessed by dextran diffusion, was comparable between ICAM-1 KO and wild-type (WT) lumens, indicating that ICAM-1 deletion did not compromise endothelial integrity. In neutrophil co-culture experiments, ICAM-1 KO lumens exhibited markedly reduced neutrophil adhesion and transendothelial migration compared to WT controls (18 vs. 420 extravasated neutrophils, respectively). Immunofluorescence confirmed expression of CD31, CD144, actin, and ZO-1 in both groups, demonstrating preserved junctional organization and endothelial phenotype.

Figure:

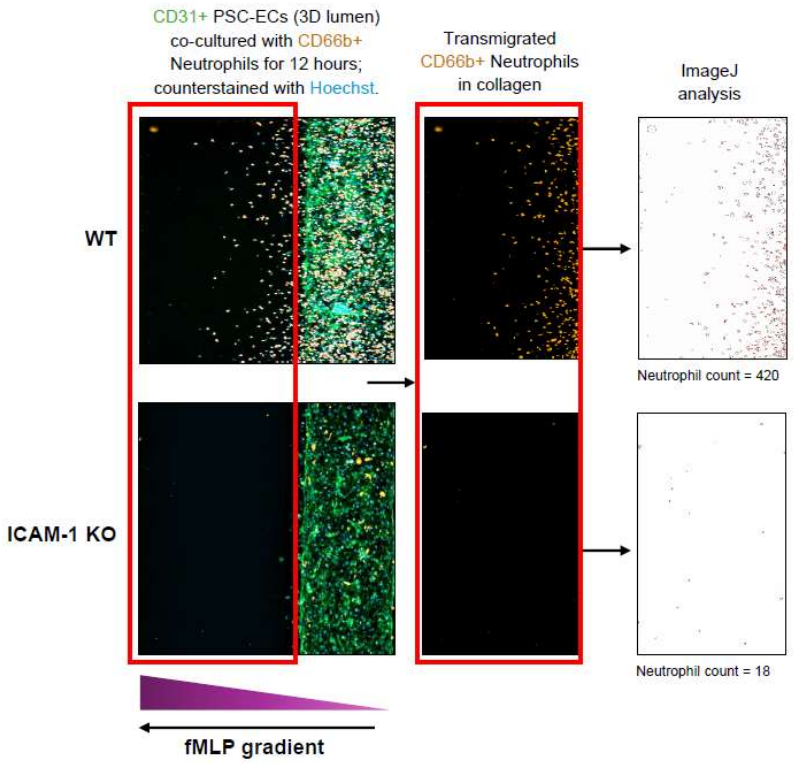


Figure: Neutrophil Transmigration Assay. CD31+ PSC-ECs (3D lumen) co-cultured with CD66b+ Neutrophils for 12 hours; counterstained with Hoechst. Neutrophils were induced to transmigrate out of the lumen using a fMLP chemoattractant. ImageJ quantification showed markedly fewer neutrophils extravasating through ICAM-1 KO endothelium (18 cells) compared to WT endothelium (420 cells).

Conclusion: ICAM-1 deletion significantly limits neutrophil transmigration without impairing endothelial structure or function. This work establishes a human PSC-based 3D vascular model for studying immune injury and highlights ICAM-1 targeting as a promising strategy to engineer immune-evasive vasculature for regenerative transplantation.

Functionally Competent Hypoimmune ICAM-1 Knockout Pluripotent Stem Cell Derived Endothelial Cells Evade Innate and Adaptive Immune Responses

Sayandeep Saha, Abhiram Nettem, Alexis M. Holm, Liupei Huang, Matthew E. Brown

Introduction: Gene-edited human pluripotent stem cells (PSCs) offer a promising platform for developing reparative cellular therapies capable of evading immune rejection. Here, we identify the adhesion molecule ICAM-1 as a hypoimmune target with critical roles in both adaptive and innate immune pathways following transplantation. The binding of immune cell LFA-1 and/or MAC-1 to ICAM-1 on endothelial cells (ECs) represents an essential early event in allograft rejection, stabilizing the immune synapse that precedes effector-mediated cytotoxicity and facilitating the firm adhesion required for immune cell extravasation into the graft parenchyma. In this study, we engineered ICAM-1 knockout (KO) PSC-derived ECs to evaluate how disrupting this adhesion pathway influences immune cell interactions and graft outcomes.

Methods: We genetically modified PSCs using CRISPR/Cas9 to KO ICAM-1 and introduce the Akaluc bioluminescent reporter gene. We differentiated PSCs into ECs using the STEMdiff Endothelial Differentiation Kit according to the manufacturer's protocol. We validated endothelial functionality by acetylated low-density lipoprotein (Ac-LDL) uptake assay and nitric oxide (NO) production. We quantified fluorescently labeled immune effector cell adhesion to PSC-ECs via fluorescence microscopy and assessed T cell activation and proliferation through co-culture with allogeneic lymphocytes. For *in vivo* studies, we injected NSG mice intraperitoneally with PSC-ECs suspended in a basement membrane matrix and monitored engraftment periodically through bioluminescence imaging.

Results: In our studies, ICAM-1 KO in PSC-ECs significantly reduced the adhesion of multiple innate and adaptive immune cell types under both static (no shear) and dynamic (with shear) conditions *in vitro*. Consistent with this, ICAM-1 KO led to diminished T cell activation and proliferation responses and reduced neutrophil-mediated oxidative stress responses. Functional characterization demonstrated that ICAM-1 KO PSC-ECs retained a normal endothelial phenotype, as indicated by expression of PECAM-1 and VE-Cadherin, uptake of Ac-LDL, and NO production *in vitro*. In *in vivo* experiments, ICAM-1 KO PSC-ECs exhibited engraftment comparable to its WT counterpart.

Conclusion: Our findings demonstrate that genetic disruption of ICAM-1 markedly reduces immune cell adhesion and T cell activation while preserving endothelial identity and function. These results highlight ICAM-1 KO as a viable hypoimmune strategy that targets an early adhesion checkpoint common to multiple immune pathways. ICAM-1 deficient PSC-ECs offer a promising platform for developing immune-evasive, reparative vascular therapies and improving the long-term survival of allogeneic grafts.

Comparative Analysis of Reference Retrieval Patterns Across Artificial Intelligence Models in Craniosynostosis Surgical Treatment Planning

Nada Botros MA, Jasmine Craig MD, Ferris Zeitouni MS, Jess Blum MD, Catherine Garland MD, Daniel Cho MD, PhD

Introduction: The use of artificial intelligence (AI)-powered tools in healthcare and medical research has grown rapidly, with broad applications from diagnostic support to surgical planning and literature synthesis. Variability in source accuracy, consistency, and recency among different platforms raises concerns about their use in clinical decision-making. A further limitation is that many tools generate fabricated citations. In pediatric craniofacial surgery, the complexity of care and expanding body of literature necessitate reliable, evidence-based information retrieval. Given the heterogeneity in source retrieval and response generation, there is a critical need to systematically compare outputs and referenced literature provided by various AI tools.

Methods: A standardized prompt requesting a staged surgical treatment algorithm for syndromic craniosynostosis (Apert, Crouzon, Pfeiffer) was submitted to eight AI-powered tools: ChatGPT-3.5, ChatGPT-Plus, Perplexity, OpenEvidence, Gemini, Co-Pilot, Claude, and Meta. Outputs were evaluated for (1) total number of references, (2) proportion of legitimate references, (3) relevance, (4) recency, (5) credibility, (6) evidence level, (7) overlap and (8) unique references across tools, and (9) open-access status.

Results: Marked variability was observed across the AI tools evaluated. All platforms provided explicit citations and retrieved clinically relevant sources. OpenEvidence and Perplexity achieved 100% legitimacy (9/9 and 8/8), with references concentrated in the past decade. ChatGPT-Plus retrieved 6/6 legitimate references, though one was Wikipedia, slightly reducing credibility. Co-Pilot scored 4/5 in legitimacy (80%) but provided higher-level evidence and the most recent references. Claude retrieved only 2/15 legitimate references (13%), and ChatGPT-3.5, Meta, and Gemini showed similarly low legitimacy (29%, 33%, 12%), with older references predominating. Of 32 total references retrieved, 26 were unique to a single platform and only 3 overlapped between tools, with Jaccard coefficients of 11%, 8%, and 6% among GPT-4o/Co-Pilot, GPT-4o/Perplexity, and Perplexity/OpenEvidence. These findings demonstrate predominantly tool-specific reference retrieval, underscoring divergence in sourcing patterns across platforms. Algorithm content also varied: ChatGPT-Plus, OpenEvidence, Co-Pilot, and ChatGPT-3.5 emphasized early posterior vault distraction osteogenesis (PVDO), whereas Gemini, Claude, and Perplexity favored early FOA or PCVE, without consistently including PVDO.

Conclusion: AI tools show marked variability in source retrieval, evidence level, and occasional citation fabrication. Differences in algorithm content further illustrate that AI-generated recommendations may not uniformly reflect evolving surgical standards. This cumulative variability underscores the need for rigorous clinician oversight when applying AI-generated outputs to guide decision-making, particularly in conditions lacking a standardized treatment algorithm. Future work will evaluate AI search engine performance across a broader range of standardized quantitative and qualitative queries.

Maternal Age-Related Trends in Orofacial Cleft Incidence: A 32-Year Population-Based Study in Wisconsin

Nada Botros MA, Marion McKinney BS, Gina Krause BS, Jasmine Craig MD, Jessica Blum MD, Catharine Garland MD, Daniel Cho MD, PhD

Introduction: Development of orofacial clefts is thought to be influenced by a complex interplay between genetic factors, maternal characteristics, and environmental exposures during pregnancy. Increased maternal age is a widely documented risk factor in fetal chromosomal abnormalities, but current literature reflects conflicting reports on whether this risk extends to orofacial clefts (OFC). Limitations of existing reports include small sample sizes, older study periods, and few studies that are specific to the United States population. Here we provide a large-scale analysis of the association between maternal age and OFC in the state of Wisconsin from 1990 to 2022.

Methods: Live birth data from 1990 to 2022 were obtained from the Wisconsin Interactive Statistics on Health (WISH) system and OFC case counts for the same period were obtained from the Department of Health Services (DHS). Annual OFC cases were aggregated and analyzed alongside WISH birth counts to calculate incidence rates. A Poisson regression model was used to examine the association between maternal age and cleft occurrence. Analysis was performed in R (version 4.4.2).

Results: Maternal age was modeled as a categorical variable with mothers aged 25-29 as the reference group. Compared to the reference group, mothers aged 40-44 had a 31% higher cleft rate (incidence rate ratio [IRR] = 1.31, 95% confidence interval [CI] = 1.01-1.68, p = 0.035), and mothers aged >45 had a 153% higher cleft rate (IRR = 2.53, 95% CI = 1.08-4.92, p = 0.014). Cleft rates were slightly elevated in younger age groups (<20 years), but results were not statistically significant.

Conclusion: Cleft incidence was lowest in mid-range maternal ages (25–34) and increased significantly among mothers in older age groups with a non-significant trend toward higher rates in younger age groups as well. These findings suggest a possible U-shaped relationship between maternal age and OFC occurrence and highlight the need for further investigation in larger, multi-state datasets to better understand whether maternal age independently contributes to OFC occurrence.

Preclinical Testing of An Implantable Device for Long-Term Intracranial Pressure Monitoring in Patients with Craniosynostosis

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Background: Craniosynostosis can predispose pediatric patients to sustained elevations in intracranial pressure (ICP), a condition associated with developmental impairment, visual deficits, and recurrent surgical procedures. Existing ICP monitoring solutions rely on invasive, short-duration methods that are impractical for ongoing assessment, especially among children who do not exhibit overt symptoms. Noninvasive monitoring options have yet to achieve adequate sensitivity or specificity for clinical decision-making. To bridge this gap, CranioCheck was introduced as a fully mechanical, implantable device engineered for durable, long-term ICP surveillance

Methods: CranioCheck is a patent pending device that consists of a 5.0 x 5.0 x7.0mm polydimethylsiloxane (PDMS) lattice embedded with radiopaque tungsten wire. Bench testing using a Materials Testing System (MTS) was conducted to evaluate the device's mechanical properties, including stress-strain behavior and pressure-displacement relationships in the 0–40 mmHg range to simulate physiologic elevations in ICP. Durability testing was performed in a physiologic environment (PBS solution at 60° C, 5% CO2), for up to 175 days to assess elasticity retention and structural stability. Additionally, manufacturing methods were altered from a multi-staged molding to a 3D printed mold.

Results: Mechanical testing on the MTS platform confirmed a highly linear deformation profile across physiologic intracranial pressure ranges, with displacement showing a strong correlation to applied pressure ($R^2 > 0.95$, ~42 mmHg per 1 mm displacement). This predictable deformation enables reliable indirect estimation of ICP through standard radiographic imaging. Importantly, devices maintained an elastic modulus of 27.4 kPa and preserved structural integrity throughout 175 days of simulated intracranial conditions, with no evidence of degradation or volume loss, underscoring material stability over prolonged implantation. In addition, the device was evaluated and found to be MRI-compatible and does not produce imaging artifact, ensuring that patients can safely undergo MRI surveillance without interference from the implant. Manufacturing yield has increased from <10% to 63% of successful production per batch of devices synthesized.

Conclusion: CranioCheck is a promising, minimally invasive solution for long-term ICP monitoring in children with craniosynostosis. Ex vivo results support its mechanical reliability and pressure sensitivity. Based on the results, in vivo testing is underway in a rabbit model for pre-clinical validation. This includes monitoring for tissue integration, device migration, and biocompatibility over time, as well as assessing the accuracy and reliability of intracranial pressure measurements under dynamic conditions and assessment of safety. Importantly, recent testing confirmed that CranioCheck does not cause significant MRI artifact, enabling safe, routine neuroimaging following implantation.

Regional and Temporal Trends in Orofacial Cleft Incidence in Wisconsin: A 32-Year Population-Based Analysis

Nada Botros MA, Catharine Garland MD, Daniel Cho MD, PhD

Introduction: Orofacial clefts (OFCs) are among the most common congenital anomalies, arising from a multifactorial interplay of genetic, maternal, and environmental factors. Persistent organic pollutants, particularly polychlorinated biphenyls (PCBs), have gained attention for their teratogenic potential. One recent study demonstrated a positive association between prenatal PCB exposure and OFC risk. Wisconsin's Fox River Valley, one of the nation's most PCB-contaminated waterways and later designated a federal Superfund site, underwent extensive dredging and remediation from the late 1980s to mid-2010s. This cleanup provides a unique opportunity to examine potential links between environmental remediation and population-level OFC incidence.

Methods: Statewide data on live births and OFC cases were obtained from the Wisconsin DHS WISH Query (1990–2022). Incidence trends were modeled using Poisson regression adjusted for annual births, and joinpoint analysis was applied to identify significant changes in slope. Analyses were stratified by DHS-defined regions. In Northeastern Wisconsin, we further examined the timing of eight Superfund cleanup actions (initiated 1987–2004; completed 2011–2016). Although individual-level exposure data were unavailable, we assessed the proportion of OFC cases with maternal ZIP codes overlapping Superfund sites. Multiple-joinpoint regression was used to evaluate inflection points in the northeast. Analyses were performed in R (v4.4.2).

Results: Statewide OFC incidence declined by 0.75% annually ($p = 0.0005$), representing a 21% reduction from 1990–2022. Joinpoint analysis revealed an accelerated decline beginning around 2012 ($p = 0.021$). Northeastern Wisconsin showed a steeper decline of 2.2% annually ($p < 0.0001$), corresponding to a 50% total reduction. Within this region, joinpoint regression identified a shift around 2009 (± 2.6 years), from a –0.25% annual change before 2009 to –6.69% after ($p = 0.0046$). Modeling of Superfund-overlapping ZIP codes revealed two inflection points: 1990–2003 (–5.9%), 2003–2008 (+19%), and 2008–2022 (–4.8%).

Conclusion: Northeastern Wisconsin exhibited a significantly greater decline in OFC incidence than other regions over 32 years. Patterns in overall incidence and in Superfund-overlapping ZIP codes raise questions about environmental influences on congenital anomalies. While causal drivers remain uncertain, the alignment of regional patterns with PCB remediation timelines supports further investigation. These findings reinforce the Fox River Valley's history as an environmentally vulnerable region and suggest that large-scale environmental cleanup may yield measurable public-health benefits. Continued regional analyses across Wisconsin and neighboring states may clarify mechanisms and guide interventions and policies addressing environmental determinants of congenital anomalies.

Current Evidence of Preservation Solutions for Minimizing Free Flap Ischemia Reperfusion Injuries in Rats: A Systematic Review and Meta-Analysis

Alec Chen, Sakar Gupta, Lauren Feeley, Melanie Benito, Aaron Dingle

Background: Ischemia reperfusion injury (IRI) is a substantial complication in flap reconstruction. Diminished blood flow may induce tissue necrosis, leading to complications and potentially necessitating a return to the operating room. Current research aims on targeting the antioxidant response pathway to address the free radicals associated with IRI. This review aims to synthesize the current research focused minimizing IRI in animal studies, which primarily consists of surgical and pharmacologic interventions.

Methods: From inception to 2025, a systematic review was conducted using PubMed, Embase, Web of Science, Scopus, and OVID repositories. Two rounds of independent author screening were conducted. The inclusion criteria consisted of studies assessing for flap necrosis after inducing ischemic injury (defined as ≥1 hour without blood flow) in rats. For each study, data were extracted on the number of rats, strain of rats, size of rats, number of control and experimental groups, type of flap used, method of ischemia, length of ischemia, experimental interventions for treating IRI, assessment outcomes, endpoint assessment, and self-reported success of intervention. Risk of bias was assessed using the SYRCLE's assessment tool for animal studies. Statistical analysis was performed using pooled statistics from all included studies.

Results: Of 2,448 unique citations, 74 (n = 3,544 rats) fulfilled the inclusion criteria. Studies predominately used the Sprague-Dawley strain (n = 47, 63.5%), followed by the Wistar (n = 25, 33.8%) or Lewis (n = 2, 2.7%) strains. Most studies induced ischemia via microvascular clamps (n = 70, 94.6%), while a minority utilized free flap models (n = 3, 4.1%) or tourniquets (n = 1, 1.4%). Interventions were primarily pharmacologic (n = 55, 74.3%), followed by surgical (n = 11, 14.9%), hyperbaric oxygen therapy (n = 4, 5.4%), or involved multiple approaches (n = 4, 5.4%). The overall rate of self-reported effectiveness of interventions was 95.9% (n = 71). Studies were classified as having low risk of bias (n = 20, 27.0%) or moderate risk of bias (n = 55, 74.3%), the latter typically due to lack of blinding of outcome assessors and/or insufficient outcome measures to substantiate conclusions.

Conclusion: Although many studies report effective therapeutic interventions for minimizing IRI, there are concerns regarding the lack of usage of free flap models and possible risk of bias concerns. Future research on strategies for reducing IRI should more closely replicate modern clinical practices of flap reconstruction and investigate possible off-target effects to address safety concerns for clinical implications.

Preclinical Advances in Peripheral Nerve Regeneration: A Systematic Review of Large Animal Model Interventions and Functional Outcomes

Abigail Cichocki, Alec Chen BS, Braxton Druckery, Genevieve Simmons, Haley Mayer, Aaron Dingle PhD

Introduction: Peripheral nerve injuries (PNI) pose a significant clinical challenge with serious consequences for patients, including reduced quality of life, financial burden, and long-term morbidity from the resulting pain or functional limitations. Most common causes are traumatic or iatrogenic. Current standard of care for PNI repair includes direct nerve repair, nerve grafts, nerve transfers, and free tissue muscle transfers. However, these techniques are limited in the slow rate of peripheral nerve regeneration (1 mm per day, or 1 inch per month) and difficulties in assessing the status of regeneration. With a need for improved treatment and diagnostic modalities, this review aims to synthesize the current clinically translatable research on peripheral nerve regeneration in large animal models.

Methods: Scopus, Embase, Web of Science, and PubMed were systematically searched. The search strategy included keywords related to PNI and large animal models. Each article was independently screened by two authors for inclusion in two rounds- title abstract followed by full text review. Inclusion criteria included large animal model experimental studies using interventions aimed at promoting sensory/motor nerve recovery, or improving diagnostic modalities of extremity and facial nerve injuries. Exclusion criteria included central nervous system injuries and human, cell, or small animal models. The primary outcome measure was the assessment of motor and/or sensory nerve function. Secondary outcomes include species, age, sex, sample size, injured nerve, grade of nerve injury, model of nerve injury, length of nerve gap, intervention type, follow-up length, adverse effects, complication rates, success rates of reinnervation, pain, functional outcome measures, electrodiagnostic outcome measures, and molecular imaging outcome measures. Risk of bias will be assessed using the CAMARADES checklist. A subgroup statistical analysis is planned for each outcome measure stratified by intervention type.

Results: A total of 2,082 studies were identified. Results are pending evaluation.

Conclusion: Despite growing research on peripheral nerve regeneration therapies, the literature lacks a thorough review focused on clinically relevant large animal models. By providing a focused analysis of existing interventions and their efficacy, this review will serve as a resource to guide future research and enhance clinical practice.

Defining early molecular and cellular responses to burn injury using spatial transcriptomics

Aiping Liu PhD, Lingxin Cheng, Mary Junak MD, Bailey Donahue, Di Yan, Christina Kendziorski PhD, Angela Gibson

Introduction: The early burn microenvironment is a complex interplay of inflammation and regeneration. With the power of spatial transcriptomics technique to reveal complex intercellular processes in situ, we aim to explore early molecular and cellular processes including reparative, regenerative and inflammatory responses, initiated by burn injury in patients.

Methods: Full thickness skin biopsies were obtained from partial thickness burns on post burn day 3 or 4 (n=4 patients). Whole human spatial transcriptome analysis was performed using Visium HD platform. Bind2cell for cell reconstruction, Louviain Clustering for cell clustering and CASSIA for cell annotation were used to define the cell types and numbers. To identify burn-induced signaling pathways and cell interactions, differential expressed genes of each cell type were generated by comparing burn skin data to a normal skin dataset using EdgeR and intercellular ligand-receptor interaction was conducted in Cellchat.

Results: Ten distinct cell clusters encompassing 56886 cells were identified in all burn samples combined. Strong presence of myeloid cells, especially neutrophils, in the upper region of injured tissue indicated that all burns were in the inflammatory phase. Fibroblasts and keratinocytes exhibited migratory gene expression profiles and their mobility was facilitated by autocrine or paracrine signaling between keratinocytes and fibroblasts via THBS1-CD36 and TIMP1-CD63 (**Figure 1**). Unlike acute excisional wounds, FOSL1 was downregulated in keratinocytes indicating that keratinocyte migration in burn was not driven by FOSL1. In addition, both keratinocyte and fibroblasts upregulated pro-inflammatory genes (SERPINB1, S100A9, CXCL1/2/5/8, IL1b, IL6) to recruit and activate neutrophils. Through autocrine signaling via CXCL8-CXCR1/2, neutrophils further amplified inflammation by recruiting more neutrophils and monocytes to the wound site. The compromised regenerative potential in burn was noted by downregulation of KRT14 and TP63 in keratinocytes and CD34 and LGR5 in eccrine cells as well as eccrine cell autocrine and paracrine signaling with fibroblasts via THBS1-CD47.

Conclusion: Early after burn injury, activated keratinocytes and fibroblasts are mobilized to repair the damaged tissue. Enhanced ligand-receptor interactions among keratinocytes, fibroblasts, eccrine and immune cells contribute to regeneration and inflammation in burns. This is the first study, to our knowledge, identifying gene expression and cell-cell communication in situ in burn injury. Spatial transcriptomics is an ideal technology for identifying gene expression on a cellular level within the tissue to improve the understanding of burn wound microenvironment. Development of future therapeutic approaches for burn wound healing will benefit from this granular insight into the interaction of these cells and signaling pathways.

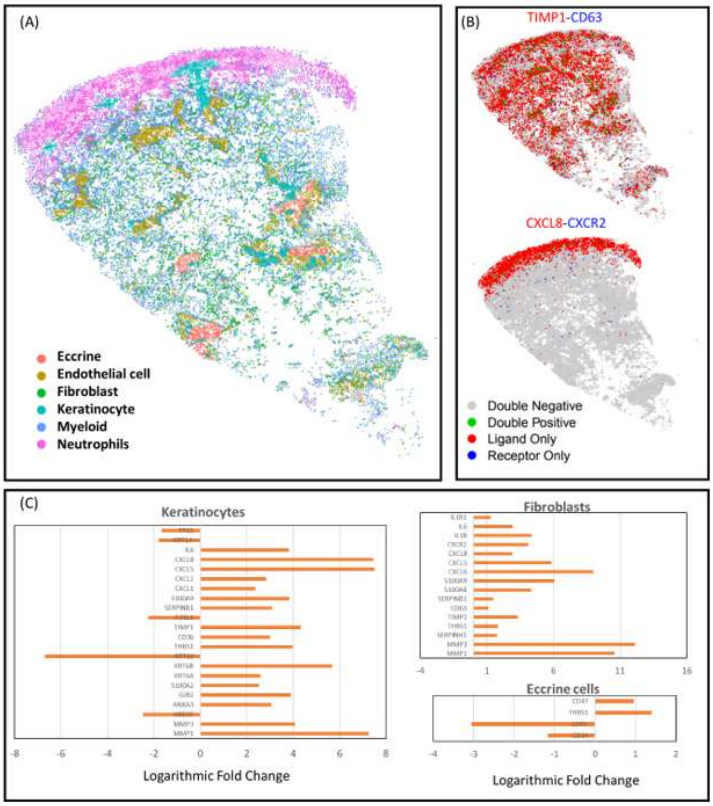


Figure 1. Spatial transcriptomic data analysis of burn skin tissue via Visium HD. (A) Cell clusters distribution in burn skin in one patient. (B) Spatial distribution of ligand-receptor interactions such as TIMP1-CD63 and CXCL8-CXCR2 in the same patient. (C) Differential expressed genes of interest in keratinocytes, fibroblasts and eccrine cells, expressed in logarithmic fold change. Positive logarithmic fold change indicates upregulation and negative change indicates downregulation in burn.

Evaluation of Protoporphyrin IX Fluorescence Imaging for Burn Depth Diagnosis in Porcine Models

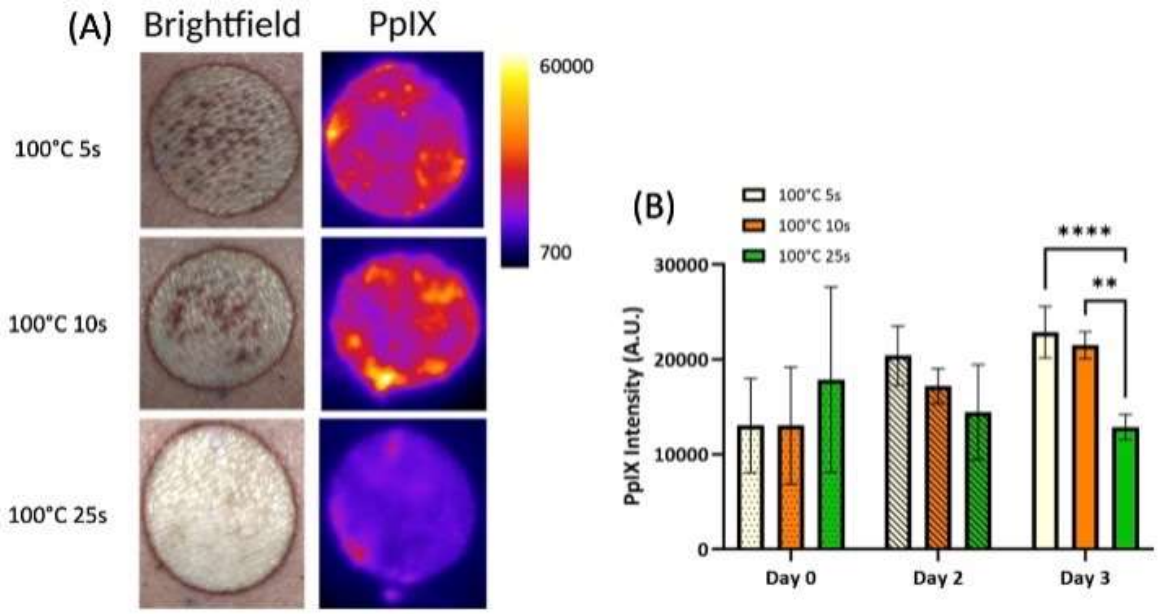
Bailey Donahue BS, Aiping Liu PhD, Marien Ochoa PhD, Mary Junak MD, Brian Pogue PhD, Angela Gibson MD, PhD

Clinical visual assessment, the current standard for determining burn depth, is prone to errors, with inaccuracies occurring in 25-30% of cases. An objective and reliable method for burn depth diagnosis is needed to address the lack of access to specialized burn care nationwide. Protoporphyrin IX (PpIX) is a common photosensitizer produced in the heme pathway from its precursor 5-aminolevulinic acid (5-ALA). The endogenous molecule can be excited at either 405 nm or 633 nm and collected at 635 nm. We aimed to explore whether a fluorescence imaging technique utilizing PpIX is capable of differentiating burn depths in a swine model of burn.

Superficial and mid-dermis burns were created on the flanks of two 64-69 kg, 5-month-old female domestic pigs using a custom burn device at varying thermal conditions at 100°C or 150°C for contact times between 5 and 25 seconds. PpIX fluorescence imaging was conducted using a customized PpIX imager (laser diode 405nm or 635nm) on post-burn day (PBD) 0, 2 and 3 to monitor fluorescence signals across burn depths. Full-thickness tissue biopsies were taken from the burn center region on PBD 3 in both studies to compare to histologic burn depth. All tissue biopsies were frozen, cryosectioned, imaged for fluorescence microscopy, and stained for lactate dehydrogenase (LDH) to evaluate burn depth based on cell viability.

We showed that PpIX fluorescence was present in burn tissue immediately after injury and selectively accumulated in burned tissue regions over time. PpIX fluorescence intensity was noticeably lower in deep burns (100^{o}C, 25s) than in both superficial and mid-dermis burns (100^{o}C, 5s or 10s, see Figure A). On PBD 3, quantification of mean PpIX fluorescence intensity in burn regions showed that PpIX fluorescence is significantly lower in deep burns ($p < 0.05$) than both superficial and mid-dermis burns (Figure B). Microscopically, PpIX fluorescence intensity and burn depths from LDH-stained tissue confirmed this finding.

This study is the first to demonstrate the use of measured PpIX fluorescence intensity to differentiate between burn depths in a clinically relevant model of burn. We will further optimize this technique by refining imaging protocols and validating this technique in human skin models of burn.



Changes in air flow exhibit a sexually dimorphic effect on diet-induced obesity in mice

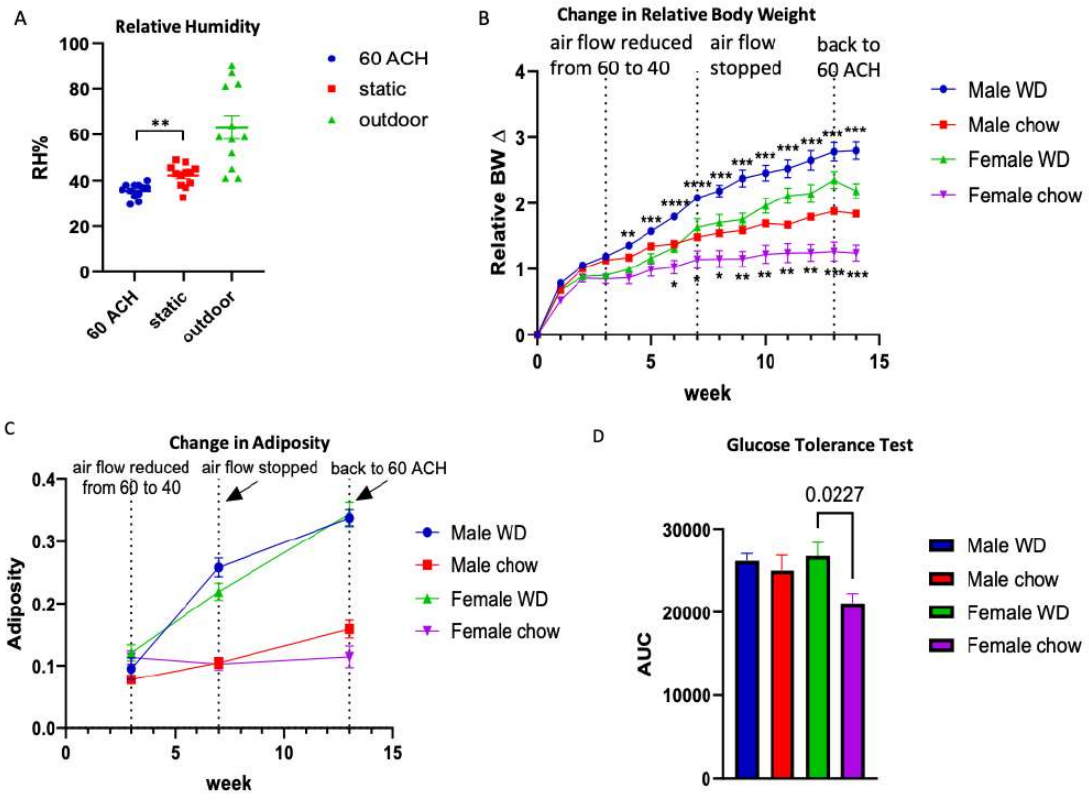
Carolyn Winder, Grace Zhu PhD, Fan Xiao MS, Twinkle Mathew MS, Dave A Harris MD, Dudley W Lamming PhD

Introduction: It is increasingly recognized that vivarium environmental conditions dramatically impact mouse metabolism and that varied, non-standard conditions limit experimental reproducibility. A commonly used mouse model to study metabolic disease is Western Diet-induced obesity (DIO). However, female mice are highly resistant to DIO in standard housing conditions. Similarly, we have demonstrated that mice housed at different vivaria across campus experience different changes in body weight and adiposity depending on environmental conditions – static caging vs. air flow caging. Thus, we hypothesized that caging humidity and air flow were major drivers of weight and adiposity gain in response to WD feeding in mice.

Methods: Starting at 3 weeks of age, male and female C57BL/6J mice were fed either a Western (WD) or chow diet. Body weight, food consumption, cage temperature, and cage relative humidity were monitored weekly. Mice were exposed to differing air exchange rates through the duration of the study starting at 60 air changes per hour (ACH), then 40 and 0, and eventually back to 60. Each stage lasted 3-6 weeks. Body composition was measured using EchoMRI at the end of each air flow change. Glucose tolerance tests were performed before and after air flow was stopped.

Results: Although no temperature difference was observed between cages at 60 ACH and 0 ACH, there was a significant difference in relative humidity (**Figure 1A**). Body weight plateaued for female mice on chow diet despite air flow fluctuations, while female mice on WD experienced significant and stepwise increase in weight when transitioning to 40 ACH and then to 0 ACH (**Figure 1B**). Similarly, male mice on WD experienced a significantly larger weight gain after air flow was reduced stepwise, though male mice on chow diet also continued to gain weight. After air flow was restored to 60 ACH, the body weights in both males and females either plateaued or began to decrease. EchoMRI revealed a significant difference in adiposity between WD and chow-fed groups for both males and females (**Figure 1C**). Females on WD also developed glucose intolerance compared to the chow-fed counterpart after the weight gain (**Figure 1D**).

Conclusion: Environmental factors such as relative humidity and air flow dramatically impact mouse metabolism. We found that manipulating cage relative humidity through changing the air exchange rate influences susceptibility to diet induce obesity. These findings illustrate critical need for standardized, more stringent, mouse housing conditions to limit lab-to-lab and study-to-study variability.



Sleeve gastrectomy improves metabolic health, cognition and reduces plaque pathology in an animal model of Alzheimer's Disease.

REJI BABYGIRIJA PhD, Julia Illiano, Shelly Sonsalla MS, Grace Zhu PhD, Tristan Molkentin, Meredith Peterson, Madison Grover, Carolyn Winder, Twinkle Mathew, Fan Xiao, Justin Wolter PhD, Dudley Lamming PhD, Dave Harris MD

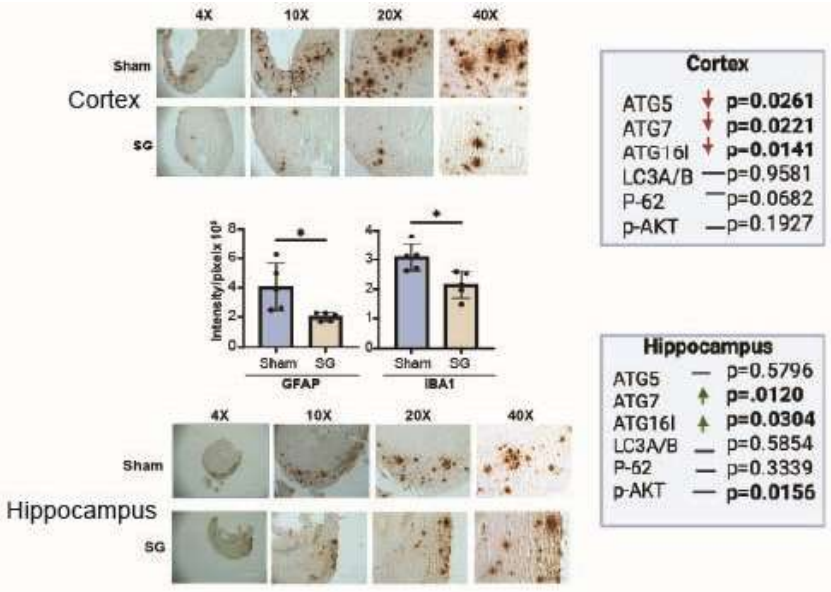
Introduction: A growing body of evidence suggests that obesity and diabetes are significant risk factors for Alzheimer's Disease (AD) highlighting the importance of metabolic dysfunction in AD pathogenesis. Sleeve gastrectomy (SG) is one of the most effective treatments for metabolic disease in humans; however, its potential impact on AD progression remains poorly understood. We hypothesized that SG would improve metabolic health, slow the progression of AD pathology, and improve cognition function in a transgenic mouse model of AD.

Methods: Prior to being weight matched and assigned to either sham or SG surgery groups, female triple transgenic (3xTg-AD) mice, which develop both amyloid-β (Aβ) plaques and tau tangles, were preconditioned on Western diet (WD) to induce obesity and glucose intolerance. Mice were then placed in two dietary groups – continued WD or a balance low fat diet. We completed metabolic phenotyping, measured whole body energy balance, body composition, frailty index, and food intake longitudinally for 12 months post-surgery. Cognitive performance was evaluated using the Novel Object Recognition (NOR) and Barnes Maze (BM) tests at 10 months of age. Mice were euthanized 12 months post-surgery for histological and molecular analyses.

Results: In chow-fed 3xTg AD mice, SG led to sustained reductions in body weight and fat mass and improved insulin sensitivity relative to sham group. SG mice exhibited reduced cortical Aβ plaque burden as well as decreased neuroinflammation (astrocytes;GFAP and microglia;IBA1). Molecular profiling showed reduced cortical expression of ATG5, ATG7 and ATG16L1 autophagy markers which are consistent with decreased autophagy demand in response to improved metabolic and AD pathological load **(Figure 1)**. In contrast, SG mice showed increased ATG5/7/16L1 expression and reduced phosphorylated AKT (p-AKT) levels in the hippocampus, suggesting region specific activation of autophagy which links to reduced insulin–mTORC1 signaling. When preconditioned with WD, SG mice maintained greater weight loss, improved glucose tolerance, and demonstrated enhanced memory performance in the Barnes Maze, along with reduced plaque pathology.

Conclusions: Our findings suggest that SG induces improvements in metabolic health and cognition in 3xTg mice, even under persistent metabolic stress from WD feeding. The observed reductions in region specific modulation of autophagy-related markers suggest that SG may influence brain insulin signaling pathways that mediate neuroprotective effects. These findings identify SG as a promising therapeutic intervention for mitigating AD risk and progression in individuals with obesity and metabolic dysfunction.

Figure 1.



The synergistic impact of resistance training and altered protein diets in sleeve gastrectomy

Grace Zhu, Luiz Lopez, Leah Braucher, Szczepan Olszewski, Julia Illiano, Twinkle Mathew, Samuel Saghafi, Isaac Grunow, Adam Konopka, Dawn Davis, Dudley Lamming, David Harris

Introduction: Sleeve gastrectomy (SG) is one of the most effective treatments for obesity. Surgery itself and the resulting substantial weight loss often leads to improvements in many obesity-related conditions such as type 2 diabetes. Following SG, patients are told to consume a protein preserving diet to retain lean skeletal muscle mass and prevent protein malnutrition. However, there's inadequate evidence to evaluate the effect of dietary protein on lean mass loss. Our previous study on protein restriction after SG in mice revealed that diet heavily influenced body weight (BW) and glucose homeostasis in SG animals. Here, we explored the interplay of diet and exercise in mice after SG to investigate whether resistance exercise training modified the physiologic response of low and high protein intake after SG.

Methods: C57BL/6J mice were preconditioned on western diet for 12 weeks and subjected to sleeve gastrectomy (SG) or sham surgery. Mice were then switched to a high (36%) or low (7%) protein diet. Four weeks after the surgery, mice were further divided into the resistance training or sedentary group. BW, food consumption, and body composition were monitored. Metabolic phenotyping, indirect calorimetry, and muscle strength assay were performed.

Results: No significant difference in adiposity between the exercise and sedentary groups was observed. SG mice had lower adiposity than the sham controls (p = 0.007 and 0.059 for 36% and 7% protein diets, respectively). All the exercise groups pulled similar weight when normalized to BW throughout the entire training regimen and showed improved muscle strength and higher muscle mass. While there was no difference in glucose tolerance between the exercise and sedentary mice, the low protein diet and SG both had significant impact on glycemic control.

Conclusion: Resistance exercise is sufficient to maintain lean mass while further driving weight loss in SG mice on low protein. More studies are needed on the safety and efficacy of low protein diets in humans after SG to improve outcomes.

Fragment end motif analysis to distinguish pathogens from contaminants in enriched plasma microbial DNA

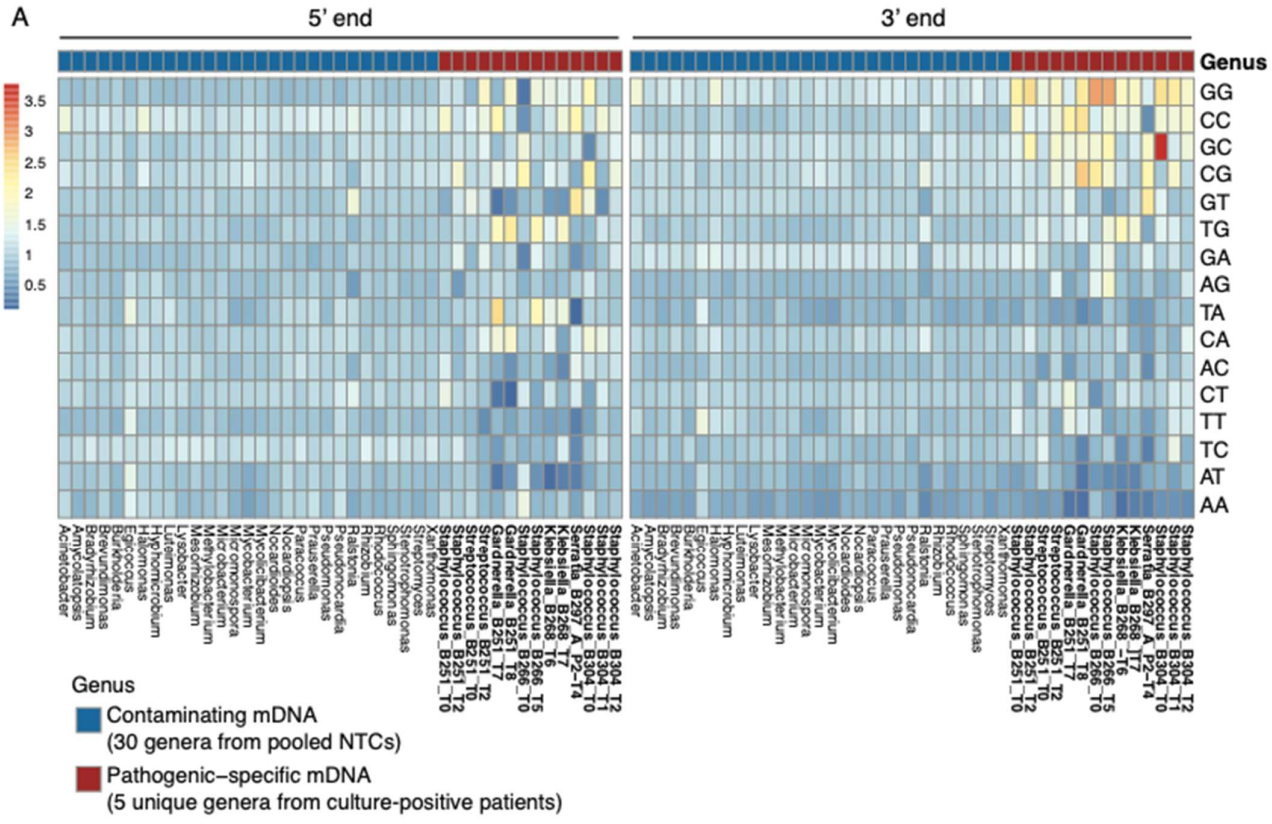
Haikun Zhang, Eddie Dominguez, Mary Junak, Muhammed Murtaza, Caitlin Pepperell, Mehreen Kisat

Introduction: Despite its promise, accuracy of microbial cell-free DNA (mDNA) in plasma as a diagnostic tool is hindered by its low abundance and process contaminants. We previously developed an approach that combines size selection with single-stranded DNA (ssDNA) library preparation, which increases mDNA yield by 200-fold. However, it also decreases sensitivity for pathogen detection due to higher background noise. A recent study using double-stranded DNA library preparation showed that pathogen-derived DNA was enriched for CC dinucleotide at 5' end compared to contaminants. We hypothesized that analysis of dinucleotide motifs at 5' and 3' microbial fragment ends in size-selected ssDNA libraries could help differentiate pathogen DNA from background noise.

Methods: We performed deep sequencing on size-selected ssDNA libraries (<110 bp) generated from longitudinal plasma samples of 11 critically-ill patients (5 with culture-proven infections, 20 samples; 6 without infections, 18 samples) and 6 no-template controls (NTCs). For each 2-mer and 1-mer motif, we calculated the ratio between its frequency observed at 5' and 3' fragment ends in sequencing data and its expected frequency in the corresponding reference genome (O/E ratio). A motif-specific abundance approach was applied to distinguish pathogen-associated mDNA in sepsis samples from non-infection samples.

Results: Pathogen-derived mDNA fragments were more biased in O/E end motif ratios compared to contaminants across all 3 groups (NTCs, no-infections and culture-proven infections), at both 5' and 3' fragment ends. Notably, the GG dinucleotide was enriched at the 3' end in pathogens compared to contaminants ($P < 0.0001$). Using motif-specific abundance of pathogen-associated mDNA, the sensitivity of pathogen detection increased from 38.5% (10/26 pathogens) to 61.5% (16/26 pathogens).

Conclusions: Pathogen-derived mDNA in size-selected ssDNA libraries is biased at 5' and 3' fragment end compared to contaminants. Integrating microbial fragment end motif analysis with microbial abundance can potentially enhance signal-to-noise ratio and improve pathogen detection in plasma metagenomic sequencing.



Cold Atmospheric Plasma as a Selective Therapeutic Approach in Neuroblastoma: Mechanistic and In Vivo Validation

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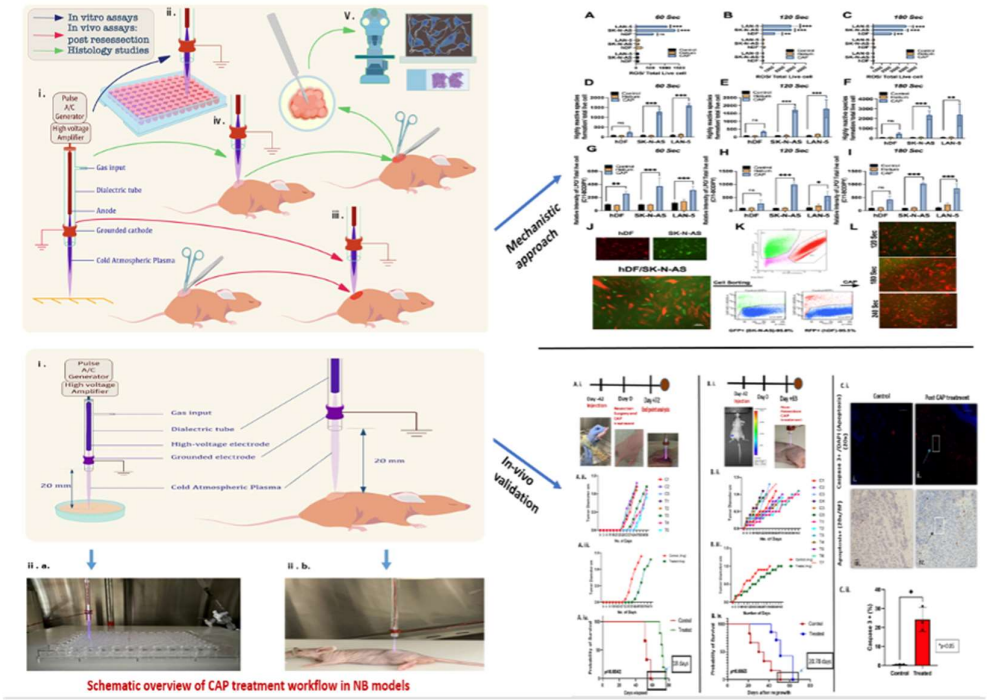
Introduction: Neuroblastoma (NB) remains one of the most challenging pediatric malignancies, particularly in high-risk patients where local recurrence after incomplete resection occurs in approximately 35% of cases. Conventional multimodal therapies, while improving survival, are limited by toxicity and residual tumor burden near vital structures. Cold Atmospheric Plasma (CAP) — a non-thermal, partially ionized gas composed of reactive oxygen and nitrogen species (RONS) — has emerged as a potential therapeutic tool that selectively kills cancer cells while sparing normal tissue. This study evaluated CAP's mechanistic effects and therapeutic efficacy in NB using in vitro assays and in vivo xenograft models.

Methods: Human NB cell lines (SK-N-AS and LAN-5) and normal dermal fibroblasts (hDF) were treated with helium-based CAP (60–300 s) using a custom dielectric barrier discharge jet. Cell viability (CCK-8), reactive oxygen species (H_2DCFDA and HPF probes), lipid peroxidation (C11-BODIPY), oxidative DNA damage (8-OHdG ELISA), apoptosis (Annexin V/PI flow cytometry), and cell-cycle distribution were analyzed. A GFP-labeled NB and RFP-labeled fibroblast co-culture model assessed selectivity. For in vivo validation, SK-N-AS xenografts were established in immunocompromised nude mice to examine CAP applied to (i) residual tumors after incomplete resection and (ii) unresected tumors as a non-resection treatment. Tumor regrowth, survival, and cleaved caspase-3 immunostaining were evaluated.

Results: CAP significantly reduced NB cell viability in a dose- and time-dependent manner ($p < 0.001$) with minimal cytotoxicity in fibroblasts. Treated NB cells exhibited elevated intracellular and highly reactive ROS, increased lipid peroxidation, oxidative DNA damage, and a two-fold rise in apoptosis compared with controls. Cell-cycle analysis revealed G_2/M arrest in NB cells. Co-culture imaging demonstrated selective death of GFP-positive NB cells while preserving RFP-labeled fibroblasts. In vivo, CAP delayed tumor regrowth following incomplete resection, reducing mean tumor diameter by ~60% and extending median survival by 18 days ($p = 0.0042$). Direct CAP application to non-resected tumors also suppressed progression and prolonged survival by 21 days ($p = 0.0065$). Histological analysis confirmed increased caspase-3-positive apoptotic cells in treated tumors without adjacent tissue injury.

Conclusion: CAP induces selective, ROS-mediated apoptosis in NB cells and demonstrates significant tumor-suppressive effects in vivo. Both resection and non-resection models confirm CAP's localized efficacy and safety profile in immunocompromised mice. These findings validate CAP as a promising, non-invasive adjunct therapy for high-risk neuroblastoma, particularly for controlling residual disease after surgery and minimizing recurrence risk.



Cell free DNA fragmentation analysis in dogs with cancer

Patricia Filippsen Favaro, Yinghua Wang, Bradon McDonald, Tammy Xiong Wang, Samanyu Jadhav, Han-Yun Hannah Cheng, Clayton Marcinak, Xuan Pan, Muhammed Murtaza

Cell-free DNA (cfDNA) fragments in plasma originate from different cells in the body and carry information about genomic alterations and chromatin organization. cfDNA analysis holds potential to improve detection of cancer in dogs, but this effort is hindered by limited data on characteristics of canine cfDNA fragments. To address this gap, we characterized cfDNA fragmentation in 254 plasma samples from 54 healthy dogs and 54 dogs with naturally occurring high grade cancers. We employed electrophoresis, whole genome sequencing using both short and long reads, and multiplexed quantitative PCR. Canine cfDNA fragment size distributions showed a striking deviation from humans, with a median of only 39% of fragments between 50-700 base pairs versus 84% in human samples. Similar to human cancer patients, dogs with cancer had characteristically shorter cfDNA fragments relative to healthy dogs, enabling classification between cancer and healthy samples with 91% accuracy. When combining fragment size analysis with copy number alterations, the random forest model predicted cancer with 85% sensitivity at 90% specificity and an area under the receiver operating characteristic curve of 0.93. Our results demonstrate key differences in cfDNA fragmentation between dogs and humans, and suggest plasma DNA analysis using qPCR and sWGS could enable cancer detection in dogs.

Comparison of plasma DNA fragmentation patterns between paired blood collection tubes in patients with early and locally-advanced breast cancer

Aqsa Khalid, Mila Gille, Kirsten Dennison, Michelle Stephens, Bradon McDonald, Barbara Pockaj, Muhammed Murtaza

Introduction: Analysis of cancer-associated fragmentation patterns in plasma DNA is a promising approach for early detection of cancer. Unlike somatic mutations, fragmentation patterns may be more susceptible to pre-analytical differences in blood collection and processing. However, the impact of these preanalytical variables on cfDNA fragmentomic features remains poorly understood, and rigorous evaluation is required to enable their reliable translation into clinical diagnostics.

Methods: We analyzed plasma from paired blood tubes at 302 timepoints prospectively collected during treatment from 96 early and locally advanced breast cancer patients. At each timepoint, we collected an EDTA tube processed within 3 hours of venipuncture (gold standard). In addition, we collected a comparison tube which was either a delayed EDTA tube processed after 24 hours at 4°C, a Streck tube, an LBgard tube or a shipped Streck tube, processed after 72 hours at ambient temperature. From each tube, we extracted plasma DNA, quantified it using electrophoresis and performed shallow whole genome sequencing. Between paired blood tubes, we compared DNA yield, low molecular weight fraction, fragment size distributions, GC content, fraction of aberrant fragments, short/long fragment ratios, and nucleotide and motif frequencies at fragment ends.

Results: Compared to the gold standard, delayed EDTA tubes showed high concordance across all metrics (n=202 sample pairs). In contrast, Streck, LBgard and shipped Streck tubes showed lower cfDNA concentrations ($p<0.001$ for all three, n=166, 190 and 46 sample pairs, respectively). Although fragment size distributions showed slightly higher frequency of 167 bp fragments in Streck, LBgard and shipped Streck tubes, fraction of aberrant fragments and short/long fragment ratios showed no difference and high correlation in paired samples (Pearson $r >= 0.95$). Moreover, Genomewide GC content was lower in Streck and LBgard tubes ($p<0.01$), along with decrease in GG dinucleotides at fragment ends ($p<0.001$), whereas, shipped Streck exhibited the opposite trend.

Conclusion: Fragmentomic features show remarkable reproducibility in paired blood tubes from patients with early-stage breast cancer. Compared to immediately processed EDTA tubes, we observed systematic differences in Streck, LBgard and shipped Streck tubes but not in refrigerated EDTA tubes processed within 24 hours.

Inferring blood volume collected on plasma-separating dried blood spots using mass and imaging analysis

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Introduction: Analysis of plasma-separating dried blood spots (psDBS) holds promise for cell-free DNA measurement, enabling at-home sample collection, room temperature storage, and easy shipment. However, unlike blood tube collection, it is not feasible to directly measure blood volume collected via psDBS. We evaluated whether analysis of psDBS mass, area, and brightness can infer blood volume and enable downstream measurement of circulating analyte concentrations.

Methods: Whole blood from healthy individuals and cancer patients was collected and used to prepare psDBS with volumes of 50 to 250 µL. psDBS were scanned and weighed. Total area and the mean grey value (MGV) of the erythrocyte region were measured using image segmentation. Using mass, area, and MGV as predictors, we developed a linear regression model to predict whole blood volume. Root mean squared error (RMSE) was used to assess model accuracy. DNA from psDBS was extracted, then quantified using qPCR targeting L1PA2.

Results: We analyzed 478 psDBS samples from 40 healthy individuals and 118 cancer patients. Using 250 samples from 30 healthy individuals, a linear regression model was fit to the data, showing a strong correlation between actual and predicted blood volume (RMSE = 10.9 µL, Pearson r = 0.95). Using 110 samples from 10 separate healthy individuals and 118 samples from cancer patients, the model predicted blood volume with high accuracy (RMSE = 12.2 µL and 17.1 µL, respectively). There was a strong correlation between plasma DNA concentration in psDBS and matched blood tubes (R^2 = 0.92). Plasma DNA concentration in psDBS was significantly higher in cancer patients than healthy individuals (p-value = 0.0036).

Conclusion: Our results suggest estimating blood volume collected on psDBS is feasible using mass and imaging analysis. This approach enables measurement of plasma DNA concentration and other potential biomarkers in psDBS from healthy individuals and cancer patients.

Personalized minimal residual disease detection using tumor-derived structural variants in cell-free DNA

Bradon McDonald PhD, Kirsten Dennison MS, Amanda Schussman, Muhammad Talha Nawaz MBBS, Stephanie McGregor MD, PhD, Lee Wilke MD, FACS, Barbara Pockaj MD, Muhammed Murtaza MBBS, PhD

Introduction: Circulating-tumor DNA (ctDNA) in plasma can potentially serve as a minimally invasive cancer biomarker. However, accurate detection of ctDNA is challenging due to its low concentration. Assaying multiple tumor-specific single nucleotide variants (SNVs) can overcome this, but SNV detection is sensitive to polymerase error. In contrast, structural variants (SVs) are a distinct hallmark of cancer and robust to polymerase errors. We have developed a novel assay, Structural Variant Enrichment and Normalization (SVEN), which leverages intrinsic strengths of SVs as genomic markers.

Methods: SVEN consists of multiplexed PCR enrichment of tumor targets followed by amplicon sequencing. SVEN was validated using tumor DNA from breast cancer cell lines. Tumor DNA was diluted into normal DNA at multiple allele fractions (0.003-1%) to simulate ctDNA from plasma. SVEN was then applied to a cohort of breast cancer patients (ELABC, stage I-III, n=15). SVs were called from FFPE tumor DNA using consensus from three software packages (DELLY2, Manta, and SVaBa). Primers targeted to these SVs were designed and tested using *in-silico*PCR. Multiplex primer panels were validated against original tumor and germline (buffy coat) DNA. Validated panels were used to detect ctDNA in plasma samples.

Results:

Analytical validation: The validation rate of SV targets in the cell line panels were 0.86 (HCC1954, 24/28 targets) and 0.79 (HCC1143, 23/29 targets). At 0.003% allele fraction, the sensitivity was 87.5% (10ng input) and 62.5% (5ng input) for HCC1954, and the sensitivity was 75% (10ng input) and 62.5% (5ng input) for HCC1143. At 0.006% allele fraction in HCC1143, the sensitivity at 5ng and 10ng inputs was 87.5%. Higher inputs and allele fractions had 100% sensitivity. Mean inferred tumor fraction, when compared to experimental input, was nearly 1:1 (standard deviation range = 0.0066-0.34, CV range = 0.32-1.81).

Clinical performance: The median validated panel size was 7 (range: 1-34, IQR: 4-21) with a median target validation rate of 0.51 (range: 0.04-0.85, IQR: 0.27-0.78). We were able to detect ctDNA in 93.3% (14/15) of the baseline plasma samples from a median input of 2.3ng of cfDNA (range: 1.1-5.8ng, IQR: 1.8-3.8ng). The median estimated tumor fraction was 0.09% (range: 0.02-0.59%, IQR: 0.03-0.22%). These tumor fractions are consistent with the expected burden for ELABC at baseline.

Conclusions: SVEN is a novel approach for patient-specific detection of ctDNA that has the potential to detect tumor-specific SVs in patient samples with the high degree of accuracy and sensitivity required for clinical implementation.

Towards Early Detection: An Evaluation of Structural Variant Signal Across Sample Types

Amanda L. Schussman, Bradon R. McDonald, Kirsten L. Dennison, Stephanie M. McGregor, Lee G Wilke, Barbara A. Pockaj, Muhammed Murtaza

Introduction: The early detection of cancer through liquid biopsy represents a significant clinical challenge, primarily due to the low abundance of tumor-derived DNA in the blood during early-stage disease. While structural variants (SVs) are highly specific cancer variants, detecting their signal in cell-free DNA (cfDNA) is difficult. This work aims to overcome this by focusing on the DNA molecules that retain the SV breakpoint, known as chimeric molecules (CMs). The purpose of this study is to verify the existence of a sufficient CM signal for early detection and to explore its characteristics, thereby establishing a foundation for a highly specific cancer screening assay that does not require prior knowledge of a patient's tumor genetics.

Methods: We first analyzed whole-genome sequencing (WGS) data from 21 cancer and 2 lymphoblastic cell lines in addition to 35 patients with breast cancer (FFPE tumor and matched normal buffy coat) to quantify CM signal around known SVs. To assess the feasibility of detecting this signal at low tumor fractions, we then performed a model system experiment using sheared DNA from a breast cancer cell line (HCC1954) and its matched normal (HCC1954-BL) at various tumor fractions (100%, 10%, 1%, 0%). Libraries from these dilutions were sequenced at high depth (avg. 434M reads).

Results: Our initial data exploration on primary tumor samples confirmed a significantly higher CM signal in tumor tissue compared to matched normal samples (paired Wilcox Rank Sum $p<0.001$), establishing the tumor-specificity of the SV-derived CM metric. In our model system, we successfully detected this tumor-specific CM signal across all libraries containing tumor DNA. The signal was substantially greater than the 0% tumor fraction control, with 11.80-fold (100% TF), 2.80-fold (10% TF), and 1.48-fold (1% TF) higher signal. This demonstrates that the CM signal is measurable and distinct even at low tumor fractions.

Conclusion: We have identified a measurable CM signal originating from somatic SVs in samples from patients with breast cancer. Our data exploration verifies that this signal is tumor-specific and of sufficient magnitude for detection at low tumor fractions, providing a critical foundation for developing a highly specific liquid biopsy assay for the early detection of cancer.

Tumor DNA analysis in peritoneal fluid from patients with peritoneal carcinomatosis

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Background: Up to 30% of patients with gastrointestinal cancers develop peritoneal carcinomatosis (PC). Unlike other body sites, imaging, blood biomarkers such as circulating tumor DNA, and peritoneal fluid (PF) biomarkers such as cytology and CEA, have limited utility and accuracy in patients with peritoneal metastases. To address this gap, we evaluated tumor DNA in PF (peritoneal tumor DNA or ptDNA) as a cancer biomarker in patients with PC.

Methods: We analyzed 63 PF samples collected from 39 patients with PC of appendiceal, biliary, or colorectal origin, undergoing intraperitoneal chemotherapy. cfDNA was extracted from 4 mL PF and quantified using fluorometry. Tumor fraction (TF) was estimated using low-pass whole genome sequencing and copy number aberration analysis. Clinical variables including peritoneal cancer index (PCI), cytology status, and overall survival were compared with molecular findings.

Results: The cohort included 39 patients (53.9% male; median age, 60.5 years) with a median baseline PCI of 19 (range, 0–37). Across 63 PF samples, median cfDNA concentration was 15.8 ng/mL (range, 0.67–135.8 ng/mL). ptDNA was detectable (TF >3%) in 71% of baseline samples; when detectable, median TF was 16.6% (range, 4.3%–88.2%). TF was higher in patients with increased PC burden (PCI 16–39 vs <=15; p=0.0062), and in patients with positive PF cytology ($p = 9.6\times10^{-5}$). ptDNA was detectable in 45.8% of patients with negative PF cytology. Median overall survival was 17.2 months in the high TF group (>10%) and not reached in the low TF group ($p < 0.001$; HR = 9.7, 95% CI: 1.9–49.0), while one-year OS was 100% vs. 78.7%, respectively.

Conclusion: ptDNA is frequently detectable in patients with PC, and associated with higher PC burden as well as worse prognosis. These findings warrant further evaluation of ptDNA as a biomarker for detection and monitoring of PC in clinical trials of intraperitoneal chemotherapy.

Use of Islet Vascularized Extracellular Matrix Organoids (IVEO) to Improve Transplantation and Survivability of Islets

Deep Kapadia BS

Introduction: Type 1 diabetes (T1D) is an autoimmune disease, resulting in beta cell loss. While cadaveric islet transplantation offers a promising beta cell replacement therapy, the required isolation process disrupts native pancreatic extracellular matrix (ECM) and severs vascular connections, leading to anoikis-mediated cell death and poor engraftment. Recapitulating the islet niche is a critical objective in regenerative medicine and stem cell transplantation. To address this, we generated 3D **I**slet **V**ascularized **E**CM **O**rganoids (IVEOs) composed of primary human islets and endothelial cells embedded in a decellularized pancreatic ECM hydrogel to support vascularization and enhance islet survival. We hypothesized that IVEO transplantation would promote engraftment, vascularization, and survival of human islets in a diabetic mouse model. While the current study uses primary islets, the IVEO platform is readily adaptable to stem-cell derived beta cells in future applications.

Methods: IVEO constructs were generated by embedding human pancreatic islets (1000 or 2000 islet equivalents; IEQ) and human umbilical vein endothelial cells (ECs) into human pancreatic ECM hydrogel (hp-HG) droplets. After gelation, constructs were cultured with angiogenic growth factors and monitored for vascular network formation.

IVEO constructs containing 1000 (1K IVEO+GF) or 2000 (2K IVEO+GF) IEQ were subcutaneously transplanted into diabetic mice. Blood glucose and serum C-peptide (a marker for insulin production) were monitored over 12 weeks. Results were compared to mice receiving naked islets or IVEO constructs without growth factors (IVEO No GF).

Results: IVEO+GF constructs exhibited robust vascular network formation *in vitro* unlike IVEO No GF constructs. *In vivo,* 2K IVEO+GF constructs significantly reduced blood glucose and increased human C-peptide levels, compared to all other groups.

Conclusions: IVEOs offer a minimally invasive, localized delivery method that augments islet engraftment, survival, and function. This strategy holds potential for integration with stem cell-derived beta cell therapies in T1D.

Development of an MRI Compatible Ex Vivo Hypothermic Machine Perfusion Platform for Evaluation of Deceased Donor Kidneys

Daniel Rice, James Rice PhD, Gregory Simchick PhD, Leah Gober MD, Abigail Chase, Diego Hernando PhD, Alejandro Roldán-Alzate PhD, Jennifer Philip MD

Introduction: There is an accelerating rate of discards of deceased donor kidneys in part driven by growing numbers of older donors and medically complex donors. Current methodologies for assessment, including post-procurement biopsies and perfusion parameters on hypothermic machine perfusion (HMP), are limited and have been shown to contribute to the discard rate. We sought to develop improved tools for deceased donor kidneys assessment utilizing an MRI compatible HMP system for characterization of renal perfusion and vascular function.

Methods: Deceased donor kidneys not able to be utilized for transplant were used in this study. Kidneys from donors with age <50 and no known vascular or renal disease were considered healthy controls. Kidneys were placed on a MRI compatible circulatory loop which replicated clinical HMP. MRI-based 4D flow and perfusion images were obtained at both HMP and physiological flow rates (100-600mL/min). Flow, kidney volume, and perfusion were quantified at each flow rate.

Results: 18 deceased donor kidneys were utilized in this study (4 healthy control and 14 diseased kidneys). The MRI-compatible HMP system was able to replicate clinical HMP perfusion. MRI protocols were optimized for kidney assessment, as demonstrated in Figure 1 A-C, featuring two representative diseased kidneys. This is evident when comparing 100 mL/min and 600 mL/min mapping of perfusion in the kidneys. At higher flow rates the perfusion maps demonstrate increased spread of fluid/perfusion inside the kidney. All kidneys demonstrated volume increase with increasing flow rates. Figure 1 D&E illustrates high resistance across all flow rates compared in the diseased compared to the healthy kidney with corresponding reduced perfusion and more turbulent vascular flow as illustrated by 4D flow.

Conclusions: This study details the development and optimization of an MRI compatible HMP system for assessment of deceased donor kidneys. It further demonstrates to potential power of 4D flow and perfusion MRI techniques to evaluate microvascular perfusion and vascular disease. 4D flow maps can provide a method to quantify the fluid dynamics and distribution of flow at the macro-vasculature level. Perfusion maps can be coupled with 4D flow MRI to visualize and quantify microvasculature perfusion. This approach aims to enhance standard HMP characterization, which does not provide any insight into the spatial distribution of flow and perfusion. Future work will include correlation of MRI findings with donor disease burden and HMP performance.

Figure 1

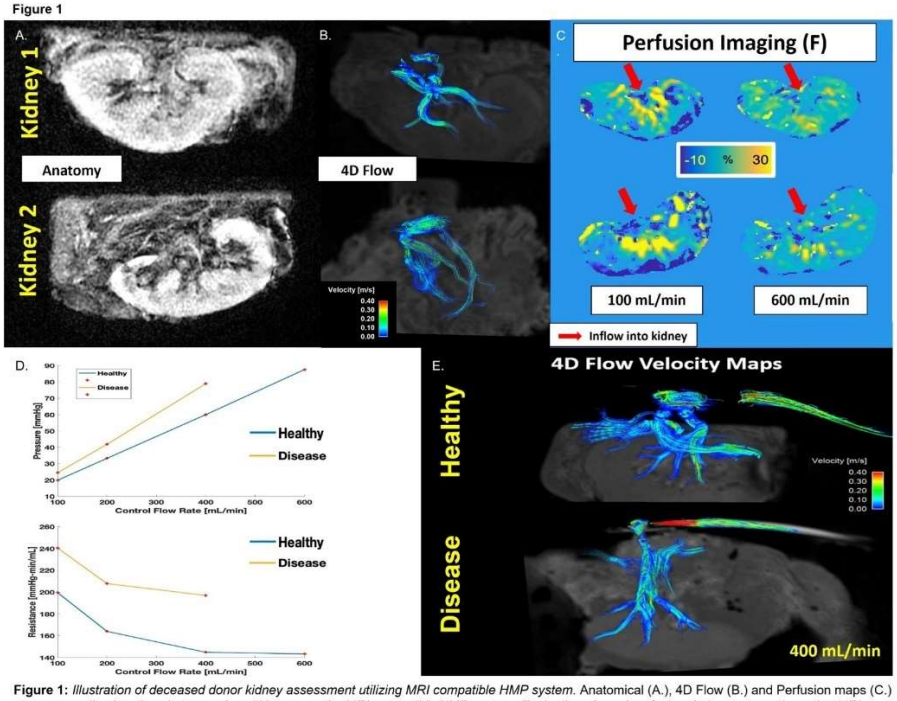


Figure 1: *Illustration of deceased donor kidney assessment utilizing MRI compatible HMP system.* Anatomical (A.), 4D Flow (B.) and Perfusion maps (C.) at corresponding locations in two perfused kidneys on the MRI compatible HMP system; *Evaluation of renal perfusion during preservation using MRI compatible HMP system.* (D.) HMP performance for a representative healthy and diseased kidney across MRI compatible HMP and physiologic flow rates. (E.) 4D flow images demonstrate reduced flow and more turbulent flow in a diseased vs a healthy kidney.

The DNAJB1-PRKACA fusion oncogene is a driver of pancreatic carcinoma

Patrick Carney MD, PhD, Manabu Nukaya PhD, Austin Stram, Sean Ronnekeliv-Kelly MD

Introduction: The *DNAJB1-PRKACA* fusion oncogene is classically thought of as a driver of Fibrolamellar carcinoma (FLC), a rare, lethal liver cancer that affects young people. However, *PRKACA* fusion genes (i.e., *DNAJB1-PRKACA*) have consistently been detected in intraductal oncocytic papillary neoplasms (IOPNs) of the liver (bile duct) and pancreas. These IOPNs progress to carcinomas, which share histologic features with FLC. This led us to hypothesize that these rare cancers share a biological origin, so we developed a novel mouse model expressing *DNAJB1-PRKACA* to investigate.

Methods: Using the Ai14 reporter mouse (red fluorescent protein expression (RFP) upon Cre-mediated recombination), we performed CRISPR/Cas9 to insert the *DNAJB1-PRKACA* construct, generating the Ai14$^{D\text{-}P}$ mouse. We crossed to the Krt19 Cre mouse to express the *DNAJB1-PRKACA* fusion oncogene in biliary and pancreatic epithelium precursor cells. Western blot and qPCR were performed to confirm *DNAJB1-PRKACA* oncogene activity in the pancreas. Histology was performed and select samples were submitted for spatial transcriptomics to better characterize these lesions.

Results: Longitudinal study of these mice out to 4 months revealed that the *DNAJB1-PRKACA* fusion oncogene is a bona-fide driver of IOPN and IOPN-associated carcinoma formation in the pancreas (Figure 1). These mice succumb to tumor burden about 4 months post-treatment with tamoxifen to induce gene expression. Examination of the pancreas revealed the multi-step transformation from neoplastic cell to IOPN to pancreatic carcinoma, effectively mimicking human IOPN-associated pancreatic carcinoma. Spatial transcriptomic analysis of these samples confirmed these complex pancreatic tumors are composed of epithelial tumor cells, cancer associated fibroblasts and diverse immune cell populations.

Conclusions: Expression of *DNAJB1-PRKACA* fusion oncogene in the pancreas causes step-wise progression of IOPN-associated pancreatic carcinoma and mimics human pathogenesis. Our histology, protein analysis and RNA expression data confirm the persistent presence of the fusion oncogene throughout this process and strongly suggest biological overlap with FLC. Further, spatial transcriptomic analysis confirms that these tumors faithfully recapitulate the complexities of human disease in an immune competent model. One major limitation of this study is that we have yet to determine the specific cell of origin in which this driver mutation arises. Future studies will focus on additional spatial transcriptomics to answer this question and on targeted therapy testing in heterotopic and orthotopic models derived from these tumors.

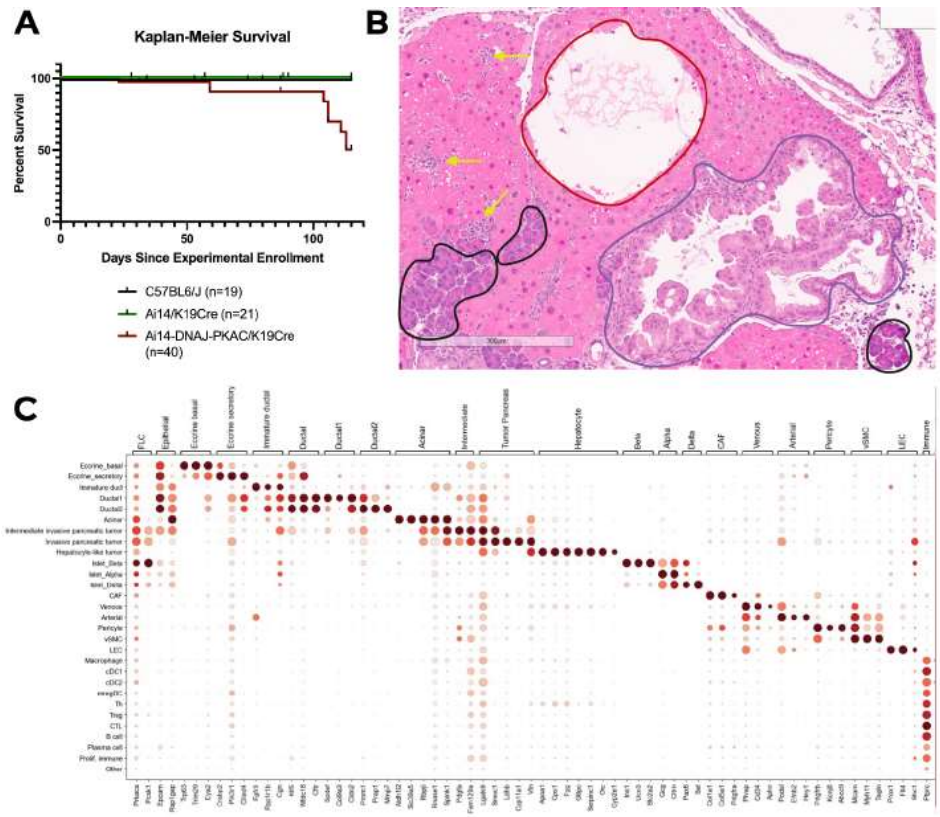


Figure 1: A novel mouse model of DNAJB1-PRKACA fusion oncogene driven IOPN-associated pancreatic carcinoma. A. Kaplan-Meier survival curve demonstrating that mice expressing the fusion oncogene live on average until about 4.5 months before they succumb to tumor burden. **B.** Representative histology from the pancreas of an experimental mouse. Normal pancreatic tissue is outlined in black. The large, eosinophilic cells throughout are early atypical cells that are histologically similar to FLC. Outlined in red is an early cystic lesion, these tend to progress to IOPN which is outlined in purple. Finally, yellow arrows point to carcinoma cells. **C.** Representative dot plot from spatial transcriptomic data showing relative gene expression in different cell clusters. Of particular note are that pancreatic tumor cells cluster with FLC and the tumor demonstrates a complex morphology that includes cancer associated fibroblasts and various immune cell populations.

Examining the effects of diet and sleeve gastrectomy on neuro transcriptional signatures.

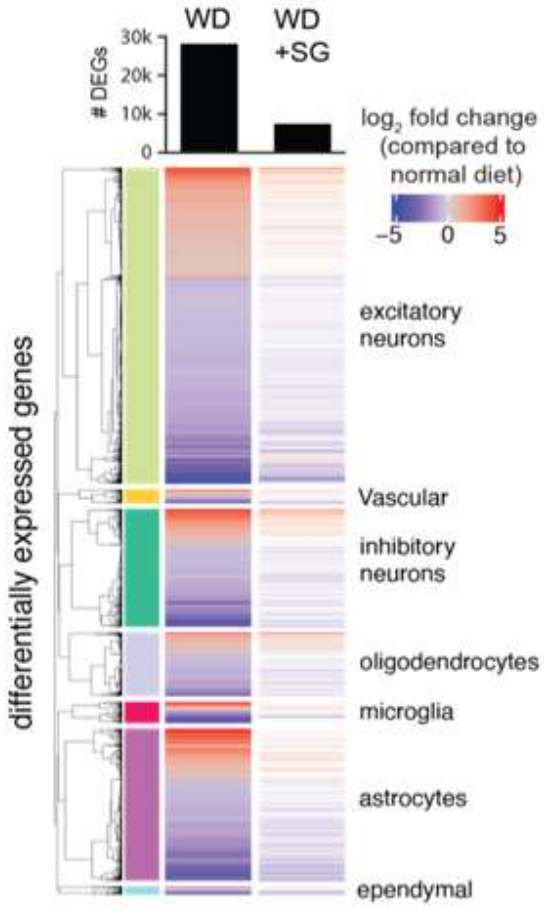
Christopher Jabbarpour, Twinkle Mathew, Grace Zhu, Justin Wolter PhD, David A. Harris MD

The gastrointestinal tract and central nervous form a complex and highly coordinated system to regulate an organism's response to changing energy demands and diet. Obesogenic diets such as the western diet (WD), high in fats and sugars, result in excess energy, impairing the function of this homeostatic system. This aberrant metabolism can contribute to multiple health disorders such as obesity, diabetes, cognitive decline, and dementia. Surgical manipulation of the intestine through sleeve gastrectomy (SG) has been shown to change critical gut-brain signaling pathways influencing global host metabolism, neural plasticity, brain grey/white matter density, and cognitive disease. It is currently unknown how specific cell types in the brain respond to an obesogenic diet and which cell types are driving the therapeutic responses to surgical intervention through SG. We hypothesize that surgical alterations in the gut can lead to molecular and cellular changes in brain, attenuating metabolic and cognitive disease progression.

To characterize the impact of surgical intervention in the gut on cellular and molecular phenotypes in the brain, we have developed a mouse model of SG. Mice were conditioned on either a WD to induce obesity, or a control diet of standard rodent chow. A subset of WD fed mice received a SG. Key brain regions involved in metabolic regulation, and cognition were collected six-week post-surgery for single-nucleus RNA sequencing (snRNA seq), to assess cell-type-specific effects on gene expression.

We found thousands of genes differentially expressed in response to WD, which are attenuated by SG within all three brain regions. In the hypothalamus we identified the down regulation of primary cilia genes within neurons of WD mice. In the cortex and hippocampus, we found WD induced transcriptional signatures common in neurodegenerative diseases, including microglia proliferation and synaptic dysfunction. Critically these signatures were all decreased by SG. Interestingly we also found that SG induced a unique transcriptomic profile, suggesting distinct signaling pathways from both WD and control. Using GWAS statistics from human populations, we identified key cell types and pathways driving disease risk associated with metabolic disorders, neurodegenerative diseases, and addiction.

We examined the effect of an obesogenic diet and subsequent rescue by SG throughout the brain. Our findings show how surgical manipulation of the intestine through SG alters transcriptomic signatures of key cell types. The substantial disease relevant signatures across the brain, can be rescued by intervening in the gut, highlighting critical pathways and targets for future therapeutic interventions.



Clinical Science & Outcomes Research Abstracts

Artery Averted: A Guide to Carotid-Safe Hemostatic Net Placement in Rhytidectomy

Sakar Gupta, Aidan O'Shea, Armin Edalatpour, Ahmed Afifi

Introduction: Previous studies have demonstrated the effectiveness of the hemostatic net in reducing post-rhytidectomy hematomas, however, it's safety as it pertains to the proximity to the carotid artery is unknown. This study aims [AE1] to provide anatomical data on the depth of the carotid artery and its branches along the neck to inform data-based guidelines for hemostatic net placement to decrease risk of inadvertent vessel injury.

Methods: We accessed medical records of patients who underwent rhytidectomy at an academic aesthetic surgery practice who subsequently underwent computed tomography or magnetic resonance imaging of the neck within 10 years following the procedure. For each patient, the left and right common, internal, and external carotid arteries were analyzed at the C2-C4 vertebral levels, corresponding to the angle of the mandible, the hyoid bone, and the thyroid cartilage respectively. The shortest distance between the wall of the vessel and the surface of the skin was measured, along with the distance between the corresponding right and left vessels, which was used to determine the average distance from the midline.

Results: Thirty-three patients (9.1% male) had images of sufficient quality available. The average age at rhytidectomy was 64.2 years and at imaging 69.1 years. Data for the average depth relative to the skin, as well as the average distance from the midline, are shown in Table 1 and visualized in Figure 1. Of particular note, the closest artery to the skin along the neck was the internal carotid artery at the level of the thyroid cartilage (C4), where on average it sat 20.5 mm below the cutaneous surface at a distance of 23.9 mm from the midline.

Conclusion: A thorough understanding of the course of the vascular structures in the neck underlies safe placement of hemostatic nets after facelift surgery. Practically, assuming the use of ⅜ circle suture needles, a 24 mm needle, which has a chord length of approximately 19 mm, may thus be safer to use than a 32 mm needle, which as a chord length of approximately 25 mm. Armed with these anatomical data, which we tied to easily identifiable surface landmarks, the plastic surgeon can more confidently and safely deploy this technique while avoiding inadvertent vascular injury.

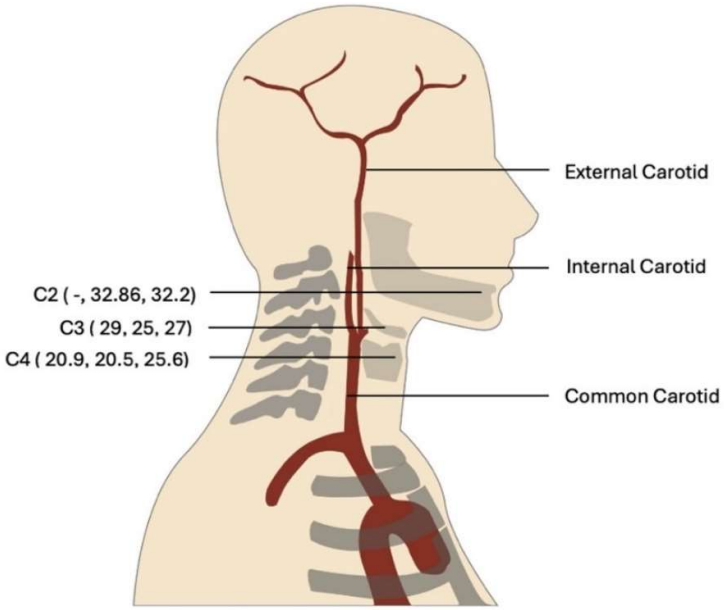


Figure 1: Mean depth (mm) of the carotid artery and its branches at the C2, C3 and C4 vertebral levels. Measurements at each level reported as (common carotid, internal carotid, external carotid). The mandible, hyoid bone, and thyroid cartilage are shown as readily identifiable surface landmarks corresponding to the C2, C3, and C4 vertebral levels, respectively.

Public Consensus on Lower Body Contouring: A Crowdsourcing Approach to Aesthetic Outcome Assessment

Jace Boswell, Armin Edalatpour MD, Ellen Via MD, Peter Wirth MD, Ahmed Afifi MD

Introduction: The current literature lacks a clear, objective distinction between body lift surgery and belt lipectomy, resulting in surgical decisions that often rely on surgeon preference rather than standardized criteria[1]. Given that patient satisfaction in elective procedures is predominantly driven by cosmetic outcomes and public perception, this study employs a crowdsourcing methodology to objectively assess and compare the aesthetic outcomes of these two procedures. The primary aim is to determine whether the general public perceives a difference in cosmetic outcomes between body lift surgery and belt lipectomy, by evaluating overall aesthetic ratings, scar appearance, and specific contouring outcomes such as waist and buttock shape.

Methods: Images were sourced from peer-reviewed journals and standardized using Adobe Photoshop. All images included both pre- and post-operative images, which were altered to show versions with and without the scar. Each picture was assigned a number from 1 to 4. 1 and 2 represent a belt lipectomy surgery, and 3 and 4 indicate a lower body lift surgery. The images were then randomized into 6 surveys with an equal amount of body lift and belt lipectomy images, as well as an equal number of images with and without a scar. The surveys were distributed using Amazon Mechanical Turk and taken by random participants from across the globe. Respondents rated each image on a 5-point Likert scale across four categories: waist contour, buttock shape, scar appearance, and overall aesthetic appeal. The results were then analyzed using a t-test.

Results: The analysis revealed no statistically significant differences between belt lipectomy and body lift surgery. No significant differences were observed in the ratings for overall appearance (belt lipectomy 3.21 ± 0.11 vs. body lift 2.90 ± 0.33, $p = 0.554$), flank contour (belt lipectomy 3.07 ± 0.09 vs. body lift 2.78 ± 0.24, $p = 0.088$), buttocks (belt lipectomy 3.07± 0.02 vs. body lift 2.81 ± 0.32), scar appearance (belt lipectomy 3.16 vs. body lift 2.66 ± 0.33, $p = 0.296$).

Conclusions: The findings demonstrate that the aesthetic parameters did not differ significantly. These results provide objective data that may assist surgeons in preoperative counseling and surgical decision-making, ultimately aligning operative strategies with patient values and expectations in elective body contouring procedures. Future studies may further refine these findings by exploring additional aesthetic factors and longer-term outcomes.

Can the CALGB 140503 Trial Support Choice of Segmental versus Wedge Resection for NSCLC? Sensitivity Analysis using the Robustness of Inferences to Replacement

Benjamin Cher, Qinyun Lin, Courtney Balentine, Kenneth Frank, James Maloney, Andrea Axtell

Introduction: The optimal extent of surgical resection for clinical T1aN0 non-small cell lung cancer (NSCLC) remains unclear. The CALGB 140503 trial found sublobar resection was not inferior to lobar resection for disease-free survival, but the sublobar arm did not differentiate between wedge resection (WR) and anatomic segmentectomy (AS). There remains debate whether WR or AS is superior for these patients.

The authors of CALGB 140503 published a post hoc analysis finding no survival difference between WR and AS. However, many thoracic surgeons question the results because of concerns about unmeasured confounding, selection bias, and sample size. The purpose of this study was to assess the robustness of the post hoc findings, to facilitate better conversations about how the findings can support decision-making.

Methods: We evaluated the findings using a novel method for sensitivity analysis called the Robustness of Inferences to Replacement (RIR). For a study finding no significant survival difference between WR and AS, the RIR quantifies how many study patients would need to be replaced by patients with the threshold survival difference (minimum smallest statistically significant difference) for the result to be changed so there is a significant difference in survival. High RIRs indicate robust findings, suggesting it is unlikely that controlling for unmeasured variables or repeating the study with a new sample would generate a different result.

Results: The post hoc analysis found no significant difference in lung cancer deaths (HR 0.89, 95% CI 0.50-1.60) between WR (n=204) and AS (n=131). The RIR was 269 (out of 335), meaning 80.2% of the sample would need to be replaced with patients with the threshold survival difference for the survival difference between WR and AS to become significant. Similarly, there was no significant difference in nonlung cancer deaths (HR 1.26, 95% CI 0.69-2.28) and locoregional recurrence-free survival (HR 1.06, 95% CI 0.57-1.97). The RIRs for these findings were 205 (61.2%) and 304 (90.6%).

Conclusions: The post hoc findings of no survival differences between AS and WR are robust, since 60-90% of patients would need to experience different outcomes for the results to change. A new study directly comparing AS versus WR would likely come to the same conclusion, even with better control for confounders, different selection criteria, and/or a larger sample size. It is unlikely there is a survival difference between AS and WR.

Increased Pack Years Is Associated With Risk of Tumor Spread Through Air Spaces

Joshua Brady MD, PhD, Jocelyn Zajac MD, Daniel McCarthy MD, MBA, James Maloney MD, Malcolm DeCamp MD, Andrea Axtell MD, MPH

Introduction: Tumor spread through air spaces (STAS) is associated with negative prognosis in non-small cell lung cancer (NSCLC). While STAS is a pathologic diagnosis, identifying preoperative predictors of STAS is needed to better risk stratify patients for STAS for optimal surgical planning, as lobectomy may be preferred over sublobar resection. We investigated the possible association between smoking, an independent predictor of poor survival, and STAS.

Methods: A retrospective cohort analysis was conducted on 421 adult patients who underwent a first-time resection for NSCLC at a single institution between January 2018-December 2022. Pack year smoking history was analyzed as a continuous variable and stratified as: light smokers (0-20PYs), moderate smokers (20.1-40PYs), and heavy smokers (>40PYs). The association between smoking and STAS was evaluated via univariable and multivariable logistic regressions.

Results: Of the 97 STAS-positive patients, 15% (15) were light smokers, 23% (22) were moderate smokers, and 33% (32) were heavy smokers. On univariable regression, increased PYH as a continuous variable was associated with increased likelihood of STAS (OR=1.01, 1.00-1.02 95%CI, p=0.045). However, on multivariable logistic regression, the association between PYs and STAS failed to reach significance (OR=1.01, p=0.064) when controlled for stage and histologic pattern. Tumors greater than stage I and papillary-predominant lesions were strongly associated with STAS (Table 1).

Conclusion: Increased PYs are associated with an increased risk of STAS; however, future research is indicated to determine if smoking represents either an independent risk factor for STAS or a driver of associated high-risk markers including histology and stage.

Table 1. Multivariable Predictors of STAS

Risk Factors	OR (95% CI)	p-value
Absolute Pack Year History (PYH)	1.01 (1.00-1.02)	0.064
Predominant Histologic Pattern		0.094
Lepidic	Ref	
Acinar	1.53 (0.41-5.51)	0.539
Papillary	6.72 (1.26-35.77)	0.026
Solid	1.52 (0.33-6.99)	0.591
Micropapillary	7.77 (0.83-72.76)	0.072
Mucinous	1.45 (0.29-7.14)	0.651
Pathologic Stage		0.326
I	Ref	
IIa	1.41 (0.17-11.90)	0.751
IIb	2.32 (0.93-5.76)	0.071
IIIa	1.90 (0.47-7.71)	0.368
Lymphovascular Invasion (LVI)	1.39 (0.72-2.67)	0.326
Tumor Size	1.13 (0.88-1.45)	0.343

*STAS – Tumor Spread Through Air Spaces

Re-Evaluating MARS1 and MARS2: Should the Trials Guide Treatment Choice for Pleural Mesothelioma?

Benjamin Cher, Qinyun Lin, Courtney Balentine, James Maloney, Andrea Axtell

Introduction: Malignant pleural mesothelioma is a rare disease with a poor prognosis, and the optimal combination of surgical and/or medical therapy remains unclear. The MARS1 and MARS2 trials compared chemotherapy plus extrapleural pneumonectomy (EPP) to chemotherapy alone (MARS1), and chemotherapy plus extended pleurectomy and decortication (EPD) to chemotherapy alone (MARS2), and found that both operations led to worse survival than chemotherapy only. However, many thoracic surgeons question these results given small sample sizes and concerns about patient selection. The purpose of this study was to quantify the strength of the findings in MARS1 and MARS2, to facilitate better conversations about how these trials can support decision-making.

Methods: We evaluated the MARS1 and MARS2 trials using a novel method for sensitivity analysis called the Robustness of Inferences to Replacement (RIR). The RIR quantifies how much resampling from a null hypothesis population would be needed to change a study result (significant difference becomes non-significant). If the RIR is high, then a study is considered more robust because it is unlikely that repeating the study with a new sample would generate a different result.

Results: The main finding of MARS1 (total n=50) was that chemotherapy+EPP was associated with decreased overall survival (adjusted hazard ratio 2.75, 95% CI 1.21-6.26) compared to chemotherapy alone. The RIR was 8, meaning that 8 additional EPP patients (16% of the entire study population) would have had to be replaced by patients who experienced the same survival as chemotherapy patients for the result to change. The main finding of MARS2 (total n=335) was that chemotherapy+EPD was associated with a difference in restricted mean survival time at 2 years of -1.9 months (95% CI -3.4, -0.3). The RIR was 71 (21% of 335), meaning that for the result to change, 21% of the study patients would need to be replaced by patients with outcomes similar to the chemotherapy group.

Conclusions: The MARS1 and MARS2 trials would have come to opposite conclusions (i.e., surgery was beneficial) if as little as 15-20% of the surgical patients had slightly better survival. This suggests that if the trials were repeated again with different selection criteria or larger sample sizes, there is at least a moderate chance that the results would be different. This analysis sheds doubt on the strength of the trials' findings. Further trials are needed to support decision-making for patients with malignant pleural mesothelioma.

Performing C-Sections: The Perspective and Experience of Wisconsin's Rural General Surgeons

Katherine Bakke MD, MPH, FACS, Elia Careaga, Srishti Gupta BS, Randi Cartmill MS, Elise Lawson MD, MSHS, FACS

Introduction: In the United States, women in rural communities are 9 times more likely to face complications or death during or after childbirth than their urban counterparts. Physician shortages are one reason for this disparity. OB/GYN physicians typically work in urban hospitals; in rural areas, family medicine physicians and nurse midwives more commonly provide obstetric care. General surgeons, too, play a role, as they perform Cesarean sections (C-sections) in many low volume birth hospitals. However, little is known about their experiences in this role. This qualitative study examines the perspectives of general surgeons working in rural Wisconsin who perform C-sections as part of their clinical practice.

Methods: Wisconsin hospitals designated as “rural” and with <200 annual births were identified using the 2021 American Hospital Association Annual Survey. General surgeons working at these hospitals were recruited via email to participate in a semi-structured interview about their experience performing C-sections. Six surgeons participated in a virtual interview held via Zoom teleconference software. Deidentified interview transcripts were iteratively coded to identify themes.

Results: All surgeons interviewed entered practice directly after residency. Most surgeons learned how to perform C-sections during residency, outside of a formal OB/GYN rotation. A surgeon’s self-efficacy in performing C-sections varied based on how frequently they performed the procedure, and if they performed scheduled C-sections. Surgeons expressed anxieties about assistance and resources available if help was needed, or a complication arose, during C-section. Surgeon satisfaction in having operative obstetrics as part of their clinical practice was influenced by on-call structure, relationships with obstetric staff, and acknowledgement of their work by hospital leadership. All surgeons described a deep commitment to providing operative obstetric care because of a community need.

Conclusion: This qualitative analysis highlights the perspectives of general surgeons working in rural Wisconsin who perform C-sections. Few formal training opportunities in operative obstetrics exists for general surgeons in the United States. Insights gained from these interviews can be used to develop an operative obstetrics training course relevant to the educational needs and goals of the rural general surgeon. Additionally, this study reveals that general surgeons who only participate in "urgent" C-sections compared to those who perform both elective and urgent C-sections are at risk for decreased operative self-efficacy and work satisfaction.

How frequently does parathyroidectomy and adjuvant treatment lead to clinically meaningful changes in bone mineral density? A multi-institutional study

Nicholas Druar, Caitlin Finn, Benjamin Cher, Rebecca Sippel, Naim Maalouf, Jorge Mosquera Izurieta, Patricia Lu, Dana Anderson, Megan Applewhite, Alexander Chiu, David Schneider, Simon Holoubek, Kristin Long, Louise Davies, Courtney Balentine

Background: The Federal Drug Administration will soon approve a new standard for what constitutes a clinically meaningful improvement in bone mineral density (BMD) that predicts fracture prevention, defined as a ≥3.18% improvement in total hip BMD. We aimed to determine what proportion of patients who undergo parathyroidectomy for primary hyperparathyroidism achieve this benchmark, with or without bisphosphonates as adjuvant therapy.

Methods: We included 493 adults who underwent curative parathyroidectomy for primary hyperparathyroidism at three institutions and had BMD testing within three years prior to and after surgery. We calculated the proportion of patients whose total hip BMD improved by ≥3.18%, with subgroup analyses based on use of bisphosphonates before, within one year postoperatively, or >1 year postoperatively.

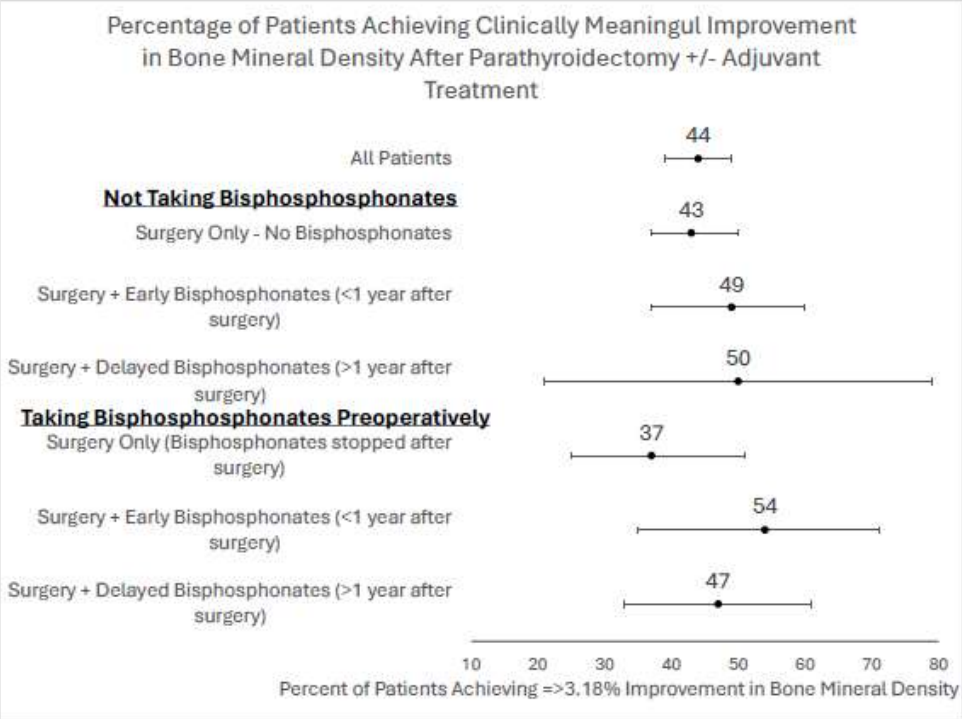
Results: Mean age at surgery was 67± 9.7 years, and mean preoperative calcium was 10.6 mg/dL.

Altogether, 43% patients (95% credible interval [CrI] 39%-48%) achieved meaningful BMD improvement within three years after parathyroidectomy.

For patients not taking bisphosphonates before surgery, 43% (95% CrI 37%-50%) experienced a meaningful improvement in BMD with surgery alone and no bisphosphonates postoperatively. Similar rates were observed regardless of whether bisphosphonates were started within one year of surgery (49%, 95% CrI 37%-60%) or after one year (50%, 95% CrI 21%-79%).

If patients were taking bisphosphonates before surgery and discontinued them postoperatively, the incidence of clinically meaningful improvement after parathyroidectomy was 37% (95% CrI 25%-51%). If bisphosphonates were restarted within one year of surgery, the rate of success was 54% (95% CrI 35%-71%), while success was achieved for 47% (95% CrI, 33%-61%) if medications were restarted more than one year after surgery.

Conclusions: Parathyroidectomy leads to a clinically meaningful improvement in BMD for <50% of patients, and the additive value and appropriate timing of bisphosphonates as adjuvant therapy is unclear. It is important to identify better adjuvant treatments to boost the effects of parathyroidectomy on BMD recovery so more patients can maximally benefit from surgery.



Improved Quality of Life after Parathyroidectomy Compared to non-Operative Management: More than just Placebo?

Benjamin Cher, Qinyun Lin, Elisa Marten, Melissa Thornton, David Schneider, Dawn Elfenbein, Alexander Chiu, Rebecca Sippel, Kenneth Frank, Courtney Balentine

Introduction: A common critique of randomized trials that compare surgery to nonoperative alternatives is that placeboeffects from “doing something” with surgery and a lack of blinding for assessments lead to biased estimateswhen comparing patient-centered outcomes such as quality of life. Despite several randomized trials showingthat parathyroidectomy improves quality of life more than nonoperative management, skeptics have arguedthat the benefit is small and have questioned whether it is mostly or entirely due to placebo effects rather thantrue improvement from surgery. We aimed to use sensitivity analysis to inform discussion about the strengthof evidence supporting parathyroidectomy while accounting for possible placebo effects of surgery.

Methods: We reviewed published meta-analyses and society guidelines to identify randomized trials that comparedquality of life after parathyroidectomy versus observation. To account for potential placebo effects, we usedestimates from a meta-analysis quantifying the placebo effect for patient-reported outcomes on a continuousscale.We then (1) calculated the effect of parathyroidectomy after subtracting the average placebo effect (0.3 SD ofobserved effect), and (2) quantified how far the remaining effect of surgery exceeded the threshold forstatistical significance.

Results: We identified 4 randomized trials that enrolled 393 patients and demonstrated significant improvement inquality of life following parathyroidectomy versus nonoperative management. After accounting for potentialplacebo effects, the observed benefit of parathyroidectomy in the trials still exceeded the threshold forstatistical significance ($p< 0.05$) by between 84% and 93%.

Conclusions: There is still a clinically and statistically significant improvement in quality of life following parathyroidectomycompared to nonoperative management, even when accounting for potential placebo effects. This suggeststhere is a true treatment effect of parathyroidectomy, and that patients with primary hyperparathyroidismshould be referred for surgery to discuss how the operation could improve their quality of life.

Morbidity After Lobectomy Versus Total Thyroidectomy for Differentiated Thyroid Cancer

Benjamin Cher, Rebecca Sippel, David Schneider, Dawn Elfenbein, Alexander Chiu, Courtney Balentine

Introduction: Patients with differentiated thyroid cancer experience similar survival and recurrence when treated with total thyroidectomy or lobectomy, so postoperative morbidity is an important consideration when selecting a surgical approach. Since differences in morbidity identified by prior studies may be attributable to selection bias, we aimed to determine whether higher complication rates with total thyroidectomy could plausibly be explained by selection bias.

Methods: We identified 2,451 patients with differentiated thyroid cancer without lymph node involvement who underwent total thyroidectomy and 1,488 patients who underwent lobectomy between 2016-2023 in the National Surgical Quality Improvement Program (NSQIP) database. We compared postoperative morbidity using propensity scores and calculated the robustness of inference to replacement (RIR) to evaluate effects of selection bias. The RIR determines how many study patients would need to be replaced with hypothetical patients who experienced different outcomes for the results to change, while controlling for the overall complication rate. Higher RIRs represent more robust results.

Results: Mean age was 50±15 years, 74% were biological females, and 48% were white. Total thyroidectomy was associated with a 9.5% (95% CI 7.3-11.7; RIR 218) increase in overall morbidity, including both thyroid-specific complications (hypocalcemia, recurrent laryngeal nerve dysfunction, or hematoma) and general (non-thyroid-specific) complications, and a 10.4% (95% CI 8.4-12.3; RIR 246) increase in thyroid-specific complications. There was no significant difference in non-thyroid-specific complications between total thyroidectomy and lobectomy.

Conclusion: Total thyroidectomy leads to significantly more complications than lobectomy, and the high RIRs indicate the difference is unlikely to be attributable to selection bias.

A New Tool to Address Differential Loss to Follow-Up in Surgical Randomized Trials

Benjamin Cher, Qinyun Lin, Courtney Balentine, Kenneth Frank

Introduction: Randomized trials are considered the gold standard for evidence-based medicine because randomization eliminates bias from both measured and unmeasured confounding, but this benefit is lessened if a significant number of patients are lost to follow-up (LTFU), and their outcomes cannot be assessed. This is particularly problematic when there is differential LTFU between study arms. Although differential LTFU is a critical threat to causal inference from randomized trials, researchers lack the tools to evaluate how LTFU may affect study results. This study presents a novel tool to quantify whether differential LTFU is likely to change the results of a randomized trial.

Methods: We assessed the importance of differential LTFU in a randomized trial comparing 3-month postoperative quality of life for patients recovering from lung cancer resection (PMID 39621348) who were treated with either (1) home-based exercise and self-management program (ESMP) or (2) usual care. The study found no difference in quality of life between groups. The method estimates how high the quality of life scores among patients LTFU in the ESMP group would need to be for the study to conclude that ESMP was superior to usual care. This is calculated by assuming that the overall mean quality of life score for patients LTFU equaled the mean score of patients who were actually observed in both study arms, but there could be quality of life differences in the missing data.

Results: In the original study, quality of life was equivalent between study arms: 77.3 (SD 20.9) in the ESMP group (n=58) versus 76.3 (SD 18.8) in the usual care group (n=58). However, LTFU was higher in the treatment group (11/58, 19%) versus the control group (2/58, 3%), which could bias results and lead to type II error. Using the method, we calculated that the only way for the results of the trial to change and show that ESMP is superior to usual care would be for the patients LTFU in the ESMP group to have a mean score of 106.75 on the quality of life scale. Since this is greater than the maximum score allowed by the quality of life instrument, it is mathematically impossible for differential LTFU to change the original study conclusion.

Conclusion: This case study highlights the value of a novel method for evaluating effects of differential LTFU on results from surgical randomized trials. We are currently developing software to make this calculation available to surgical researchers.

Parathyroidectomy and Fracture Prevention: How Strong is the Evidence?

Benjamin Cher, Qinyun Lin, Elisa Marten, Melissa Thornton, Dawn Elfenbein, Alexander Chiu, David Schneider, Rebecca Sippel, Kenneth Frank, Courtney Balentine

Introduction: Many physicians are hesitant to trust observational data to guide treatment decisions because unmeasured differences (confounding) between groups can bias estimates of treatment benefits. Primaryhyperparathyroidism increases risk of fractures, and parathyroidectomy is the only treatment. Since the studies comparing parathyroidectomy to nonoperative management are observational rather than randomizedstudies, some have questioned whether surgery truly prevents fractures. We aimed to use sensitivity analysis to inform dialogue about the strength of evidence supporting parathyroidectomy versus nonoperative management for fracture prevention.

Methods: We used published meta-analyses, society guidelines, and NIH RePORTER to identify studies that compared overall and hip fractures following parathyroidectomy or nonoperative management in patients with primary hyperparathyroidism. Since differences in observational studies could be due to either (1) true treatment effects or (2) unmeasured confounding, we quantified how much unmeasured confounding would have to be present for parathyroidectomy to offer no benefit in fracture prevention.

Results: We identified four observational studies involving 216,470 patients that demonstrated significantly lower overall and hip fracture risk after parathyroidectomy compared to nonoperative management.For overall fracture risk, we found that it would require highly implausible levels of unmeasured confounding to change the study conclusions that parathyroidectomy is superior to nonoperative management. To change the study results, up to 98% of the observed benefit of parathyroidectomy would have to be attributed to unmeasured differences between surgical and nonoperative patients before parathyroidectomy would no longer be associated with lower fracture risk.Similarly, for hip fractures, up to 93% of the benefit from parathyroidectomy could be attributed to unmeasured confounding and surgery would still reduce fractures when compared to nonoperative management.

Conclusions: Although evidence showing fracture reduction from parathyroidectomy comes from observational studies, the results are highly robust to plausible levels of unmeasured confounding. Parathyroidectomy likely reduces fractures for most patients with hyperparathyroidism.

Small sample size but still definitive, a secondary analysis of a randomized trial on central neck dissection for papillary thyroid cancer

Benjamin Cher, Qinyun Lin, Kenneth Frank, Courtney Balentine

Introduction: Physicians occasionally dismiss randomized trial findings because of concerns about external validity and power. There is a major controversy in endocrine surgery regarding whether patients with thyroid cancer should have lymph nodes removed in addition to their thyroid, with the goal to prevent cancer recurrence. The only RCT about this topic is criticized for being underpowered and non-generalizable, so we use novel frequentist and Bayesian statistics to test the robustness of the findings, aiming to facilitate discussions with physicians who question the trial.

Methods: We apply three statistical techniques, two grounded in frequentist statistics: the robustness of inferences to replacement (RIR) and bootstrapping, and one grounded in Bayesian statistics, to evaluate the results of the original trial by Sippel et al, which randomized 30 patients to standard thyroid removal (control group) and 31 to removal of both thyroid and lymph nodes (treatment group), and there was no difference in recurrence.

Results: Using the RIR, we find that a large percentage of both the treatment and control groups would have to be replaced with patients who experienced the probability of recurrence as the other group (RIR=28, requiring double switches). In >99% of 1,000 bootstrap repetitions of the trial, we no difference in recurrence. Using Bayesian statistics, we find the study results would only change if the true effect of lymph node removal were a 100% reduction in recurrence relative to the standard surgery, and if the trial were repeated 10 times with a larger sample size, 7 out of the 10 trials would show no difference between groups.

Conclusion: The findings of the original randomized trial are highly robust to plausible levels of change.

CDH1 and TP53 Somatic Mutation Trends Across Invasive Breast Carcinoma Subtypes

Jordan Petrick BS, Wei Xu PhD, Lee Wilke MD, Anna C Beck MD

Introduction: Invasive lobular carcinoma (ILC) and invasive ductal carcinoma (IDC) account for roughly 85% of breast cancer cases. ILC possesses a linear growth pattern, is frequently estrogen receptor (ER) positive, and is routinely E-cadherin negative on IHC staining, whereas IDC routinely expresses E-cadherin. E-cadherin plays a crucial role in epithelial cell adhesion and is encoded for by the gene *CDH1,* with somatic mutations in *CDH1* being more common in ILC. We sought to examine the implication of co-occurrence of other somatic mutations with *CDH1*, specifically *TP53* as it is known to be associated with worse outcomes in ER+ breast cancer, and if associations differed by histologic subtype.

Methods: Overall survival and DNA sequencing data from The Metastatic Breast Cancer Project (n = 313), Breast Cancer MSK (n = 1861), Breast Cancer METABRIC (n = 2005), and Breast Invasive Carcinoma TCGA (n = 924) in cBioPortal were extracted and the proportion of samples with and without somatic mutations in *TP53* and *CDH1* was calculated. Non-breast tissue samples were excluded (n=512). Overall survival (OS) at 10 years was assessed using Kaplan-Meier curves for patients with ER+/HER2- Stage I-III disease in the ILC and IDC independently with patients stratified by somatic mutation status.

Results: In a total of 5103 patients, *CDH1* and *TP53* somatic co-mutations occurred more frequently in ILC (8.3%) compared to IDC (1.3%). Isolated *CDH1* somatic mutations were present in 59.1% of ILC samples but 5.2% of IDC. Conversely, isolated *TP53* somatic mutations occurred in 5.4% of ILC but 36.9% of IDC. Association between OS and somatic mutation status in ER+/HER2- Stage I-III differed by histologic subtype, with both isolated *CDH1* and *TP53* mutations associated with worse OS in IDC (Figure 1a), but only isolated *TP53* (not *CDH1*) in ILC (Figure 1b). In ILC, patients with co-occurrence of *CDH1* and *TP53* somatic mutations had similarly poor OS to those with isolated *TP53* mutations (49% vs 48%).

Conclusions: Although co-occurrence of *CDH1/TP53* somatic mutations is more frequent in ILC compared to IDC, OS between those with ER+/HER2- stage I-III ILC and a co-occurrence of *CDH1/TP53* mutations versus *TP53* alone did not differ. Conversely, in ER+/HER2- stage I-III IDC, both isolated *CDH1* and *TP53* mutations were associated with worse OS. This suggests that while *TP53* somatic mutations are an important prognostic marker in both ILC and IDC regardless of *CDH1* mutation status, *CDH1* somatic mutation status has prognostic implications only in IDC.

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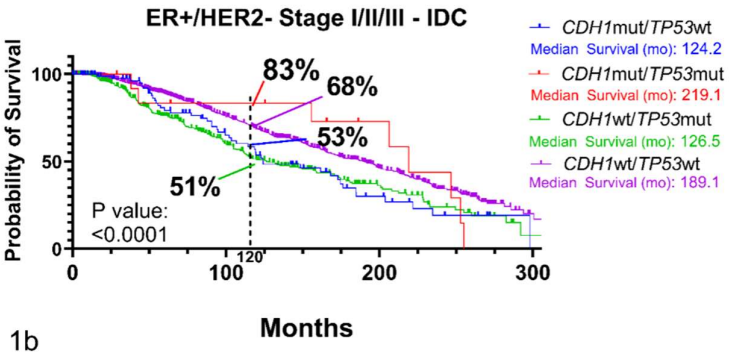

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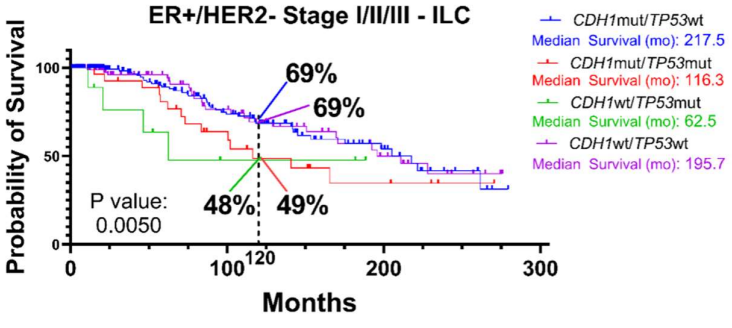

Implementation of Multi-Disciplinary Guidelines in the Management of Lobular Carcinoma In Situ and Atypical Lobular Hyperplasia: Outcomes and Oncologic Safety of Selective Surgical Excision

Vibhusha Kolli BS, Jordan Petrick BS, Madhuchhanda Roy MD, Mai Elezaby MD, Anna Beck MD

Introduction: Lobular carcinoma in situ (LCIS) and atypical lobular hyperplasia (ALH) are proliferative breast lesions and markers of overall elevated breast cancer risk. In 2015, our institution implemented multidisciplinary, evidence-based guidelines to standardize management of high-risk breast lesions with input from radiology, pathology, and breast surgical oncology. This study evaluates outcomes before and after guideline implementation, hypothesizing that patients with low risk of upgrade on surgical excision may be safely monitored with imaging surveillance.

Methods: A single academic institution retrospective review was conducted of consecutive patients ≥18 years with biopsy-proven LCIS or ALH diagnosed between February 2009 and December 2024. Patients with prior or concurrent ipsilateral breast cancer or atypical ductal hyperplasia were excluded. Cases were stratified into pre-guideline (before October 29, 2015) and post-guideline (after October 30, 2015). Data were analyzed using descriptive statistics, chi-square, and Fisher's exact tests in Python Version 3.8.8.

Results: A total of 228 patients met inclusion criteria (LCIS = 103; ALH = 116; concurrent LCIS and ALH = 9). Median age at diagnosis was 53.3 years (IQR 46.6-60.8), and 52% were postmenopausal (n=120). The cohort was predominantly White (n=206, 90%), followed by mixed race (n=13, 6%), Black (n=4, 2%), and Asian (n=4, 2%). On biopsy, 23 patients (10%) had additional high-risk lesions.

Surgical excision rates declined significantly after guideline implementation (60% vs 37%; p=0.016). Upgrade rates to invasive carcinoma or DCIS among surgically excised lesions were similar (10% vs 23%; p=0.228). Rates of upgrade to malignancy on 12-month surveillance imaging were infrequent and did not differ between eras (1% vs 4%; p=0.458), supporting the safety of more selective surgical excision.

Referral to a high-risk clinic increased (46% vs 69%; p=0.008), with higher attendance rates observed among the recommended group post-guideline (37% vs 53%; p=0.464). Recommendation to take endocrine therapy rates decreased (74% vs 54%; p=0.014), and the endocrine therapy utilization among those for whom it was recommended did not differ significantly between eras (44% vs 42%; p=0.997).

Discussion: Implementation of a single institution multi-disciplinary management guidelines for LCIS and ALH with 10-year post-guideline follow up significantly reduced surgical excision rates while maintaining stable malignancy-upgrade and short-term cancer-incidence rates. These findings support the safety of selective, concordance-based surveillance and offers de-escalation strategies of surgical excision for classic LCIS and ALH.

Participation in a Surgical Quality Improvement Initiative Associated with Improved Opioid Stewardship

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Introduction: Surgical prescribing is a leading cause of new opioid prescriptions in the state of Wisconsin. Efforts to curb excess prescribing exist, however, these are often broad and lack the specificity necessary for implementation by surgeons. To address this gap, a surgery specific intervention consisting of targeted education on opioid-sparing acute pain management and audit-feedback of individual prescribing habits was created and implemented through the Surgical Collaborative of Wisconsin (SCW), a statewide quality improvement network consisting of 95 hospitals and over 350 surgeons and quality leaders. We hypothesized that participation in SCW is associated with improved opioid stewardship following common surgeries.

Methods: We conducted an observational study of patients undergoing three common surgeries (laparoscopic cholecystectomy, inguinal hernia repair, appendectomy) using a statewide claims database to identify opioid naïve, adult patients. Filled opioid prescriptions were identified from 3 days prior to 14 days post-procedure. The dose prescribed was converted to morphine milligram equivalents (MME) to allow for comparison across opioid types. Using a difference-in-differences approach, we compared the average change in dose prescribed and guideline-concordant prescribing (≤ 50MME or no fill), between patients treated at SCW and non-SCW hospitals before (7/1/2017-6/30/2018) and after (1/1/2019-12/31/2022) our intervention, allowing for an implementation period of at least six months. Multivariable linear (dose) and logistic (guideline concordant) models included patient age, gender, Elixhauser comorbidities, procedure type, hospital volume, and hospitals as a random effect to account for clustering of patients within hospitals.

Results: We identified 22,394 patients treated at SCW hospitals and 8,645 patients treated at non-SCW hospitals who underwent the three surgical procedures. Characteristics were similar between SCW and non-SCW cohorts, although SCW hospitals generally had higher surgical volume and more Medicaid patients. The mean opioid dose prescribed decreased from 157 MME to 99 MME at SCW hospitals ($p<0.001$) and 160 MME to 112 MME at non-SCW hospitals ($p<0.001$). Guideline-concordant prescribing increased from 34% to 49% at SCW hospitals ($p<0.001$) and 34% to 46% at non-SCW hospitals ($p<0.001$). SCW hospitals had larger declines pre-to post intervention in dose prescribed (b=0.92, 95%CI 0.88-0.96; 11% difference post-intervention) than non-SCW hospitals, but no difference in guideline-concordant prescribing (OR=1.05; 95% CI 0.9-1.22).

Conclusions: A directive intervention for surgeons, including targeted education and audit-feedback of individual prescribing habits, implemented through a statewide surgical quality collaborative was associated with significantly improved post-operative opioid stewardship. Despite significant reductions, prescribing remained at twice the guideline levels, indicating a continued need to engage surgeons in opioid reduction efforts.

Navigating Barriers and Facilitators to Parathyroidectomy: Patient Perspectives on Communication and Care in Primary Hyperparathyroidism

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Introduction: Patients from disadvantaged backgrounds are significantly less likely to receive parathyroidectomy. Although barriers to primary hyperparathyroidism (PHPT) treatment are well described, less is known about what facilitates patients from disadvantaged settings to proceed with surgery. Understanding how patients overcome barriers can inform actionable strategies to reduce disparities.

Methods: We conducted semi-structured interviews with 14 patients from disadvantaged neighborhoods, defined as an Area Deprivation Index score >5 (average 8.4 ± 1.4), who underwent parathyroidectomy for PHPT between 2024 and 2025. A multidisciplinary team applied deductive thematic analysis guided by the Disparities in the Treatment of PHPT model.

Results: Of 14 patients (mean age 62 ± 13), 12 were female, 9 White, 5 Black, and 1 Spanish-speaking. Patients described two factors that facilitated parathyroidectomy: logistical (system navigation) and motivational (decision-making readiness).

Care coordination was the most commonly described logistical barrier, particularly navigating long wait times, difficulty scheduling, and unclear diagnostic responsibility between primary care and surgical teams. Proactive follow-up by surgical clinics facilitated care through direct outreach to streamline scheduling, arrange referrals and labs, and ensure rapid progression from consultation to surgery. Electronic messaging systems were also valued for efficient communication.

Motivational facilitators included: 1) trusting relationships with primary care providers (PCPs), 2) clarity of communication with surgeons, and 3) peer testimonials. First, patients relied heavily on the opinions of their PCP, especially with longstanding relationships, and were more motivated when encouraged by their PCP. Second, clear explanation of PHPT and parathyroidectomy by the surgeon increased confidence and readiness for surgery. Use of plain language, education with visual aids, and unrushed dialogue, built trust and strengthened motivation. Finally, peer testimonials played a critical role in surgical readiness and emotional decision-making. Success stories from other patients provided reassurance and normalized fears, sometimes carrying more weight than clinical explanations.

Table 1. Key logistical and motivational facilitators help patients overcome barriers to proceed with parathyroidectomy.

Theme	Subtheme	Representative Patient Quote
Logistical Facilitators	Ease of Logistical Navigation of Healthcare Systems	"It was extremely organized and quick… I had surgery within two weeks after seeing the surgeon. It was all arranged, and everything went very smoothly." Patient 05
	Electronic Medical Messaging Systems and Virtual Visits	"I primarily do all mine through MyChart online as far as scheduling and messaging… So somebody who is in my position, who is mildly to moderately electronically inclined, could easily navigate through that." Patient 04
Motivational Facilitators	Longstanding Relationship with PCP	"But I always feel better when [my PCP] recommends someone…I've been with [her], 20-something years, so I usually will run things by her." Patient 03
	Clarity & Transparency of Provider Communication	"I trust [the surgeon] for whatever. He gave me all the information, the good, the bad, and different, he gave everything…he made me feel like I was comfortable enough to let him do the procedure." Patient 15
	Peer Testimonials	"My friend... had the same problem. She went through the surgery before me. She told me it's all right. You've got to do it... so then I called and said I would do it." Patient 06

Conclusion: Key facilitators to parathyroidectomy among patients with higher ADI included logistic support, trust in providers, and peer testimonials. To increase access to parathyroidectomy, Endocrine Surgeons can expand navigation-based support, prioritize clear, patient-centered education that emphasizes peer testimonials, and strengthen collaboration with PCPs, whose trusted relationships influence referral acceptance and surgical decision-making.

Evaluating the Evidence for Spring-Mediated Cranioplasty in Non-Sagittal Craniosynostosis: A Systematic Review of Techniques and Outcomes

Jasmine Craig MD/MPH, Nada Botros MA, Catharine Garland MD, Daniel Cho MD- PhD

Background & Purpose: Spring-mediated cranioplasty (SMC) has emerged as a minimally invasive alternative to open techniques for the treatment of sagittal craniosynostosis, offering advantages such as reduced operative time, blood loss, and hospital stay. However, its use in non-sagittal synostoses—such as unicoronal, metopic, and lambdoid variants, and multi-suture synostoses—remains less well characterized. As interest in expanding the application of SMC grows, it is critical to evaluate the existing evidence regarding surgical technique, complication rates, head shape outcomes, and long-term efficacy in these more complex suture involvements. This systematic review aims to synthesize the current literature on the use of spring-mediated cranioplasty in non-sagittal craniosynostosis, identify gaps in evidence, and inform future clinical and research directions.

Method/Description: A systematic review was conducted in accordance with PRISMA guidelines. Comprehensive searches were performed in PubMed and Embase from database inception to [insert cutoff date, e.g., July 2025] to identify studies evaluating spring-mediated cranioplasty (SMC) in non-sagittal craniosynostosis. The search strategy combined the title/abstract keyword “craniosynostosis” with various synonyms for SMC (“spring-mediated cranioplasty,” “spring-assisted cranioplasty,” “spring cranioplasty,” “spring expansion”), and terms related to surgical evaluation (“indications,” “techniques,” “surgical procedure,” “outcomes,” “results,” “complications”), excluding articles focused exclusively on sagittal synostosis. Data were extracted on study design, patient demographics, suture type, surgical technique, follow-up duration, complication rates, and clinical and aesthetic outcomes.

Results: 67 studies were identified and screened by title and abstract. Of these, 18 studies met criteria for full-text review, 14 studies were included in the final analysis. These studies reported on spring-mediated cranioplasty (SMC), including unicoronal, bicoronal, metopic, and lambdoid synostoses. Outcome measures varied across studies but commonly included operative details, complication rates, cranial index changes, aesthetic results, and reoperation rates. Most studies were retrospective case series with small to moderate sample sizes. Due to heterogeneity in outcome reporting and surgical technique, a meta-analysis was not performed.

Conclusion: Spring-mediated cranioplasty appears to be a feasible and safe technique for selected cases of non-sagittal craniosynostosis, with early studies demonstrating acceptable aesthetic outcomes and low complication rates. However, current evidence is limited to small, retrospective series with significant heterogeneity in technique and outcome reporting. Further prospective, comparative studies are needed to define optimal indications, standardize surgical approaches, and assess long-term outcomes in this complex patient population.

Global Practices in Adult Primary Cleft Lip and Palate Repair: A Review of Techniques and Outcomes

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Background: Adults with unoperated cleft lip and palate (CL/P) represent a unique population with specific clinical and surgical challenges. Though rare in developed countries due to medical advancements and awareness, untreated CL/P remains prevalent in developing nations, with potential impacts on their speech, function, economic productivity, and quality of life. This review examines the current literature on the primary repair of untreated CL/P in adults.

Methods: We queried Embase, PubMed, and Web of Science using relevant keywords (e.g., “adult” AND “cleft lip” OR “cleft palate”) for studies published since 2000. From 1,825 initial results, 15 English-language articles covering 857 adult patients from eleven countries were included. A qualitative thematic analysis was conducted to identify recurring themes related to primary repair of untreated CL/P. Quantitative analysis included counts and percentages.

Results: Most patients presented with cleft lip (70.2%), followed by cleft palate (23.5%) and combined CL/P (6.3%). Surgical techniques mirrored pediatric approaches but required modifications due to skeletal maturity, tissue stiffness, and widened clefts. Local anesthesia (LA) was highlighted in seven studies as a safe, cost-effective alternative to general anesthesia, especially for cleft lip repair, enabling outpatient surgery with minimal complications. Despite greater surgical complexity, postoperative outcomes were favorable across studies, with improvements noted in appearance, speech, or social functioning. Common barriers to timely care included poverty, limited access to surgical services, cultural stigma, and lack of awareness.

Conclusion: Primary CL/P repair in adults is safe, effective, and transformative, even in older patients. Tailoring surgical techniques to adult anatomy and leveraging local anesthesia can improve access and outcomes, especially in resource-limited settings. This review underscores the need for context-specific, anatomy-informed care pathways to address this underserved population and calls for broader investment in adult cleft care infrastructure and research.

More than Just Surgery: The Time Burden of Helmet Therapy after Strip Craniectomy in Craniosynostosis Care for Wisconsin Families

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Introduction: Craniosynostosis is the premature fusion of cranial sutures that can cause increased intracranial pressure, neurocognitive delays, and craniofacial differences if untreated. Minimally invasive approaches to treatment, such as strip craniectomy with post-operative helmet therapy, have gained popularity over traditional open cranial vault remodeling because of reduced scar burden, blood loss, operative times, and potentially improved outcomes. However, helmet therapy benefits are thought to be dependent on consistent wear with guidelines recommending 23 hours of daily wear for up to a year. Proper helmet fit requires regular visits for helmet adjustments and monitoring. Limited research exists quantifying the treatment burden of helmet therapy. This study aims to measure the time spent by families undergoing postoperative helmet therapy in order to improve shared decision making and expectations for postoperative care.

Methods: A retrospective chart review was performed on patients who underwent strip craniectomy with helmet therapy at American Family Children's Hospital (AFCH) between 2017 and 2024. The number of office visits was calculated from the first patient encounter for craniosynostosis care to cessation of active helmet therapy. Duration of each appointment was extracted from documentation in orthotics progress notes. The patient zip code was used to calculate the distance and drive time from home to the orthotics office in Middleton, Wisconsin.

Results: A total of 67 patients underwent endoscopic strip craniectomy with postoperative helmet therapy at AFCH. The mean duration of helmet therapy was 8.0 months with an average of 17.2 orthotics appointments and 4.4 craniosynostosis clinic appointments. The mean number of craniosynostosis clinic and orthotic appointments on the same day was 1.39. The mean number of patient-cancelled orthotics appointments and no show orthotics appointments were 2.8 and 0.6, respectively. The mean distance traveled to orthotic appointments was 59.24 miles. The average orthotics appointment lasted 32.9 minutes.

Conclusion: On average, helmet therapy at AFCH required roughly 54 hours for travel and appointments over an 8-month period. This time spent could create a significant financial burden because of travel costs and missed work. This should be factored into surgical decision-making and postoperative planning. While additional research to elicit caregiver perspectives is needed, the scheduling department could work with families to coordinate same day craniosynostosis clinics and orthotics appointments to reduce travel. Efforts to expand satellite orthotic clinics in Wisconsin and educational opportunities for local orthotists could reduce the substantial time requirements of helmet therapy.

Surgical Needs, Outcomes, and Access Inequities in Adults Aging with Cleft Lip and Palate

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Introduction: While most of the surgical care for cleft lip and palate (CLP) typically occurs in childhood, a subset of patients presents for care in adulthood due to residual aesthetic concerns, functional complications, or gaps in early treatment. Despite extensive literature within pediatric populations, CLP care remains largely understudied in adults. This study aims to understand what factors influence surgical needs, outcomes, and access to care among adults with CLP.

Methods: We performed a single-institution, retrospective review for all adult patients (≥18 years) with CLP who received surgical treatment between 2012-2022. Variables collected include demographics, insurance, state Area Deprivation Index (ADI) decile, procedure type, Veau classification, and post-operative complications. Follow-up variables included significant follow-up delay (>2-years), loss to follow-up, and completion of full follow-up care. Descriptive statistics were used to summarize patient demographics, clinical features, and follow-up.

Results: 43 adult patients with CLP (median age 34 ± 15.9 years; 58.1% female) were analyzed. The most frequently performed procedures were septorhinoplasty (29.7%), fistula repair (23.4%), and lip revision (20.3%). While 60.5% of patients received a single cleft-related intervention, 39.5% underwent surgery involving multiple concurrent elements, most often septorhinoplasty with lip revision and/or fistula repair. Patients receiving combined procedures were more likely to have private insurance compared to those undergoing a single procedure type (64.7% vs. 50%). Post-operative complications occurred in 48.8% of all patients, most commonly fistula formation (30.0%), airway concerns (30.0%), and hypertrophic scarring (13.3%). Among patients with available Veau classification, complete cleft phenotypes (Veau III and IV) predominated and patients with Veau IV clefts had the highest complication rate (66.7%). Follow-up adherence emerged as a major challenge. Publicly insured patients had higher loss to follow-up (62.5% vs. 33.3%) and significantly delayed follow-up (56.3% vs. 33.3%), with fewer completing full follow-up care (18.8% vs. 41.7%) than those privately insured. Similar access disparities were observed across ADI deciles, with the lowest completion of follow-up care (21.4%) and highest rates of delayed follow-up (64.3%) seen in patients from moderately deprived areas (ADI 4-7).

Conclusion: Adult patients with CLP often return for surgical care due to persistent functional or aesthetic concerns, facing disparities in follow-up care access and complication rates associated with insurance status, socioeconomic disadvantage, and cleft severity. These patterns highlight the need for structured transitions from pediatric care and further targeted research to better understand long-term needs and optimal care delivery in this population.

What's in the Water? Investigating Environmental Contaminants and Orofacial Cleft Incidence in Wisconsin

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Introduction: Orofacial clefts (OFC) arise from a complex of genetic and environmental factors. However, environmental contributions are poorly understood. Prior work from our group demonstrated OFC rates were recorded at nearly 400% higher in the Fox River Valley (FRV) region of Wisconsin than expected in general population studies. This rate declined by 50% after an Environmental Protection Agency (EPA) Superfund cleanup between 1988 and 2025. This temporal pattern suggests an association between environmental contaminants and the pathogenesis of OFC development in utero. The aim of this study is to identify contaminants associated with OFC development in the FRV for further investigation.

Methods: Contaminant data from Wisconsin Department of Natural Resources (DNR) remediation and EPA Superfund site reports in the FRV were cross-referenced with chemicals identified in a scoping review of environmental exposures associated with OFCs in the published literature. From this, a list of regionally prevalent chemicals with potential links to OFC development was generated. A systematic literature search into ten region-specific candidate chemicals was performed using PubMed, with priority given to human epidemiological data when available.

Results: 112 studies assessing candidate chemicals in relation to OFC development were identified. Of the ten regionally prevalent chemicals identified in remediation efforts, several inorganic metals—Aroclor 1242, Aroclor 1254, 2,3,7,8-tetrachlorodibenzo-p-dioxin, PFOS, 2,3,4,5,3',4'-HCB, pyrene, barium, cadmium, and lead—were highly represented as risk factors for OFCs. Zinc was identified as a potential protective factor. However, there is a paucity of data on remediation-targeted contaminants linked to paper mill pollution, including PCBs, PAHs, and chlorinated pesticides in the context of OFC development.

Conclusion: EPA and DNR data were used to identify ten region-specific environmental contaminants with potential links to OFCs. In the FRV, regionally specific contaminants targeted by remediation efforts were shown to be under-represented in OFC risk factor literature, suggesting promising directions for future research. Better understanding of regionally prevalent contaminants in OFC incidence patterns will provide insights into environmental determinants of OFC prevalence, closing a gap in the literature between established risk factors and the complex realities of environmental contamination. Next steps include collaboration with researchers in the Departments of Developmental Biology and Toxicology to conduct in vitro studies examining the epigenetic effects of these contaminants on OFC development. At the policy level, these results may justify stronger regulations and promote education on teratogenic risks and further targeted cleanup efforts, like the Ensuring Lasting Smiles Act.

A Dual-Species VCA Surgical Framework: High-Throughput Rat Model Adaptable to Swine for Translational Research

Weifeng Zeng MD, Malibongwe Murapa, Natalie Furtado, Aaron Dingle PhD

Introduction: Vascularized composite allograft (VCA) animal models are essential for studying immune rejection. However, current hindlimb models—especially mid-thigh transplants in rats or pigs—are associated with complications such as poor perfusion, large muscle wounds, and high autophagia rates. We aimed to develop a refined lower leg VCA model in both rat and pig that reduces soft tissue volume, maintains consistent perfusion, and facilitates surgical feasibility and translational applicability.

Methods: Five Wisconsin mini-pigs and five Lewis rats cadavers underwent hindlimb dissection and perfusion studies using latex and dye via the femoral artery. A heterotopic hind limb VCA model was designed with tibia/fibula osteotomies performed at the distal quarter, above the ankle joint, avoiding large muscle transections. The gracilis was transected proximal to its insertion to minimize wound volume. A lateral skin paddle, consistently perfused by fibular vessels, was included as a circulation monitor. The pedicle comprised the entire length of the superficial femoral artery and vein. Chronic VCA transplantation was performed in 7 rats and 1 pig using the methods modeled in cadavers with standard microsurgical technique. End-to-end or end-to-side anastomoses were performed between donor femoral vessels and recipient femoral or superficial epigastric vessels.

Results: Perfusion studies confirmed a consistent blood supply to the lower leg musculature via the femoral artery. Compared to traditional thigh models, the modified VCA weighed one-third to one-half less, with reduced muscle bulk and surgical dissection burden. The longer pedicle allowed donor inset away from the groin, minimizing irritation during recipient ambulation and consequent autophagia. The pig skin paddle showed excellent perfusion for 12 days; thrombosis was observed at day 12, likely due to infection or rejection. In rats, 5 of 6 grafts survived 6 weeks with patent anastomoses and 4 complete viable skin paddles, and 1 case of skin paddle necrosis. One animal was euthanized per protocol due to autophagia.

Conclusion: This novel lower leg VCA model significantly reduces tissue volume, minimizes muscle dissection, and ensures reliable perfusion through a long pedicle, enhancing graft inset and reducing autophagia. Its anatomical and technical consistency between rats and pigs supports translational application for stepwise VCA research in immune modulation and reconstructive surgery from small to large animal models. This could, in all, advance the field of VCA study and transform reconstructive plastic surgery, among many other surgical specialties, while simultaneously improving the lives of thousands who go through limb loss and surgical amputations.

Reported Patient Satisfaction and Complication Outcomes Following both Surgical and Non-Surgical Microtia Treatments: A Systematic Review.

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Introduction: Microtia is a congenital deformity characterized by partial or complete loss of the external ear anatomy. The purpose of this study is to explore the differences in postoperative outcomes of microtia treatment, specifically patient satisfaction and incidence of complications, between prosthetic and surgical reconstruction. Surgical reconstruction is the standard, but there may be other methods that prove to be more effective in obtaining the patient's desired results and minimizing complications.

Methods: A database search was conducted on PubMed, Embase, and Web of Science. Article screening consisted of an abstract and full-text review. Inclusion criteria consisted of any mention of microtia, patient satisfaction, or postoperative complications. Articles were excluded if they were surgical technique papers, animal studies, or revisions or salvages. Patient satisfaction is characterized by direct factors such as symmetry and indirect factors such as improved mental health. Demographic variables such as microtia classification, treatment type, mean age, and mean follow-up time were collected. For patient satisfaction, the method of assessment and variables examined were collected from each article. Variables collected for complications included hematoma, infection, necrosis, cartilage framework exposure, and implant exposure, among other less common complications.

Results: Searches yielded a total of 1,345 articles for screening. A total of 209 articles were approved for full-text review based on the established inclusion and exclusion criteria. 127 articles were included in the final data collection. Articles were categorized by treatment type: surgical (94.49%), non-surgical (2.36%), and surgical prosthetics (3.15%). 5.51% of papers included both surgical and non-surgical methods. There were a total of 52506 patients. Patient satisfaction variables most commonly analyzed across included location, size, symmetry, incidence of complications, detail, and color of reconstructed ear or prosthetic. 65.35% of papers included patient satisfaction in their follow-up.

Conclusion: The majority of the articles that were used for data extraction were on surgical reconstructive methods. Prosthetic interventions for microtia were less prevalent. An area of further research is the lack of non-surgical treatment for microtia for patients, despite the advanced technology supporting a satisfactory result. Most of the articles provided patient satisfaction variables included in determining post-treatment satisfaction; however, the majority of articles examining patient satisfaction did not report numerical data and only referred to the patient population as "majority satisfied". The inability to homogenize the data across multiple studies due to the lack of standardized reporting for patient satisfaction is an area for future development.

Co-Occurrence of Osteoporosis in Ankle Fracture Patients

Christian Shepler, Kayla Nennig-Kniaz, Elizabeth Laning, Samuel Mosiman MS, Paul Whiting MD, Jacquelyn Dunahoe MD

Introduction: Ankle fractures are generally not considered pathologic presumably because they have not exhibited a robust association with osteoporosis. However, bone fracture pattern and comminution, consistent with other frailty fractures, have been detected in ankle fractures, indicating the likelihood of these fractures being pathologic in nature. To reduce potential socioeconomic burdens and address a variety of surgical concerns, these fractures need to be screened for. Computed tomography (CT) may present an opportunity to do so using Hounsfield units (HU) to approximate bone mineral density (BMD) based on DEXA scan. The aim of this study was to evaluate if there were differences on CT between the BMD of ankle fracture patients diagnosed with osteoporosis and those with normal BMD.

Methods: This study consisted of n=46 patients aged 50+ who underwent an ankle surgery and a DEXA scan from June 1st, 2024 to December 31st, 2024, at the University of Wisconsin hospital. We selected regions of interest on the body of the talus to determine average HU. Average HU were compared between groups of interest using t-tests for binary variables and ANOVA for variables with more than two categories. Pearson correlation was run to look at the relationship between average HU and continuous variables of interest. Finally, average HU were modeled with sex and bone mineral density as independent variables. All analysis was done in SAS version 8.5 and in all instances a p-value less than 0.05 was considered statistically significant.

Results: Mean HU was significantly lower in the osteoporosis group compared to the normal BMD group (367.0 ± 72.9 vs. 434.2 ± 85.0, $p = 0.0067$). When stratified by age, older patients (≥65 years) demonstrated significantly lower HU compared with younger patients ($p = 0.031$). A significant negative correlation was observed between age and HU ($p = 0.0059$), indicating that HU decreased as age increased. Fixed effects modeling confirmed that BMD status was an independent predictor of HU ($p = 0.0124$), whereas sex had no effect ($p = 0.657$).

Conclusion: Our results support the potential of using CT as a screening tool for pathologic ankle fractures. Using the talar body as our region of interest, the HU did correlate with BMD as found on DEXA scan. Further understanding of the relationship between osteoporosis and ankle fractures as well as better CT screening standardization is critical for improving operative management, postoperative outcomes, and earlier recognition of osteoporosis.

Hip Fracture Outcomes at University Hospital Over Ten Year Span

Elizabeth Laning, Kayla Nennig-Kniaz, Christian Shepler, Samuel Mosiman MS, Paul Whiting MD, Jacquelyn Dunahoe MD

Introduction: Hip fractures are associated with high morbidity and mortality in geriatric populations. One-year mortality rates range from 20–30%, and survivors often experience lasting functional decline. Common risk factors include smoking and obesity, and comorbidities such as cardiovascular disease, diabetes, osteoporosis, and chronic kidney disease. Despite patients undergoing surgical repair of their hip fractures, comorbidities and perioperative complications frequently worsen outcomes. This study aims to retrospectively review how comorbidities, surgical factors, and postoperative complications impact outcomes (mortality, readmission, and functional recovery) for geriatric hip fracture patients.

Methods: We conducted a 10-year retrospective review of patients treated for hip fractures at the University of Wisconsin Health Hospital and Clinics (January 2014–January 2024) who were 65 years and older. Patient data includes demographics, comorbidities such as osteoporosis, diabetes, chronic kidney disease, and ASA score. Surgical factors include transfusions and time interval from presentation to surgery. Postoperative complications such as delirium, infection, cardiac events, thromboembolism, and stroke were also recorded. Outcomes assessed included 30-, 90-, and 365-day mortality, readmission, reoperation, functional status, and pain at final follow-up. Descriptive statistics summarized complication rates in the form of frequency and column percent. For each 2-way association, chi-square tests and the odds ratio (OR) were recorded. A p-value <0.05 was considered statistically significant.

Results: Postoperative complications were significantly associated with 90-day readmission (14.7% vs. 54.8%; OR 6.1, $p < 0.0001$), reoperation (OR 5.24, $p < 0.0001$), and mortality at 30 days (OR 4.0, $p = 0.0074$), 90 days (OR 4.4, $p < 0.0001$), and 365 days (OR 3.3, $p < 0.0001$). Timing of surgery (≤1 vs. ≥2 days) significantly affected 30-day survival (OR 5.5, $p < 0.001$).

Conclusion: Comorbidities and postoperative complications significantly affect outcomes in hip fracture patients. Comprehensive, multifactorial perioperative management is critical to optimize recovery and survival in patients with geriatric hip fractures.

Association of a Venous Thromboembolism Prophylaxis Protocol with Post-operative Bleeding After Bariatric Surgery

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Introduction: Patients undergoing bariatric surgery are at increased risk of post-operative venous thromboembolism (VTE). VTE prophylaxis varies widely and can contribute to post-operative bleeding. Our objective was to evaluate whether implementation of a standardized peri-operative VTE prophylaxis protocol with a higher intra-operative enoxaparin dose but lower total daily dose was associated with a change in the frequency of post-operative bleeding in patients undergoing bariatric surgery. We hypothesized that the frequency of clinically significant bleeding would decrease after protocol implementation.

Methods: Patients who underwent sleeve gastrectomy or Roux-en-Y gastric bypass between 2020 and 2024 were assigned to the pre- or post-protocol group based on date of surgery. Patients in the pre-protocol group received 40 mg of enoxaparin intra-operatively followed by 40 mg twice daily, while the post-protocol group received 60 mg of enoxaparin intra-operatively followed by 60 mg daily. The primary outcome was the frequency of clinically significant post-operative bleeding within 30 days of surgery, defined as administration of a blood transfusion and/or surgical or endoscopic intervention. Two-tailed Fisher's exact tests were used to compare bleeding frequency. Bivariate and multivariable analyses were performed to identify characteristics associated with post-operative bleeding.

Results: 660 pre- and 797 post-protocol patients met inclusion criteria (mean [SD] age 45.4 [10.8] years; 85.5% White; 82.0% female, 60.6% sleeve gastrectomy). 39 (2.7%) patients experienced clinically significant post-operative bleeding. The frequency of bleeding was similar between groups (2.3% pre- vs. 3.0% post-; p=0.419). Pre-operative weight <120 kg was associated with increased odds of bleeding on multivariable analysis (OR 1.77, CI 0.92-3.39; p=0.09).

Conclusion: Implementation of a standardized VTE prophylaxis protocol using a higher intra-operative enoxaparin dose but lower total daily dose was not associated with an increased risk of bleeding. These results suggest protocolized prophylaxis can be applied safely but that patients with lower pre-operative weights may be at higher risk of bleeding and warrant dose adjustment.

Table 1: Incidence of post-operative bleeding through 30 days after surgery

Complication, n (%)	Pre-Protocol n=661	Post-Protocol n=797	P-value
Total Bleeding	15 (2.3)	24 (3.0)	0.418
Transfused	13 (2.0)	23 (2.9)	0.310
Required Intervention	5 (0.8)	13 (1.6)	0.157

Incidence of post-operative bleeding within 30 days after surgery stratified by operative timing in relation to the institution of the VTE prophylaxis protocol. "Clinically Significant Bleed" represents the number of unique patients who experienced a bleed that required blood transfusion and/or endoscopic or surgical intervention.

Analysis of Facial Feminization Surgery Safety and Postoperative Adverse Events

Madeline Chin MD, MSc, Allison Seitz MD, Alisha Khosla BS, Aidan O'Shea BS, Daniel Cho MD, PhD, Catharine Garland MD

Purpose: While existing studies have demonstrated the impact of facial feminization surgery (FFS) on quality-of-life outcome measures, there is still limited data characterizing clinical outcomes and complications of these surgeries. We sought to evaluate postoperative adverse events following facial feminization surgery.

Methods: This retrospective cross-sectional study examined patients undergoing FFS between June 2019 and August 2025. Patients were sub-grouped into those that underwent partial-FFS (upper face or lower face) and full-FFS. Outcomes included postoperative admissions, emergency department visits, and complications. Fischer exact tests were used to assess difference in outcomes between sub-groups.

Results: We identified 116 FFS surgical encounters among 74 patients between June 2019 to August 2025. There were 311 procedures amongst the surgical encounters, with the most common procedures being frontal cranioplasty (n=63), rhinoplasty (n=48), browlift (n=44), and hairline advancement (n=41). One-fifth of the surgical encounters were for full-FFS (combined upper and lower face, n=23), while the majority were for partial-FFS (upper face or lower face) (80.2%, n=93).

Overall, 94% of the surgical encounters had same-day discharges. There were 7 post-operative admissions (6.0%), one of which was a planned admission for orthognathic surgery. Most unplanned admissions were for intractable postoperative nausea and vomiting. There was no significant difference in postoperative admissions between the partial-FFS and full-FFS cohorts.

There were 7 postoperative emergency department (ED) visits (6.0%). When compared to partial-FFS cases, full-FFS cases were associated with an increase in ED visits (3 of 93 [3.2%] versus 4 of 19 [17.4%], p=0028).

There was one major complication of a temporal hematoma (0.9%) that required a return to the OR for evacuation. There were ten cases (8.6%) of infection or concern for infection that required antibiotic prescription within thirty days of surgery. Regarding minor wound-related complications, there were 7 cases (6.0%) of delayed wound healing, 4 cases (3.4%) of excessive post-operative swelling, and 8 cases of scar-related concerns (6.9%). There was no significant difference in complications between the partial-FFS and full-FFS cohorts.

Conclusions: Overall, facial feminization surgeries are safe, with a less than 1% incidence of major complications. There was no increase in complications or postoperative admissions between partial and full-FFS encounters. While there was a significantly greater incidence of ED visits among the full-FFS cohort, most of these presentations did not require any intervention, which may suggest the need for increased counseling on postoperative expectations for these patients.

Safety Profile of Feminizing Facial Gender Affirming Surgery in Single vs. Multiple Stages

Allison Seitz MD, Aidan O'Shea ScB, Emily Zona BS, Alisha Khosla BS, Daniel Cho MD, PhD, Catharine Garland MD

Introduction: Facial gender-affirming surgery (FGAS) often includes procedures on the upper face (frontal contouring, hairline, brows), midface (nose, cheeks), and lower face (mandibular contouring). Procedures may be performed in a single or multiple stages. A single stage surgery requires a longer anesthetic, operative time and potentially increased perioperative risks. We seek to compare the safety profile of procedures performed in a single stage vs. multiple stages.

Methods: We conducted a retrospective study of patients who underwent both upper and lower face feminizing FGAS between 2018-2024. We collected data on procedures performed, number of stages, total operative time (incision to closure), total blood loss, and postoperative outcomes. Group 1 (G1) underwent single-stage FGAS including both the upper and lower face, with or without rhinoplasty. Group 2 (G2) underwent two-stage surgery in which upper face and lower face were done separately, with or without rhinoplasty.

Results: G1 included 22 patients (mean age 32.8 years), and G2 included 36 patients (mean age 31.6 years), with a mean interval of 8.4 months between stages. Simultaneous rhinoplasty was more common in G2 (G1 22.7% vs G2 66.7%). Among patients with a simultaneous rhinoplasty, total operative time was significantly shorter in G1 (G1 464.4±41.7 vs G2 550.0±78.3 min, $p<0.0001$). Without rhinoplasty, total operative time did not significantly differ (G1 401.1±77.9 vs G2 376.8 ± 59.2 min, $p=0.18$).

Total blood loss was comparable between the groups (G1 216.1±151.9 vs G2 199.0±90.7 mL, $p=0.59$), and no patient required a blood transfusion. Rates of postoperative nausea and vomiting were similar (G1 27.3% vs G2 31.9%, $p=0.67$). Patients were equally likely to experience an unplanned hospital admission across their surgical treatment (G1 13.6% vs G2 13.9%, $p=0.97$). One patient in G1 experienced a pulmonary embolism. No infections occurred in G1, while one patient in G2 required operative mandibular abscess washout and six received antibiotics for minor surgical site infections.

Conclusion: Single-stage FGAS appears to offer a similar safety profile to a staged approach, with similar complication rates and operative times. Larger studies are needed to better understand factors influencing outcomes as well as preferences in this surgical population.

Time to Trauma Center for Hemodynamically Unstable Pediatric Trauma Patients: Where Do We Need to be "Pediatric Ready"

Chandler A. Annesi, MD; Pawan Acharya, MSPH, PhD; Jeffrey D. Kerby, MD, PhD; John B. Holcomb, MD; Robert T. Russell, MD, MPH; Zain G. Hashmi, MD

Purpose: Hemodynamically unstable (HDU) pediatric trauma patients require expedient, balanced resuscitation and rapid transportation to definitive care decreasing the time of prehospital phase of care. We hypothesize that the trauma setting affects time to definitive care which remains an important question to evaluate with increasing emphasis on "pediatric readiness" both in the trauma bay and in the prehospital phase of care. The aim of this project is to understand the time HDU children spend in the prehospital phase during transportation based on the trauma setting.

Methods: HDU patients ≤14 years after trauma included in the National Emergency Medical Services Information System (NEMSIS) from 2020-2023. HDU was based on age-defined systolic blood pressure and heart rate parameters. Demographics were compared amongst the age groups. Median (IQR) total prehospital time was assessed as the summation of system response time, Emergency Medical Services (EMS) scene time, and EMS transport time, metrics which were all analyzed by rurality.

Results: There were 2882 HDU children included with greater than 50% over age 10 years. Approximately 50% were males with a median (IQR) age of 11 years (6-13). Median (IQR) total prehospital time was highest for patients who experienced trauma in the rural areas (89min [60-127) and lowest for those in urban areas (72min [52-95], p<0.001, Figure). System response time was double (14min [7-24]) in rural areas compared to urban areas (7min [5-11], p<0.001). Median (IQR) EMS scene time was significantly higher for children in rural areas (18min [11-25]) compared to urban areas (14min [10-21], p<0.001). Children in rural areas had higher median (IQR) EMS transport times (23min [11-36]) compared to those in urban areas (17min [11-27], p<0.001).

Conclusion: This study found that HDU pediatric trauma patients in rural areas have significantly longer prehospital times compared to those in urban settings, mostly due to EMS system response and transport times. With longer transportation time for HDU patients, we must continue to evaluate proximity to definitive care. Potential ways to improve this prehospital time include ensuring efficient prehospital resuscitation strategies, improved pediatric education of EMS, and facilitating rural hospitals to become "pediatric ready."

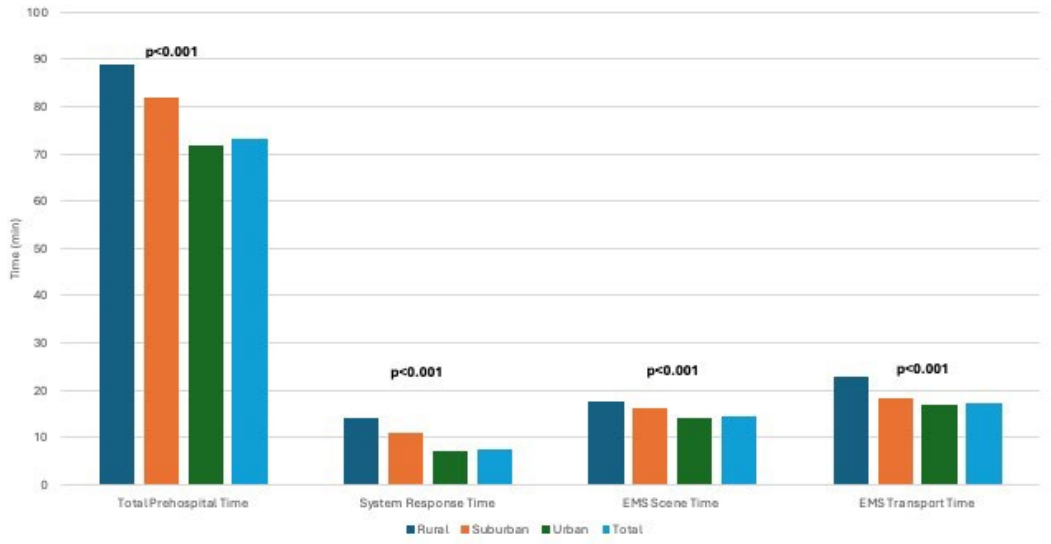


Figure. Median total prehospital, system response, EMS scene, and EMS transport time by rurality for hemodynamically unstable pediatric patients.

Graft Selection and Union Rates in Scaphoid Nonunion Surgery: A Meta-Analysis of 127 Surgical Arms

Ferris Zeitouni MS, Keenan Fine MS, Aniekanabasi Ufot BS, Jace Boswell BS, Emily Zona BS, Armin Edalatpour MD, Jacqueline Israel MD

Introduction: The scaphoid's unique shape and blood supply significantly influence the risk of nonunion. Surgical intervention is often required; however, optimal bone graft selection remains debated. This study aimed to compare union rates based on graft type and fixation without grafting.

Methods: A systematic review and meta-analysis of 135 studies yielded 127 study arms for analysis. Meta-regression assessed differences in union rate (%). A random-effects model with the I^2 statistic was used to account for inter-study variability. Analyses were conducted using R.

Results: Fifty-four arms (*n*=1,256) utilized cancellous bone grafts, 30 (*n*=705) used corticocancellous, 27 (*n*=926) used vascularized grafts, 14 (*n*=265) employed fixation without bone grafts. Across all surgical arms, union rate was 87.8% (95% CI: 86.2–89.3%), with low heterogeneity (I^2=18.1%). Fixation without bone grafting had 90.1% (95% CI: 84.5%–93.8%, I^2=3.5%) union rate. Similarly, union rates were high for cancellous (89.9% [95% CI: 87.5%–91.8%, I^2=12.8%]), corticocancellous (84.9% [95% CI: 80.6%–91.8%, I^2=24.7%]), and vascularized bone grafts (85.2% [95% CI: 82.2%–87.8%, I^2=0.0%]).

Meta-regression revealed lower union rate with corticocancellous (p=0.008) and vascularized (p=0.002) compared to cancellous grafts. Cancellous grafts and fixation without grafting did not significantly differ. Sex, age, and smoking status did not differ across graft type.

Conclusions: Union rates are high across all graft types; however, cancellous bone grafts achieve significantly higher union rates compared to both corticocancellous and vascularized bone grafts. Cancellous bone grafts and fixation without grafting show similar union rates, suggesting that bone grafting may not be necessary to achieve adequate union.

Assessing the risk of non-colorectal aerodigestive malignancy in patients with a positive stool multi-target DNA test and negative colonoscopy

Kaniala Aragon BS, Jennifer Weiss MD, Nataliya Uboha MD, PhD, Kaitlyn Kelly MD

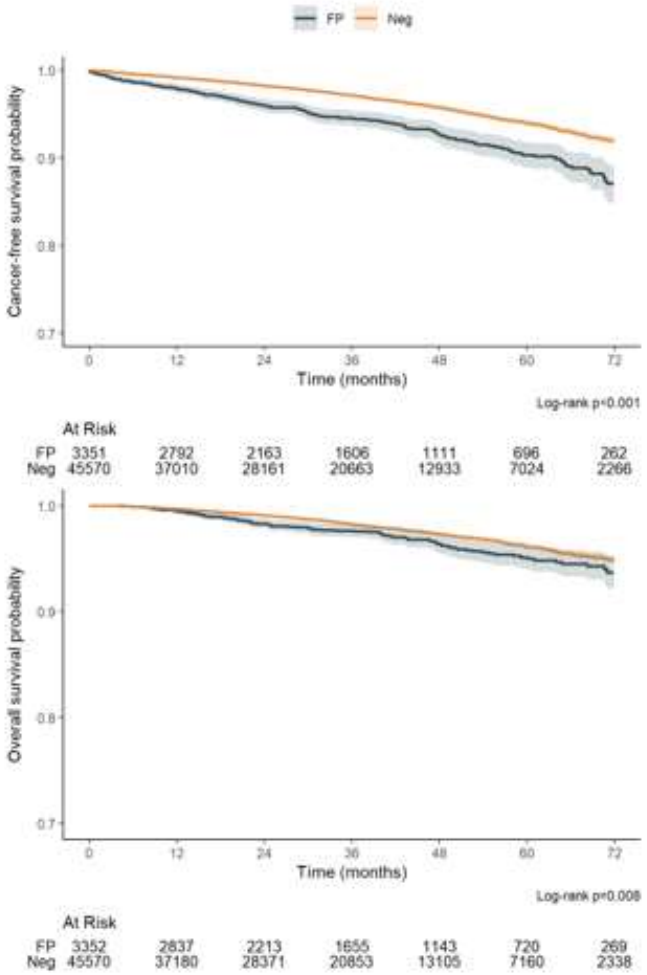
Background: There is a paucity of data on the risks of non-colorectal cancers for patients with a positive multi-target stool DNA test and negative subsequent colonoscopy. The aim of our study was to compare the incidence of non-colorectal aerodigestive malignancy (NCAM) in patients who had a positive multi-target stool DNA test and subsequent negative colonoscopy versus negative stool test result.

Methods: All patients who underwent colorectal cancer screening by stool mtDNA at our institution from 2014 to 2024 were identified. Patients with a positive result and no colonoscopy and those who had a true positive finding (colorectal cancer or advanced precancerous polyp) were excluded. Patients who had a positive stool mtDNA and no polyps or only non-advanced adenomas found on colonoscopy were termed "false positives." We compared baseline demographics, incidence of NCAM, NCAM-free survival, and overall survival (OS) in those who had a negative result versus those who had a false positive result.

Results: We identified 48,921 patients who had stool mtDNA testing, 3,352 (6.9%) of whom had a false positive result and 45,567 (93.1%) of whom had a negative result. The median follow-up was slightly longer for the false positive group at 36.0 months (interquartile range (IQR) 18.0-58.0 months) versus 33.0 months (IQR 16.0-51.0 months) for the negative group. Patients with a false positive result had a statistically-significantly higher incidence of NCAM than those with a negative result (4.3% vs 1.5%, p<0.001), including head and neck cancer (0.6% vs 0.4%, p=0.018), lung and bronchus cancer (1.5% vs 0.5%, p<0.001), and non-colorectal gastrointestinal malignancies (2.2% vs 0.6%, p<0.001). Patients with a false positive result had a shorter NCAM-free survival than those with a negative result. The 3-year NCAM-free survival was 87.0% (95% Confidence Interval (CI) 84.9-89.2) for false positive patients versus 92.0% (95%CI 91.4-92.5); p<0.001. OS was also shorter in the false positive group with 3-year estimate of 93.7% (95%CI 92.2-95.2) versus 94.9% (95% CI 94.5-95.3); p=0.008 (Figure 1). When adjusting for variables that were different between the two groups, false positive stool mtDNA was an independent predictor of NCAM-free survival (HR 1.49, 95% CI 1.23-1.72) but not OS (HR 1.09; 95% CI 0.89 – 13.4) (p=0.400).

Conclusions: This data suggests that a positive finding on a stool mtDNA test with negative colonoscopy is clinically relevant, with increased non-colorectal aerodigestive malignancies found and associated decreased survival, suggesting the need for further diagnostic workup, including possible upper endoscopy and cross-sectional imaging in patients.

Figure 1. NCAM-free and OS for patients with false positive or negative stool mtDNA result.



Development of a Statewide Breast Surgery Virtual Case Conference through the Surgical Collaborative of Wisconsin

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Introduction: Modern breast cancer management requires increasingly complex, multidisciplinary coordination. While surgeons have historically led breast cancer care, the rapid evolution of clinical trials and surgical innovations has deeply integrated surgical decision-making with systemic therapy and radiation treatment algorithms. To foster collaboration, knowledge sharing, and best practice alignment among breast surgeons across the state, we sought to develop and implement a statewide virtual breast surgery case conference through the Surgical Collaborative of Wisconsin (SCW).

Methods: Using the SCW roster of surgeons performing breast operations, we conducted personalized outreach via email invitations following an SCW-wide announcement. Interested surgeons were invited to participate in monthly virtual case conferences, each accredited for Continuing Medical Education (CME) through the American College of Surgeons. Participants were encouraged to submit de-identified breast surgery cases for discussion, emphasizing complex decision-making, evolving techniques, and multidisciplinary management. Conferences also included brief reviews of recent, high-impact breast cancer clinical trials.

Results: The inaugural statewide case conference was held on October 7, 2024, with 14 surgeons representing 9 hospitals across Wisconsin. With continued outreach and word-of-mouth promotion, attendance increased steadily, reaching 26 surgeons from 13 health systems by the sixth session. On average, four de-identified cases were presented per meeting. Participant feedback, collected through post-session surveys (response rate 75%), indicated that 95% of respondents found the discussions “highly relevant” to their clinical practice, and 89% reported that the conference influenced their approach to multidisciplinary breast cancer management. Participants cited the virtual format, CME availability, and peer engagement as key strengths of the program.

Conclusion: Leveraging the SCW platform, we successfully developed and implemented a statewide breast surgery virtual case conference that fostered collaboration and shared learning among surgeons from diverse practice settings. This form of surgeon engagement is a crucial component of continuous quality improvement initiatives to ensure optimal and equitable breast surgery care for all women in Wisconsin regardless of where they receive care. The virtual conferences also build camaraderie and connections amongst surgeons across the state. This initiative represents a sustainable model for ongoing surgeon engagement and continuous quality improvement in breast cancer care. By enhancing communication, disseminating evidence-based practices, and strengthening collegial networks, these conferences promote equitable, high-quality breast surgery care for all patients across Wisconsin.

The Evolution of Breast Free Flap Monitoring in the ERAS Era: A National Cohort Analysis

Ferris Zeitouni MS, Armin Edalatpour MD, Jasmine Craig MD, MPH, Nada Botros MA, Myiah Quach BS, Brett Michelotti MD

Purpose: While recommendations for the optimal duration of free flap monitoring in breast reconstruction have evolved over the last decade, current practice patterns demonstrate significant heterogeneity. This study aimed to determine if early postoperative complications have been impacted by the adoption of enhanced recovery after surgery (ERAS) protocols.

Methods: Women who had free flap breast reconstruction between 2016-2023 were analyzed using the American College of Surgeons National Surgical Quality Improvement Program to determine rates and timing of free flap-related reoperation and monitoring duration. Reoperation was defined as any 30-day reoperation related to the index procedure. Pre- (2016-2017) and post-ERAS (2019-2023) cohorts were compared. Chi-square and Mann-Whitney U tests were used to compare categorical and continuous variables. Multivariable logistic regression was used to determine independent predictors of flap takeback. All analyses were performed using SPSS.

Results: A total of 15,343 patients underwent free flap breast reconstruction between 2016 and 2023. Multivariable analysis revealed that a body mass index of ≥40 kg/m², smoking status, and hypertension were independent predictors of reoperation (P<0.05). The overall reoperation rate was 10.7% (n=1,635/15,343), with significantly higher rates in the pre-ERAS group compared to the post-ERAS group (11.8% [n=318/2,690] vs. 10.4% [n=1,146/11,025]; P=0.032). Overall, reoperation rates were highest on postoperative day (POD) 1 (3.2%), decreased significantly by POD 2 (1%; P<0.001), and remained low after POD 3 (<0.5% daily). Post-ERAS patients were significantly more likely to be discharged by the end of POD 1 (5.8% [n=646/11,082] vs. 3.6% [n=96/2,690]; P<0.001), and by POD 3 (61.5% [n=6,811/11,082] vs. 37.1% [n=999/2690]; P<0.001) compared to pre-ERAS patients indicating a shift toward earlier discharge. There was no significant difference in unplanned readmission rates for patients discharged on POD 1 compared to patients discharged on POD 5. The number of patients needing to be monitored to detect one flap requiring reoperation increased substantially with each postoperative day from POD 1 (NNM=31) to POD 6 (NNM=1,180).

Conclusion: The widespread adoption of ERAS protocols has shortened the average duration of flap monitoring in free flap breast reconstruction patients without increasing 30-day reoperation rates. Our data demonstrates a shift to earlier discharge protocols nationwide and supports the safety of early discharge.

Impact of Medicaid Expansion on Post-Mastectomy Breast Reconstruction

Faith Dickerson MD, Heather Neuman MD, MS, Jessica Schumacher PhD

Introduction: Disparities in post-mastectomy reconstruction exist by income and insurance type. The Affordable Care Act introduced Medicaid expansion as a key strategy to improve healthcare access for low-income Americans. The objective was to examine the impact of Medicaid expansion on receipt of post-mastectomy reconstruction.

Methods: We identified women aged <65 with stage 0-3 breast cancer treated with mastectomy (2009-2022), using the National Cancer Database. Exclusion criteria included radiation, early/late Medicaid expansion states (anytime other than January 1, 2014), and Medicare/government or unknown insurance type. Multivariable logistic regression models assessed whether the odds of reconstruction differed in Medicaid expansion vs non-expansion states, before and after January 1, 2014 (difference in difference analysis). A three-way interaction assessed how differences in odds of reconstruction between expansion and non-expansion states differed over time based on insurance type. Adjusted average predicted probabilities of reconstruction were generated.

Results: Relative to the pre-expansion period, women in expansion states after 2014 had 16% lower odds of reconstruction compared to those in non-expansion states, (OR 0.84; 95% CI 0.81-0.87). There was not a statistically significant three-way interaction between Medicaid expansion, time, and insurance type. Data demonstrated a decline in the predicted probability of reconstruction among privately insured patients pre- and post-2014, in both expansion and non-expansion states (Table). Modest increases in reconstruction for Medicaid and uninsured patients were observed before and after 2014, with greater increases in non-expansion states.

Conclusion: We did not observe an increase in post-mastectomy reconstruction rates that is attributable to Medicaid expansion in this difference-in-difference analysis. This suggests that access to insurance coverage alone is not enough to support disadvantaged patients undergoing reconstruction. Given that reconstruction requires larger and often multiple procedures, the decision is likely influenced by other factors (e.g. work leave, caregiving needs, cost of travel) that disproportionately impact disadvantaged patients and may impact their motivation for reconstruction. While reconstruction may not be desired by every patient, all patients deserve the opportunity to make that choice. For those who desire reconstruction, support must include social resources, financial protections, and care systems that make post-mastectomy reconstruction truly feasible.

Adjusted average predicted probabilities of reconstruction rates by state Medicaid expansion status, pre and post 2014*

	Non-Expansion States		Expansion States	
	2009-2013 n=52,199	**2014-2022 n=102,149**	**2009-2013 n=40,172**	**2014-2022 n=76,197**
Overall n=270,717	51.8% (51.4-52.3)	52.0% (51.6-52.4)	52.2% (51.6-52.7)	48.2% (47.7-48.6)
Insurance Type				
Private n=239,009	55.%0 (54.5-55.5)	53.6% (53.3-54.0)	54.6% (54.0-55.2)	49.8% (49.3-50.2)
Medicaid n=24,327	29.6% (28.1-31.1)	37.9% (36.7-39.2)	35.4% (33.7-37.0)	38.8% (37.7-39.7)
Uninsured n=7,381	25.4% (23.5-27.4)	34.6% (32.8-36.4)	28.3% (25.1-31.6)	32.9% (29.5-36.3)

* Adjusted for age, region, census-based median income, Charlson comorbidity index.

Role of Surgeon Discussions in Post-Mastectomy Reconstruction Racial Disparities

Faith Dickerson MD, Megan Saucke MA, Catherine Breuer MS, Jessica Schumacher PhD, Heather Neuman MD, MS

Introduction: Surgeons often serve as the "gatekeepers" of breast surgery, including decisions for post-mastectomy reconstruction. The options surgeons present and how recommendations are communicated can influence which treatments patients consider. This dynamic suggests that surgeon framing could play a key role in perpetuating or mitigating reconstruction disparities. We analyzed surgeon-patient consultations to describe surgeons' discussion of reconstruction overall and by patient race.

Methods: This study was a secondary analysis of Alliance clinical trial A231701CD. We included women aged ≤60 years who underwent breast cancer surgery without neoadjuvant therapy that had an available surgical consultation transcript (n=182). Transcripts were reviewed by 2 or more researchers to categorize discussions: preference for breast conserving surgery (BCS) without consideration of mastectomy or reconstruction, discussion of mastectomy but not reconstruction, or discussion of mastectomy with reconstruction. For consults with a reconstruction discussion, we coded who initiated the topic (surgeon vs patient/support person) and how reconstruction was presented (neutrally vs suggestion for or against). We generated summary statistics and used multivariable logistic regression models to identify factors associated with reconstruction discussions, with the first model including patient age alone and then adding race, insurance, and income. We used chi square tests to assess differences in how reconstruction was presented by patient race.

Results: Most patients were White (63%), with 23% Black and 10% Asian. Patient median age was 51 (range 28-60). A minority of consultations did not discuss reconstruction (preference for BCS [29%, n=53] or discussed mastectomy but not reconstruction [4%, n=8]). Older patient age was associated with lower odds of discussing reconstruction. Black patient race was significantly associated with a lower odds of discussing reconstruction when controlling for age (Table), but not after inclusion of private insurance or income. Surgeons initiated the discussion in most consults (86%). Reconstruction was presented neutrally in 67% of consults, with surgeons making suggestions for or against reconstruction in 27% and 6% of consults, respectively. There was no statistically significant difference in how reconstruction was presented by patient race (p=0.30).

Conclusion: Our findings suggest that Black patient race is associated with a lower odds of discussing reconstruction. The strength of this association was tempered by insurance type and income, although the pattern of findings remained consistent. This suggests that reconstruction disparities may partially stem from a lack of conversation during the initial surgical consultation. Additional work should focus on developing interventions to increase consistency in discussions about surgical options.

Multivariable Logistic Regression Models Assessing Patient Factors Associated with Discussion of Post-Mastectomy Reconstruction *(*Statistically significant at p<0.05)*

	Model 1	Model 2	Model 3	Model 4
	Odds Ratio (95% Confidence Interval)	Odds Ratio (95% Confidence Interval)	Odds Ratio (95% Confidence Interval)	Odds Ratio (95% Confidence Interval)
Age	0.93 (0.89-0.97)*	0.92 (0.88-0.97)*	0.92 (0.87-0.97)*	0.92 (0.87-0.97)*
Race				
White		Ref	Ref	Ref
Black		0.39 (0.18-0.84)*	0.47 (0.21-1.1)	0.51 (0.22-1.2)
Other		0.51 (0.20-1.3)	0.50 (0.19-1.3)	0.51 (0.19-1.3)
Insurance				
Other/Self-Pay			Ref	Ref
Private			1.8 (0.78-4.1)	1.8 (0.65-5.3)
Household Income				
<$25,000				Ref
$25-49,999				0.68 (0.17-2.8)
$50-99,999				0.69 (0.17-2.8)
>$100,000				1.2 (0.29-5.1)
Missing				0.58 (0.14-2.5)

Donor Type and Procurement Distance in Simultaneous Pancreas–Kidney Transplantation: Comparable Survival but Greater Early Complications in Imported DCD Grafts

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Introduction: Simultaneous pancreas–kidney transplantation (SPKT) is the definitive therapy for patients with diabetes and end-stage renal disease. With broader geographic sharing, pancreas grafts are increasingly transported over long distances, raising concerns for prolonged cold ischemia and ischemia-reperfusion injury. We hypothesized that greater procurement distance, particularly among DCD donors, may increase perioperative complications without affecting long-term outcomes.

Methods: We retrospectively reviewed 769 primary SPKTs performed between 2000 and 2022. Recipients were stratified by donor type (DBD vs DCD) and procurement distance (≤250 vs >250 nautical miles [NM]), forming four subgroups. Outcomes included patient survival, death-censored graft survival (DC-GS), rejection, and major surgical complications. Kaplan–Meier survival analyses compared outcomes across groups.

Results: Of 769 SPKTs, 82% were from DBD and 18% from DCD donors; 90% were procured within 250 NM. At 90 days, death-censored pancreas graft survival was 94% for DBD and 91% for DCD grafts (p = 0.98). Five-year pancreas DC-GS remained comparable across donor and distance groups (DBD ≤250 NM 84%, DBD >250 NM 88%, DCD ≤250 NM 83%, DCD >250 NM 74%; p = 0.52). Five-year kidney DC-GS (91%, 93%, 89%, 88%; p = 0.96) and patient survival (92%, 89%, 85%, 73%; p = 0.20) were likewise similar. Rejection and thrombosis free survival did not differ by group. However, DCD grafts from >250 NM had significantly higher rates of peripancreatic fluid collections in the 90 days early post-operative period (DBD ≤250 NM 15%, DBD >250 NM 18%, DCD ≤250 NM 28%, DCD >250 NM 41%; p = 0.0002).

Conclusion: Long-term graft and patient survival after SPKT are unaffected by procurement distance. Donor type, rather than transport distance, is the principal determinant of early technical complications, with imported DCD grafts showing the highest risk. These findings underscore the need for optimized DCD recovery and preservation practices to mitigate additive ischemic injury.

Graph 1: Number of transplanted simultaneous Pancreas-Kidney by graft type, procurement distance and type and distance. SPK, Simultaneous Pancreas-Kidney Transplant; NM, Nautical Mile; Donation after brain death (DBD); donation after circulatory death (DCD).

Donor Type		Procurement Distance		Donor Type and Procurement Distance			
DBD	DCD	<250NM	>250NM	DBD <250NM	DBD >250NM	DCD <250NM	DCD >250NM
631 (82%)	138 (18%)	691 (90%)	78 (10%)	573 (74%)	58 (8%)	118 (15%)	20 (3%)

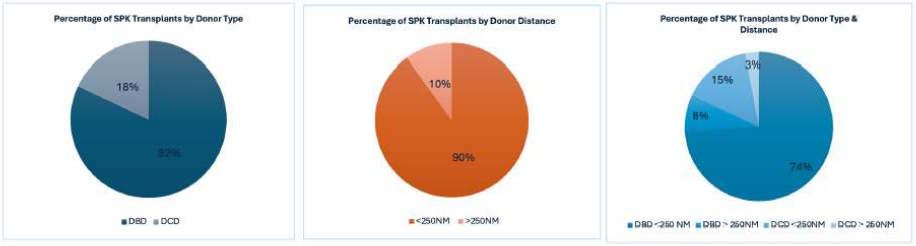


Table 1: Major Transplant related Endpoints of Simultaneous Pancreas-Kidney Transplants (SPK) according to graft type, procurement distance and type and distance. SPK, Simultaneous Pancreas-Kidney Transplant; NM, Nautical Mile; Donation after brain death (DBD); donation after circulatory death (DCD).

				Procurement Distance			Donor Type and Procurement Distance				
	DBD	DCD	p-value	<250NM	>250NM	p-value	DBD <250 NM	DBD > 250NM	DCD <250NM	DCD > 250NM	p-value
Death Censored Pancreas Graft Survival at 90 days (%)	94	91	0.98	93	94	0.96	94	97	92	85	0.52
Death Censored Pancreas Graft Survival at 5 years (%)	81	84	0.98	84	85	0.96	84	88	83	74	0.52
Death Censored Kidney Graft Survival at 5 years (%)	91	89	0.82	90	92	0.80	91	93	89	88	0.96
Patient Survival at 5 years (%)	92	84	0.20	91	85	0.75	92	89	85	73	0.20
Rejection Free Survival at 5 Years (%)	67	69	0.53	67	62	0.80	67	61	70	67	0.92
Fluid Collection rate at 90 days (%)	13	25	< 0.0001	15	24	0.08	13	18	33	41	0.0002
Bleeding Free rate at 90 days (%)	1	1	0.72	1	0	0.31	1	0	2	0	0.75
Pancreas Graft Thrombosis rate at 90 days (%)	6	7	0.38	7	7	0.92	6	9	9	6	0.61

Long-Term Postoperative Recovery Trajectories Among Older Individuals Undergoing Major Operation

Mujtaba Khalil MD, Abdullah Altaf MD, Selamawit Woldesenbet PhD, Shahzaib Zindani MD, Zayed Rashid MD, Timothy Pawlik MD, MPH, PhD, FACS

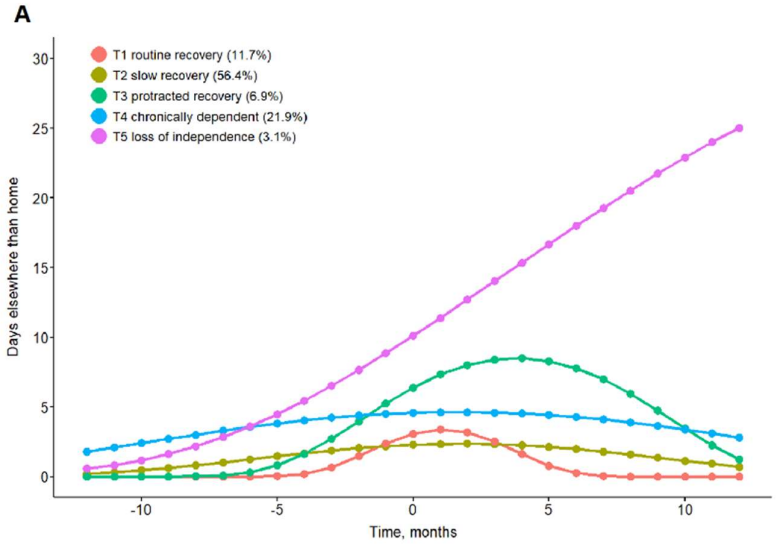
Introduction: Older individuals undergoing major surgery may experience a prolonged recovery period or even permanent institutionalization. We sought to develop a postoperative recovery trajectory model and identify patients at risk of loss of independence following major surgery.

Methods: Patients undergoing major surgery were identified using Medicare Standard Analytic Files. Latent class group-based trajectory modeling was used to identify clusters of patients with distinct postoperative recovery patterns. Multivariable regression was performed to predict cluster membership.

Results: Five distinct postoperative recovery trajectories were identified: routine (n=83,603, 11.7%), slow (n=403,715, 56.4%), protracted (n=49,704, 6.9%), chronically dependent (n=156,881, 21.9%), and loss of independence (n=21,817, 3.1%). On multivariable analysis, preoperative factors associated with loss of independence included older age (RRR, 1.03; 95% CI, 1.03–1.03), high CCI (RRR, 3.30; 95% CI, 3.17–3.40), minority status (RRR, 1.30; 95% CI, 1.22–1.39), urgent index surgery (RRR, 1.31; 95% CI, 1.26–1.36), and frailty (RRR, 3.90; 95% CI, 3.66–4.16). Postoperative factors associated with loss of independence included major complications (RRR, 1.78; 95% CI, 1.72–1.84), ventilator support during the index admission (RRR, 1.90; 95% CI, 1.85–1.96), and ICU stay (RRR, 1.09; 95% CI, 1.05–1.13). The loss of independence risk model was made available online for broad clinical use (https://khalil-pawlik-postoperativeindependence-calculator.streamlit.app/).

Conclusion: Patients undergoing major surgery demonstrated distinct patterns of postoperative recovery, with some experiencing a loss of independence. A risk prediction model was developed to help clinicians provide more informed guidance to patients and their families regarding future care needs.

A



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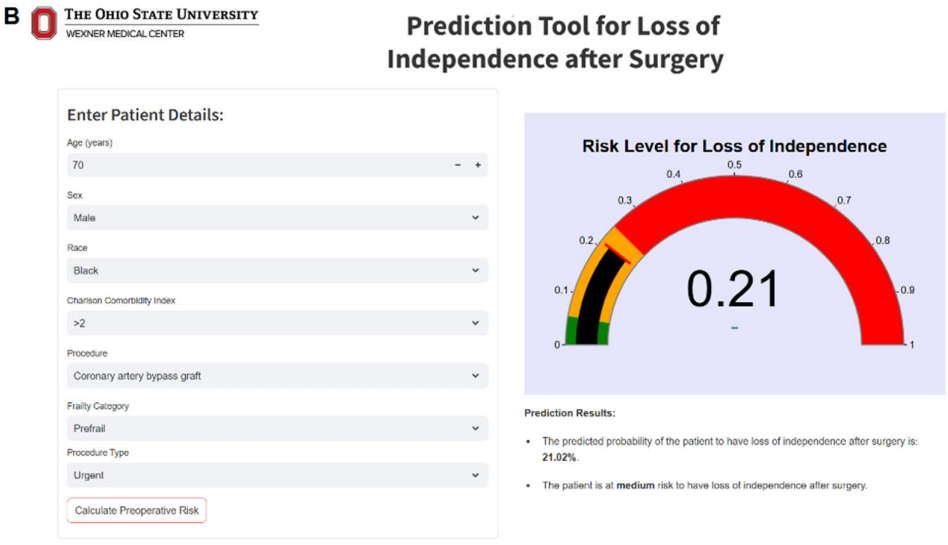


The Weekend Effect: Do Friday Surgeries Carry Greater Risk of Complications?

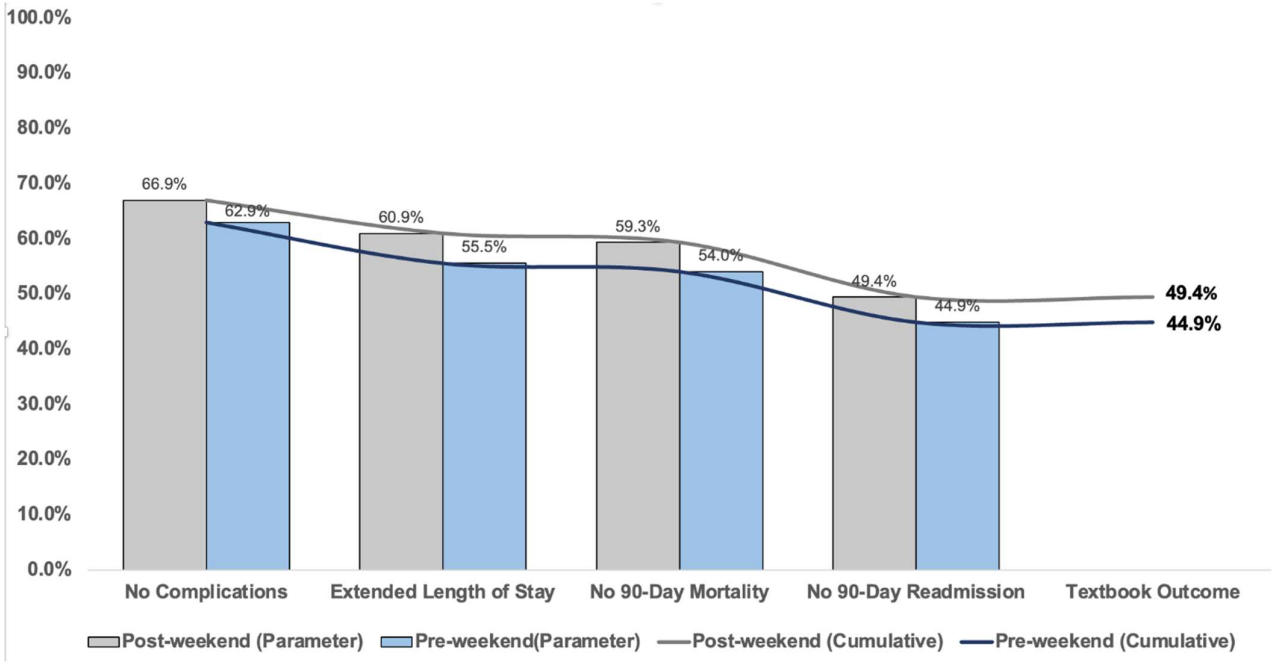
Mujtaba Khalil MD, Jasmine King MD, Timothy Pawlik MD, FACS, MPH, MTS, PhD

Introduction: Healthcare systems routinely adjust their operational workflows to accommodate changing demands throughout the week. There is growing concern that the quality of inpatient care may differ between weekends and weekdays. Therefore, we investigated postoperative outcomes among patients undergoing major surgery immediately before versus after the weekend.

Methods: Patients who underwent coronary artery bypass grafting, abdominal aortic aneurysm repair, pneumonectomy, pancreatectomy, and colectomy between 2016 and 2021 were identified from the Medicare Standard Analytic Files. Multivariable models were used to compare textbook outcome (TO) among patients who underwent surgery one day before versus one day after the weekend. TO is a composite measure of optimal surgical outcomes.

Results: Among 232,504 Medicare beneficiaries, 101,568 (43.7%) underwent surgery on Friday. Patients who underwent surgery on a Friday were less likely to achieve a TO (pre-weekend: 44.9% vs. post-weekend: 49.4%; $p < 0.001$). Specifically, pre-weekend surgery was associated with higher rates of ICU utilization (pre-weekend: 55.2% vs. post-weekend: 53.1%), complications (pre-weekend: 37.1% vs. post-weekend: 33.1%), readmission (pre-weekend: 23.0% vs. post-weekend: 22.2%), and 90-day mortality (pre-weekend: 9.6% vs. post-weekend: 8.8%) (all $p < 0.001$). On multivariable analysis, pre-weekend surgery was associated with 7% lower odds of TO (OR, 0.93; 95% CI, 0.92–0.95).

Conclusion: Operational changes in hospital settings over the weekend may introduce vulnerabilities in the delivery of surgical care. Patients undergoing surgery near the end of the workweek experience poor surgical outcomes with a lower likelihood of achieving textbook outcomes across diverse procedures and hospital types.



Hypothermic Machine Perfusion Parameters are Associated with Donor Characteristics and Post-Transplant Outcomes in Deceased Donor Kidney Transplant

Daniel Rice, Jennifer Philip MD, Angela Gifford MA, Taylor Bradley, Glen Leverson PhD, Nikole Neidlinger MD, Jaqueline Garonzik-Wange MD, PhD

Introduction: Hypothermic machine perfusion (HMP) is widely used in deceased donor kidney transplants (DDKT). Currently, there is only limited understanding of how perfusion parameters of flow and resistance relate to donor characteristics and risk factors nor whether they predict post-transplant outcomes. The current study aims to determine which donor factors impact HMP performance and how perfusion parameters relate to DDKT recipient outcomes.

Methods: Retrospective analyses of HMP data and allograft outcomes for all DDKTs procured in the UW-OTD donor service area and transplanted at the UW Transplant Center over a 15-year period (2008-2023) were performed. Donor factors evaluated included age, gender, history of hypertension (HTN), diabetes or smoking, Kidney donor profile index (KDPI), and donation type (brain death or donation after circulatory death). Recipient factors evaluated included age, cold ischemia time, gender, race, body mass index, cause of renal failure, history of HTN, diabetes or prior transplant, pretransplant dialysis, and estimated post-transplant survival. We evaluated correlation between HMP flow and resistance with DDKT outcomes of delayed graft function (DGF), one-year estimated glomerular filtration rate (EGFR) and death censored graft survival using both univariate and multivariate analysis.

Results: 1423 DDKT were included in this study. The DGF rate was 25.72%, the average 1 year EGFR was 67.9 +/- 26.6 (mL/min/1.73 m2). Flow during HMP showed significant inverse correlation with donor age, KPDI, and terminal creatine whereas HMP resistance was directly correlated with these. Donor history of HTN, Diabetes or Smoking were all predictors of significantly lower HMP flow and higher HMP resistance. Flow was significantly lower and resistance significantly higher in DGF group and that in the immediate function group ($p<0.001$). Long term graft outcomes of 1 year EGFR and graft survival were also associated with HMP parameters. Importantly, Flow and Resistance were independent predictors of DGF and 1 year EGFR in multivariate analysis.

Conclusions: HMP flow and resistance were demonstrated to be independent predictors of both short and long term DDKT outcomes. Further, key donor demographics and comorbidities were associated with worsened perfusion parameters, highlighting the importance of allograft quality. These findings provide important insights into HMP parameters as a predictive measure of renal allograft outcomes.

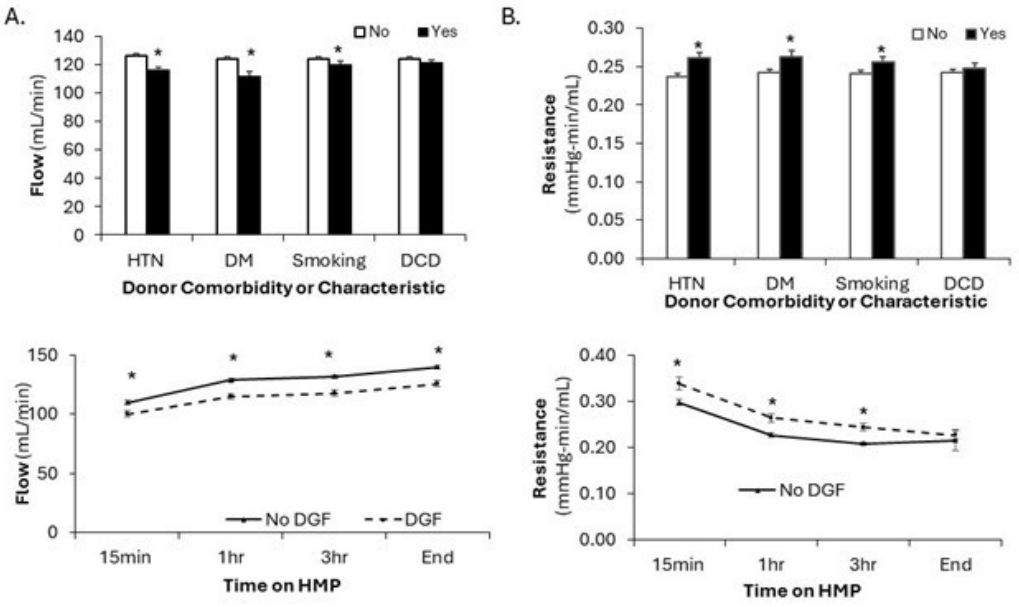


Figure 1: *Flow and Resistance are associated with both donor comorbidities and development of DGF in recipients.* Data presented as mean +/- standard error of the mean. n=1057 in No DGF and N=366 in DGF, *p<0.05

Impact of OPO provided Abdominal NRP on Abdominal Organ Allocation Outcomes

Daniel Rice, David Aufhauser MD, Meaghan O'Donnell MSN, APNP, AGCNS-BC, Nikole Neidlinger MD, Jennifer Philip MD

Introduction: Abdominal Normothermic Regional Perfusion (A-NRP) is a preservation technique which improves recipient organ outcomes in death after circulatory death (DCD) donation and increases organ utilization. Unlike competing technologies, A-NRP treats all abdominal organs. As a result, many organ procurement organizations (OPOs) have started providing A-NRP. We examined the impact of an OPO initiated A-NRP program on abdominal organization utilization.

Methods: We analyzed organ placement for all DCD donors over an 18-month period in a single donor service area with the OPO provided A-NRP. Organ utilization and allocation sequence at acceptance were compared for abdominal organs. DCD donors where the heart was transplanted were excluded from both groups.

Results: 34 (27%) of DCD donors had OPO provided A-NRP and 77 (60%) of donors underwent super rapid recovery (SRR)) with or without *ex situ* machine perfusion. Abdominal organ outcomes are detailed in Table 1. There was a higher liver utilization rate in the A-NRP group compared to SRR (62% vs 45%, P=0.11) with lower mean sequence of liver acceptance (37.7 vs 101.4, P=0.09). The was marked reduction in liver placement at sequence >200 in the A-NRP cohort (8.8% vs 14%, p=0.4). Kidney utilization rate and mean sequence of kidney acceptance was not impacted by procurement type. However, there was a trend towards lower percentage of kidneys placed at sequence >200 (20.6% vs 29.9%, p=0.34).

Conclusions: This study examined the impact of OPO provided A-NRP on both abdominal organ allocation outcomes by examining both organ utilization and sequence at acceptance. In contrast to the clear impact on liver utilization, kidney outcomes were not impacted despite known improved recipient outcomes. This highlights key areas of future studies to evaluate this differential outcome between abdominal organs.

Table 1

	A-NRP (n=34)	SRR (n=77)
Organs Transplanted per Donor	1.73	1.91
Donors with no organs transplanted, n (%)	6 (17.6%)	13 (16.9%)
Liver Outcomes		
Transplant Rate (%)	61.8%	45.5%
Mean acceptance sequence	37.7	101.4
Acceptance sequence >200, n (%)	3 (8.8%)	11 (14%)
Kidney Outcomes		
Utilization Rate (%)	63.3%	72.7%
Mean acceptance sequence	1453.9	773.9
Acceptance sequence >200	7 (20.6%)	23 (29.9%)

Novel Perfusion Parameters Predict Early and Late Renal Allograft Outcomes

Daniel Rice, Jennifer Philip MD, Angela Gifford MA, Taylor Bradley, Glen Leverson PhD, Nikole Neidlinger MD, Alejandro Roldán-Alzate PhD, Jaqueline Garonzik-Wang MD, PhD

Introduction: Hypothermic machine perfusion (HMP) is widely used in deceased donor kidney transplants (DDKT). Current HMP parameters only weakly correlate with post-transplant outcomes and are not based on biomechanical properties. Further, while vascular function is critical to renal allograft function, the vascular compartment has largely been ignored during allograft assessment. We developed novel perfusion parameters to assess biomechanical renal vascular function and evaluated their correlation to donor factors impacting vascular function and post-transplant outcomes.

Methods: Retrospective analyses of HMP data and allograft outcomes for all DDKTs procured in our donor service area and transplanted at our center over a 15-year period (2008-2023) were performed. In addition to flow and resistance, two novel perfusion assessment parameters were developed and assessed over time during HMP: Pulse pressure flow index (PPFI) and Distensibility. PPFI (Systolic Pressure-Diastolic Pressure/Flow) quantifies renal allograft arterial stiffness during HMP. Distensibility (Initial Resistance-Current Resistance/Initial Resistance) quantifies microvascular function, recruitment, and perfusion. We evaluated which donor characteristics were associated with these metrics of vascular function. We further evaluated whether PPFI and Distensibility correlated with delayed graft function (DGF), one year estimated glomerular filtration rate (EGFR) and death censored graft survival in both univariate and multivariate analysis.

Results: We studied 1423 DDKTs. 366 (25.7%) had DGF and the average one-year EGFR was 67.9 +/- 26.6 (mL/min/1.73 m2). There was a significant correlation between both novel perfusion parameters and donor age, high KDPI, and history of smoking, hypertension, and diabetes (Figure 1A&B). PPFI was significantly higher in kidneys with DGF (Figure 1C). Higher PPFI was also predictive of lower one year EGFR and shorter graft survival. Distensibility was lower in kidneys with DGF and overall increased during HMP (Figure 1D). Lower distensibility predicted lower one year EGFR and shorter graft survival in both univariate and multivariate analysis.

Conclusions: PPFI correlated with both donor characteristics and recipient outcomes, highlighting its validity as a measure of renal vascular function and utility in predicting post-transplant outcomes. Distensibility was a strong predictor of clinically important long term graft outcomes. These novel biomechanical based perfusion parameters may be powerful tools for renal allograft assessment during HMP.

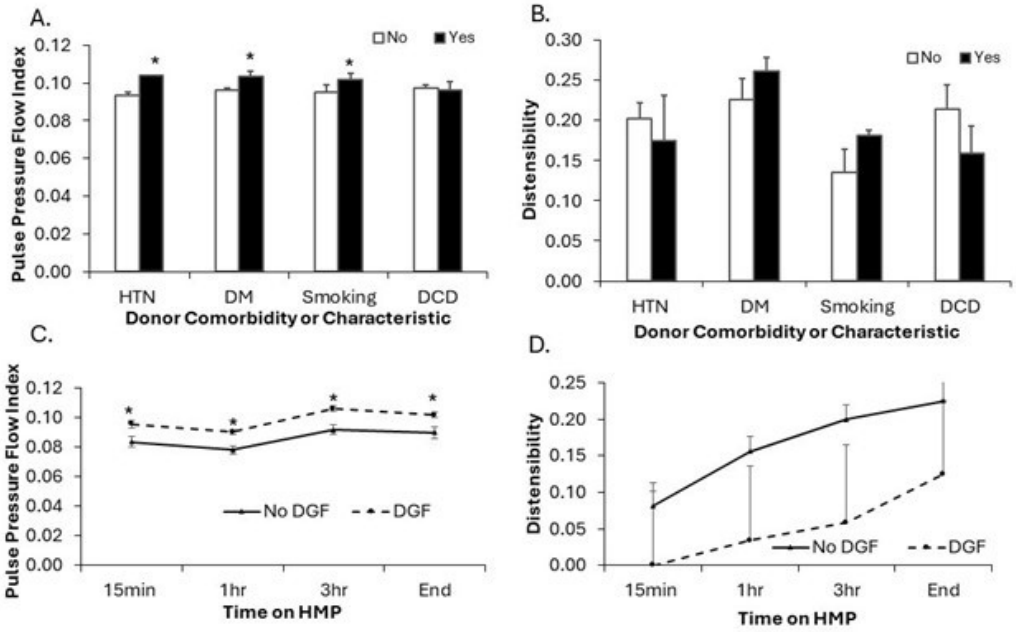


Figure 1: *Increased pulse pressure flow index (PPFI) and decreased Distensibility are associated donor comorbidities and development of DGF in recipients.* Data presented as mean +/- standard error of the mean. n=1057 in No DGF and N=366 in DGF, *p<0.05

Evidence of Fat Grating to Decrease Chronic Pain and Opioid Usage Following Mastectomy with Axillary Lymph Node Dissection: A Multi-Institutional Study

Alec Chen, Katherine Reuter Muñoz, Allison Seitz, John Nguyen, Myiah Quach, Doruk Orgun, Aaron Dingle, Samuel Poore

Background: Adipose-derived stem cells in fat grafts have been shown to promote tissue regeneration, including peripheral nerves. Given the risk of peripheral nerve injuries in mastectomy, this study evaluates whether fat grafting can reduce post-operative chronic pain and opioid analgesic usage among patients undergoing mastectomy.

Methods: From January 2016 to September 2025, all female patients who underwent mastectomy with axillary lymph node dissection (ALND) were identified on the TriNetX Research Network. Patients were stratified by method of breast reconstruction. Outcomes were defined as 3–24 months following mastectomy. Propensity score matching (PSM) was performed for patient age, body mass index, nicotine dependence, radiotherapy, chemotherapy, and diabetes mellitus. Statistical significance was set at $p < 0.05$.

Results: Of the 89,420 patients (mean age: 57.6 ± 13.4) identified, the overall rate of chronic pain was 14.6% and opioid usage was 50.4%. Among patients undergoing mastectomy without reconstruction, fat grafting showed significantly reduced chronic pain (14.5% vs. 17.3%, $p = 0.0003$) and opioid usage (39.0% vs. 50.0%, $p < 0.0001$) compared to patients without fat grafting. Of mastectomy and ALND with implant reconstruction patients, fat grafting showed no difference in chronic pain (16.3% vs. 15.9%, $p = 0.7$) or opioid usage (43.9% vs. 43.8%, $p = 0.9$). Among mastectomy and ALND with autologous reconstruction patients, fat grafting was associated with decreased opioid usage (47.0% vs 54.2%, $p < 0.0001$) but showed no difference in chronic pain (18.7% vs. 17.7%, $p = 0.5$).

Conclusion: Fat grafting was shown to reduce chronic pain and opioid usage in patients who underwent mastectomy with ALND and without breast reconstruction. Additional research is needed to confirm the true efficacy of fat grafting for treating post-mastectomy pain syndrome.

Impact of Timing and Type of Transverse Abdominis Plane Block on Postoperative Pain and Recovery in DIEP Flap Reconstruction

Melanie Benito B.S., Myiah Quach B.S., Nada Botros MA, Emily Zona B.S., Madeline Tierney MD, Aaron Dingle PhD, Samuel Poore MD, PhD

Introduction: Transverse abdominis plane (TAP) blocks have shown to improve postoperative analgesia in various surgical procedures, including post-mastectomy deep inferior epigastric perforator (DIEP) flap reconstruction. Prior studies found that liposomal bupivacaine (Exparel), which is ten times more costly than plain bupivacaine (Marcaine), has no significant benefit on DIEP reconstruction outcomes. However, no research has characterized the optimal timing and mode of administration on pain-related outcomes, specifically comparing preoperative, ultrasound-guided Exparel administration to intraoperative administration of Marcaine via direct visualization. The purpose of our study is to compare the efficacies between preoperative Exparel and intraoperative Marcaine on pain-related postoperative outcomes in hopes of guiding clinical decision making by offering a cost-effective approach to pain management.

Methods: A retrospective chart review was performed on patients who underwent DIEP reconstruction between 2014-2024 at UW Hospital with 3 attending plastic surgeons. Demographic, postoperative patient-reported pain scores, and opioid use (converted to morphine milligram equivalents (MME)) were collected. Postoperative numeric rating scale pain scores and opioid use were compared between groups across consecutive postoperative days using mixed-effects models, and cumulative morphine use during hospitalization was assessed with linear regression adjusted for baseline opioid use and BMI. All analyses were performed in R (v4.2.2). Statistical significance was set to $p<0.05$.

Results: A preliminary analysis between the two groups was done: preoperative Exparel (n=54) and intraoperative Marcaine (n=76). The Exparel group had an average age of 48.7 and average BMI of 30.6, while the Marcaine group had an average age of 48.3 and 29.6 BMI. Patients in the Marcaine group reported lower pain on postoperative days (POD) 0,1, and 3 with a significant overall group effect ($p=0.037$). Patients in the Exparel group had higher morphine use on POD 0 ($p=0.0004$), while morphine use in the following days through POD 4 was similar between both groups. Cumulative postoperative morphine use throughout hospitalization showed that the Marcaine group used approximately 30MME less on average than the Exparel group, though this was not significant ($p=0.31$).

Conclusion: Our current results suggest that intraoperative Marcaine may offer better analgesia when compared to preoperative Exparel for patients undergoing DIEP reconstruction. Use of Marcaine would translate to lower costs associated with DIEP reconstruction, as well as less time spent per operative case when considering the additional time needed to perform an ultrasound guided TAP block. Thus, this could offer a cost-effective, time-productive approach to pain management. Further analysis is pending to ascertain these results.

The Lifecycle of Acellular Dermal Matrix and Why It Matters

Myiah Quach BS, Emily Zona BS, Gabrielle Hon, Robert Johnson, Nikole Neidlinger MD, Aaron Dingle PhD, Samuel Poore MD, PhD

Background: Acellular Dermal Matrices (ADMs), have revolutionized reconstructive surgery through their use as a biologic scaffold promoting tissue integration and remodeling. Despite its widespread use, the origins and ethical implications of the use cadaveric human skin for reconstruction are often misunderstood and underrecognized among both clinicians and patients.

Methods: A narrative review of the literature was performed using PubMed, Embase, and Web of Science databases. Search terms included “AlloDerm”, “acellular dermal matrix”, “cadaveric dermis”, “medical ethics”, and “tissue bank”. Articles were included if they discussed tissue sourcing, processing, decellularization, clinical use of ADMs, or the ethics involved in any stage. Additional data were obtained from primary materials published by the Food and Drug Administration (FDA), American Association of Tissue Banks (AATB) and manufacturer materials.

Results: The production of ADMs begins with cadaveric tissue donation which is regulated under FDA guidelines for human tissue procurement. Donors must undergo extensive medical, social, and serologic screening to minimize infectious risk. The recovered dermis is stored pending final clearance and then is sold to the ADM manufacturer. Processing includes non-denaturing solution washes, controlled decellularization, and electron beam sterilization. The processed tissue is then visually inspected, cut to standardized sizes, and verified histologically prior to distribution. Throughout processing, strict standards prevent cross-contamination while ensuring retention of structural proteins that support host integration and remodeling. This controlled, multi-step process transforms donated dermis into a safe, biologically active scaffold capable of reliable clinical performance. Ethical considerations surrounding its use include donor consent, the lack of donor compensation despite commercial profit, and transparency with recipient patients.

Conclusion: ADMs represent a remarkable fusion of biomedical innovation and altruistic human donation. Clinicians should have a deeper understanding of the procurement process, cost of production and use, and the implications of tissue donation for families electing to donate their loved ones’ tissue. Improved familiarity with these processes can better inform patient counseling and operative decision-making. Future efforts should focus on education of both clinicians and families to maximize transparency, support informed donation, and optimize clinical outcomes.

Microvascular Anastomotic Devices: A Scoping Review of Current Technologies and Clinical Outcomes

Sakar Gupta, Myiah Quach, Emily Zona, Doruk Orgun, Piayeng Thao, Nada Botros, Ferris Zeitouni, Natalie Furtado, Jasmine Craig, Weifeng Zeng, Aaron Dingle, Samuel Poore

Introduction: This scoping review aims to examine and synthesize the landscape of microvascular anastomotic devices with the ultimate goal of evaluating their practical utility in comparison to traditional suture-only methods. Emphasis was placed on efficiency, outcomes, and potential limitations.

Methods: A scoping review of the PubMed, Scopus, and Web of Science databases was conducted in accordance with the PRISMA-ScR checklist. Search terms related to microsurgery, anastomoses, and devices (e.g., couplers, staplers, clips, stents, glue, laser). Eligible studies included primary research, excluding meeting abstracts, reviews, commentaries, non-English studies, and research on robotic technology or venous couplers for end-to-end anastomoses. Data were extracted on study design, anastomosis completion outcomes (e.g., patency rates, time to completion), and complication rates (e.g., flap loss, thrombosis).

Results: The initial search identified 4878 studies. 73 English-language articles met the inclusion criteria. Device distribution included: couplers (36.1%), clip appliers (25.0%), lasers (8.0%), intravascular stents (2.6%), glue (6.2%). The majority of included studies were prospective cohorts (43.1%), followed by pre-clinical studies (23.6%), retrospective review studies (22.2%), case series (5.6%), prospective comparative studies (2.8%), and randomized controlled trials (2.8%) (Table 1). The majority of studies evaluating devices replacing traditional handsewn suture such as clips, staplers, and couplers reported significantly reduced anastomotic times with comparable or improved vessel patency and/or flap survival, with one study reporting an average anastomotic time of less than 5 minutes. Adjunctive anastomosis devices such as laser, stents, and glue were also shown to be useful in a majority of studies. Intravascular stents were reported to have similar results to conventional technique however, some studies noted concerns about long-term vessel patency and compromised perfusion. Glue was shown to reduce the number of required sutures, though few studies noted reactive inflammation, and significantly increased thrombosis.

Conclusion: This scoping review demonstrates these microvascular anastomotic devices as either a replacement for conventional suture or as an adjunct demonstrate favorable efficiency and safety profiles. Certain limitations were identified such as vessel characteristics (diameter, thickness, friability), increased risk of thrombosis, or reactive inflammation. These devices also exist in a greater context of practicality such as cost feasibility, ease of use, and initial learning curve. Further high-quality, large-scale trials are required to confirm these findings in both human and preclinical settings.

Table: Overview of Microvascular Anastomotic Devices

Device	Ideal Context	Technical Considerations
Coupler	Venous: 1.5–4.0 mm diameter; EEA and ESA Arterial: <2.0 mm diameter; EEA only	Venous: Low technical difficulty; Average anastomotic time: 5.89 min Arterial: High technical difficulty; Thicker, possibly stiffer vessel walls; Average anastomotic time: 10.7 min
Clip	Venous (>2.5 mm diameter); EEA and ESA	High level of eversion of vessel walls may limit arterial use; Low technical difficulty; Single deployment allows flexibility with vessel mismatch; Average anastomotic time: 10.3 min
Stapler	Venous and arterial; EEA and ESA	Less eversion of vessel walls; Low technical difficulty; Single deployment allows flexibility with vessel mismatch; Average anastomotic time: 8.1 min
Laser (Diode, CO_2, KTP)	Venous and arterial; EEA and ESA	Risk of arterial aneurysm; High precision; Average anastomotic time: 6.4 min
Laser (SELENA)	Arterial; ESA only	Extremely high technical difficulty; Non-occlusive to recipient vessel; Average anastomotic time: 15.2 min
Intravascular Stent	Venous (large-caliber); EEA only	High rates of thrombosis and foreign body reaction; Moderate technical difficulty; Average anastomotic time: 7.4 min
Glue	Venous and arterial; EEA and ESA	Low technical difficulty; Fibrin glue: low tensile strength but clinically used; Polyacrylate (PA) and cyanoacrylate (CA): high tensile strength but not yet proven safe clinically; Average anastomotic time: 14.6 min

Predicting Graft and Flap Failure in Lower Extremity Burns: The Impact of TBSA, Excision Number, and Anatomical Site

Emily Miller BA, Christopher Kujalowicz MD, Jayde Powell BA, BS, Taylor Schumann BS, Bianca DiChiaro MD, MPH, Irene Helenowski PhD, John Kubasiak MD, Manuel Portalatin DO, MPH

Introduction: Current literature suggests that lower extremity burns have higher rates of complications and graft failure than upper extremity and trunk injuries. There is scarce evidence analyzing the factors that contribute to graft and flap failure in these patients. Our group aims to explore the impact of affected total body surface area (TBSA), number of burn excisions, anatomical site of injury, and type of skin substitute on rates of graft and flap complications in acute burns of the lower extremity.

Methods: This single center, retrospective cohort study analyzed all adult patients at the authors' institution for treatment of acute burns of the lower extremity from 2007-2024 who underwent graft or flap based reconstruction for their injuries. Demographic data including age, sex, race/ethnicity, BMI, insurance type, and length of stay were collected. Complications, comorbidities, readmission data, and surgical details were collected via CPT and ICD10 codes. TBSA, flap and graft details, skin substitute type, and additional complications were collected via operative and postoperative reports.

Results: 98 patients met study criteria, with 284 individual grafts and 13 flaps included in analysis. Older patients were more likely to experience delayed wound healing; there were no significant changes in complication rates associated with sex, race, ethnicity, BMI, or smoking. Patients with larger TBSA% and higher number of burn excisions had no change in flap complications but had significantly increased rates of graft complications, including partial and total graft failure, delayed graft healing, and graft infection. Initial categorical analysis identified 21% TBSA as the first significant threshold above which various graft complications increased significantly ($p<0.001$). Burns affecting the foot had the lowest rate of complications, while burns affecting the buttocks had the highest rate of complications. Cadaveric-based grafts had the highest rate of graft complications, while skin/dermal substitutes such as Stratagraft, Suprathel, Primatrix, BTM, and Integra showed no significant increase in graft complications.

Conclusions: This study is the first to analyze complication rates of lower extremity grafts and flaps across a number of demographic, operative, and therapeutic strata, and further bolsters the growing body of literature showing increased complications in lower extremity burns. Additionally, while previous studies have broadly classified burns as lower extremity, this study further stratifies results by anatomical subsite, identifying site-specific risks and facilitating a more granular analysis of complication patterns.

Post-Acute Care Pathways in Plastic Surgery

Myiah Quach BS, Emily Zona BS, Jasmine Craig MD, MPH, Allison Seitz MD, Venkat Rao MD, MBA

Background: Discharge destination following hospitalization plays a critical role in surgical recovery, long-term outcomes, and healthcare resource use. This review outlines the continuum of discharge options available to plastic surgery patients, including long-term acute care hospitals, inpatient rehabilitation facilities, skilled nursing facilities, assisted living facilities, postoperative guest suites, and home with or without home health care.

Methods: We conducted a focused narrative review to characterize post-discharge care destinations and associated payer structures. Relevant information was identified through searches of PubMed and Google Scholar. Additional references were identified by manual review of references from key articles. We prioritized primary sources including peer-reviewed articles and government reports that described the type of PAC facility, patient population served, services provided, and reimbursement models. We excluded review style articles and articles published with data no longer accurate to current policy.

Results: Plastic surgery patients undergoing complex procedures such as free tissue transfer, trauma reconstruction, or burn care may require specialized facilities for wound management, rehabilitation, or close monitoring. Medicare and Medicaid policies influence access and coverage varies widely across facility types and states. Home discharge is generally associated with superior outcomes and more predictable costs, but non-home PAC facilities remain essential for patients with higher medical and functional needs.

Conclusion: For plastic surgeons, knowledge of these discharge settings is essential to effective discharge planning directly impacting readmission rates, reimbursement, and patient recovery. Plastic surgeons must engage actively in discharge planning by advocating for the most appropriate level of care, aligning patient safety, functional recovery, and financial stewardship.

	Relative Acuity	Considerations	Medicare Coverage	Medicaid Coverage	Total licensed maximum capacity or total number of beds [a]
LTACH	High	Very high acuity; costly; risk of infection; limited length flexibility; Medicare-defined threshold	Yes	Varies by state	23,100
IRF	High	Resource-intensive; suitable for significant recovery needs; requires therapy infrastructure	Yes	Varies by state	325,200
SNF	Moderate	Requires skilled care; staffing-level varies; can be costly; common PAC destination	Yes, with qualifying 3-day in-patient stay	Yes	1,578,800
ALF	Low-Moderate	Patients requiring help with ADLs but not skilled nursing, private pay or long-term insurance coverage is often required	No	Yes, only after all other assets exhausted	1,313,600
HHC	Moderate–Low	Needs home support; suitable for moderate patients; depends on staffing and home environment	Yes	Yes	-
Postoperative Guest Suites	Low	Nursing support	No	No	-
Routine Home Discharge (Self-Care)	Low	Best for stable patients; requires adequate support and safety at home	N/a	N/a	-

Abbreviations: LTACH, long-term acute care hospital; IRF, inpatient rehabilitation facility; SNF, skilled nursing facility; HHC, home health care; ADL, activities of daily living; PAC, post-acute care

[a] National Center for Health Statistics 2022 National Post-acute and Long-term Care Study; U.S. Census Bureau, Population Division, Population Estimates, September 22, 2025.

Better Conversations for Better Informed Consent: A Pilot Study for Surgeon Training

Kate Telma MD, Jolene Tsang BS, Ava Hitzeman BS, Kyle Bushaw MA, Jenna Nitkowski PhD, Margaret Schwarze MD

Introduction: Better Conversations is an evidence-based intervention designed to address failures of informed consent. Better Conversations focuses on the goals and downsides of surgery, supports deliberation, and makes more efficient use of surgeons' time while meeting ethical standards for informed consent. The objective of this study is to evaluate the effect of a program to train surgeons to use Better Conversations routinely in the clinic.

Methods: We recruited ten attending surgeons at the University of Wisconsin. We delivered 30 minutes of individual instruction, then performed audit feedback of 10 recorded outpatient consultations per surgeon. We delivered feedback via email including the de-identified transcript of the consultation, noting one element for praise and one element for improvement using the language: "here is what you did well…" and "next time consider…". We recorded five additional consultations to assess competence. We performed qualitative interviews with surgeons to obtain perspectives on the training process and the role of Better Conversations in their practice. We surveyed patients after consultation using the "Feeling Heard and Understood" survey and compared responses pre- and post-surgeon training.

Results: Surgeons in our cohort represented a range of subspecialties (colorectal, vascular, acute care, endocrine, minimally invasive, surgical oncology) and had a median time in practice of 7.5 years (interquartile range 5-10 years, range 0-21+ years). To date, we recorded 127 conversations between surgeons and patients. Surgeons found the audit feedback acceptable and 7 of 10 surgeons reached competence using our assessment. Feedback reinforcing Better Conversations elements most commonly focused on the novel use of naming the goal of surgery (41% of responses). Recommendations for improvement focused on the surgeon "showing their cards" to contextualize the discussion (36%) or using a question to support deliberation (24%). Surgeons reported that Better Conversations impacted their practice positively, enabled more efficient consultations, and facilitated patient engagement in decision making. Average responses to four of ten items on the "Feeling Heard and Understood" survey showed a statistically significant increase following surgeon training.

Conclusion: It is possible to train attending surgeons to use Better Conversations competently with personalized iterative audit feedback. Use of Better Conversations may improve patient participation in surgical decision making. Measuring patient outcomes is dependent on surgeons using this intervention with fidelity, which is resource intensive. Future efforts will employ computerized automation for feedback in collaboration with colleagues at the Wisconsin Center for Education Research to test the effect of Better Conversations on patient outcomes at scale.

Figure: Five elements of Better Conversations as described in the video demonstrating how to use Better Conversations: https://patientpreferences.org/better-conversations/.

Prognosis in the Trauma ICU through the Lens of Best Case/Worst Case-ICU: What happens when the content and timing of communication changes?

Amy Zelenski PhD, Melanie Fritz MD, Alexandra Hernandez MD, MCR, Jenna Nitkowski PhD, Carly Sobol MD, Kyle Bushaw MA, Taylor Bradley, Alex Dudek RN, BSN, MPH, Jolene Tsang, Kristine Kwekkeboom PhD, Margaret Schwarze MD

Introduction: Clinicians often manage prognostic challenges by emphasizing imprecision, focusing on optimistic predictions, projecting an upbeat attitude, or avoiding discussions about uncertainty altogether. They also worry about losing credibility if their predictions are inaccurate. In addition to efforts to increase diagnostic accuracy with better tools, there is a push to improve communication about diagnostic uncertainty by acknowledging it, attending to emotions related to life-changing news, and helping loved-ones and patients focus on in-the-moment decision making in the context of an uncertain future. Communication that is withheld or unclear can lead to unnecessary suffering. When surrogate decision makers were asked about preventable adverse issues they experienced while a loved one was in the ICU, communication was the most frequently mentioned issue. We conducted a multi-site randomized clinical trial to test a communication intervention called Best Case/Worst Case–ICU (BC/WC-ICU) which uses scenario planning and a graphic aid to support communication and decision-making for critically ill older adults.

Methods: We trained 208 trauma surgeons, team leaders, residents, APPs and ICU nurses to use the BCWC-ICU tool daily on rounds at 8 large volume trauma centers in the US. We then employed a phenomenological qualitative inquiry to understand how using the intervention impacted the way clinicians changed how and how often they discussed prognosis with patient's loved ones. We used multiple data sources including field notes, interviews with clinicians, and one focus group of trauma survivors. We explored clinician and patient use of this communication tool to characterize concerns around delivery of information. We used constant comparison to support inductive open coding about delivery of prognostic information and a group process for higher level thematic analysis.

Results: Clinicians (n = 46) worried that describing Worst-Case scenario would cause loved-ones unnecessary harm. They valued their ability to control the tone of information that was shared, hesitating to focus on the big picture and preferring to focus on small wins or "tone down" the worst case. Loved ones (n = 11) described how lack of communication about prognosis had a negative impact on their ability to engage in decision-making and plan. One commented that, "the unknown is always worse than a worst case that is explained."

Conclusion: Discussions earlier in the post-injury course that describe a range of events and what they mean for the patient's life might better support loved ones as they make decisions in the context of an uncertain future.

Standardization and Documentation of Surgical Goals in the Electronic Health Record

Ava Hitzeman BS, Kate Telma MD, Jessica N. Cohan MD, Margaret L. Schwarze MD

Introduction: The goals of surgery are discussed in <25% of surgical consultations, yet the American College of Surgeons and Centers for Medicare and Medicaid Services identify documenting the goal of treatment as a quality standard. Improving clinical practice by requiring electronic health record (EHR) documentation could meet these quality standards. We used co-design with clinicians across the US and collaborated with designers at Epic software to develop a template to document the goals of surgery in the EHR. The objective of this study was to understand how clinicians might use the template.

Methods: We invited 20 surgeons and surgical trainees from a range of specialties at UW Health to participate in a documentation simulation exercise using recall of three recent operations. We used open-ended questions to understand their perspectives on using the template and the value of surgical goal documentation.

Results: Participants were universally able to generate a primary surgical goal category for recently performed operations, a secondary goal category when applicable, and a specific goal related to the patient's clinical condition. Participants were frequently unable to generate a quote of the patient reported goal and often restated the technical objective. Typically, the surgical goals were plausible. At times, surgeons selected implausible goals: for example, choosing "live longer" for feeding tube placement for an elderly patient with dementia. Generating a goal category was quick and intuitive, though some found it challenging to rank the goals as primary or secondary. Some participants wanted additional goal categories, e.g., "to help others." Participants thought goal documentation could help manage surgical expectations particularly when patient expectations were misaligned with outcomes. For operations that were highly beneficial, e.g., appendectomy, participants felt goal documentation would be less useful. Further, they believed goal documentation would support the entire clinical team particularly through a long hospitalization. There were concerns about additional time and overall documentation burden, and some participants believed this was not applicable to their specialty despite easily generating a surgical goal.

Conclusion: A standardized process to document surgical goals could be valuable for patients, surgeons, and surgical teams, if the EHR prompts are easy to use and add minimal documentation burden. Nonetheless, connecting the technical objective of surgery to what surgery can plausibly accomplish for the patient will likely require efforts beyond a focus on documentation.

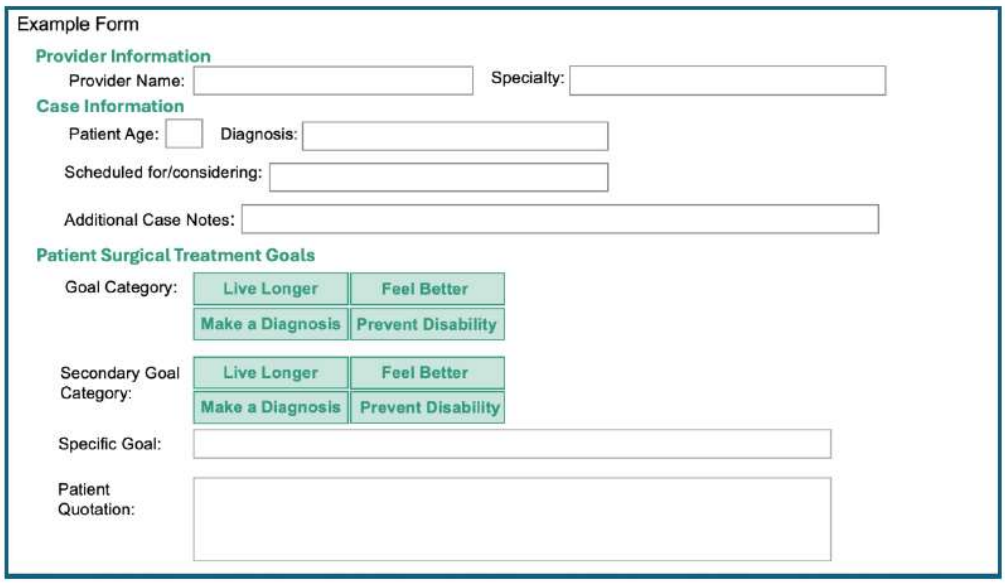


Figure 1: The surgical goals template lists the primary and secondary goal categories from which the surgeon can choose: live longer, feel better, prevent a disability, and make a diagnosis. The template includes a text box to fill in the specific surgery goal, which could be pre-populated, and would describe more precisely what the surgery will accomplish for that individual patient, and a patient quote describing the goal in the patient's own words.

Introduction of Buccal Buprenorphine in Enhanced Recovery Protocol for Colorectal Surgery Patients

Corinne Praska MD, Evie Carchman MD, Glen Leverson PhD, Julia Berian MD, MS, Ana De Roo MD, MSc, Dana Hayden MD, MPH, Charles Heise MD, Ray King MD, PhD, Elise Lawson MD, MSHS, Cristina Sanger MD, Beth Thompson BS, John Silva MD

Background: Buprenorphine is a partial opioid agonist with high receptor affinity and long duration of action. These properties lead to sustained analgesia with reduced side effects compared to other full agonist mu-opioids. We sought to add scheduled buccal buprenorphine to our colorectal surgery enhanced recovery protocol (ERP) and evaluate its impact on perioperative outcomes and inpatient utilization of full agonist opioids.

Methods: In 2024, an interdisciplinary team including Anesthesiology, Colorectal Surgery, and Pharmacy developed a protocol for administration of buccal buprenorphine. Beginning in May 2025, opioid naïve patients undergoing inpatient, elective colorectal surgeries were prescribed scheduled buccal buprenorphine until discharge as part of the updated ERP. We performed a preliminary analysis including patients who underwent loop ostomy takedown (takedowns); laparoscopic or robotic right hemicolectomy or ileocolic resection (rights); and laparoscopic or robotic low anterior resection, left hemicolectomy, or sigmoid colectomy (lefts). Patients were excluded from analysis for undergoing an open operation or receiving an epidural or patient-controlled analgesia pump. Cases were matched 1:1 by index operation to controls that did not receive buprenorphine. Length of stay (LOS), total daily morphine milligram equivalents (MME), daily MME of full opioid agonists (i.e. excluding buprenorphine), and rates of post-operative ileus were compared between groups using a two-sided unpaired t-test.

Results: 50 patients were included in this study, 25 in the buprenorphine group and 25 controls. Six patients in each group were rights (6/25; 24%); seven were takedowns (7/25; 28%); and twelve were lefts (12/25; 48%). Barriers to compliance with the updated ERP included lack of familiarity with buprenorphine, preventing administration of scheduled dosing across phases of care. Average LOS in the buprenorphine group was 2.8 days (SD 1.1) compared to 3.1 days (1.4) in controls (p=0.38). There was no significant difference in average LOS when stratified by index operation. Average total MME per hospital day was similar between groups (46.4mg [SD 21.6] buprenorphine vs. 43.1mg [24.9] controls; p=0.61), as was average full agonist MME (excluding buprenorphine) per hospital day (40.8mg [SD 21.7] buprenorphine vs. 43.1mg [24.9] controls; p=0.72). There were no adverse effects secondary to medication administration. One patient in each group developed a post-operative ileus (p=1).

Conclusions: Preliminary analysis shows that the addition of scheduled buprenorphine to our colorectal surgery ERP did not significantly impact length of stay, total MME, full agonist MME, or rates of ileus. Buccal buprenorphine was well-tolerated by patients and warrants further investigation with ongoing analysis of a larger cohort of patients.

Benefits of a Pre-Procurement Conversation with the Surgical Recovery Team: Donor Family Perspectives

Megan Saucke MA, Esra Alagoz PhD, Nikole Neidlinger MD, Carrie Thiessen MD, PhD

Introduction: Organ procurement organizations (OPOs) manage all aspects of deceased donations, including family support. The Wisconsin Organ and Tissue Donation systematically offers all families of deceased donors the opportunity to meet the donor surgery team before procurement. We sought to explore the impact of pre-procurement conversations (PPCs) on family members of deceased organ donors.

Methods: We conducted qualitative interviews with family members who had a PPC before their loved one became a deceased organ donor. We used inductive thematic analysis to identify themes relating to reasons for participating in the PPC, experiences during the PPC, and impact of the PPC.

Results: Of the 8 study participants, 3 described a PPC prior to circulatory death donation. The pilot interview took place 8 years after the participant's PPC, and the remaining 7 interviews took place within 2 years of the PPC (median=16 months).

Common motivations for engaging in the PPC included meeting their loved one's "last doctor," ensuring their loved one would be treated as a person who could feel pain rather than just a body, understanding the process, seeking reassurance that they were doing the right thing, and gaining closure (Table).

Multiple aspects of the conversation provided reassurance to families. Hearing how the donation would save lives helped participants find meaning in their loss. When the surgical team asked personal questions about the donor (e.g., what kind of music they liked), families felt the surgical team knew their loved one. Families also valued the surgery team's taking time from their busy schedule and not rushing the conversation, sincerity and compassion, acknowledgment of the gift of donation, eye contact, and offers of hugs. The team expressing their own emotions about the tragic situation displayed the human side of the surgical team, which made it easier for families to trust them with their loved one.

All participants said that families of organ donors should have the opportunity to have a PPC. While the PPC was a blur for some participants, others had vivid memories even years later. Most participants also reported that the PPC produced or reinforced positive feelings about the donation process in general, with several becoming advocates for organ donation after their loved one's death.

Conclusion: Participating in PPCs had emotional and informational benefits for the families, enhancing their trust in the donation process and comfort moving forward with procurement. OPOs may consider implementing PPCs more widely.

Table. Motivations for participating in the pre-procurement conversation

Theme	Exemplary quote
Meeting their loved one's final care team	"I've known all her other doctors. It's like, okay, let's see who these people are. I know she's not of importance [to them] like she is to me. But I also know that these are the last people who will have her as whole…This is a chance, I have to do this now, because if not, it's never going to happen again. So just to kind of know who's going to do what." (Family 6)
Ensuring their loved one would not be treated as just a body	"I just wanted to make sure that any testing and stuff that was done, that if there was a remote possibility that she would feel pain, that that was taken care of. Just that she was seen as a conscious person, not just the body." (Family 4)
Understanding the process	"We had no real clue what the process was, and all the steps involved and behind the scenes things that you don't see or hear about. I think having questions answered that we didn't even know to ask is such a big deal. It makes such an important impact on the family to have that information." (Family 5)
Seeking reassurance that they were doing the right thing	"Because of what my mom meant to me, I needed reassurance that she'd be helping somebody. I think everybody needs to hear that when their loved one is going away. And like I said, it was harder because I didn't know she was signing up for it [donation]. So when we found out, it was hard, but they were there to reassure that she's helping people. So that made it easier." (Family 1)
Gaining closure	"My last conversations with the surgical team, and leaving them with her music, which was such a big part of her, left me feeling at ease….Then driving away, listening to the same music that they would be listening to, [chokes up] kind of let me breathe, not [feel] so suffocated….It helped answer the what if's as soon as I leave her. Honestly, like it was the best closure." (Family 3)

The Lived Experiences of Patients Seeking Renal Autotransplant: A Qualitative Study

Megan Saucke MA, Esra Alagoz PhD, Jennifer Philip MD, Marcie Kniaz RN, David Foley MD, Carrie Thiessen MD, PhD

Introduction: Nutcracker syndrome (NCS) and loin pain hematuria syndrome (LPHS) are characterized by symptoms such as progressively worsening pain, nausea, and severe fatigue. We sought to describe the experiences of patients seeking renal autotransplant (RA) to treat their NCS or LPHS.

Methods: We conducted qualitative interviews with patients undergoing RA. We used thematic analysis to identify themes around patients' experiences with diagnosis, seeking care, and impact of symptoms.

Results: Our 10 participants were 90% women, aged 16 to 42; 8 had NCS and 2 had LPHS. Time from symptom onset to RA ranged from 10 months to 9 years.

Patients described difficult journeys to getting diagnosed with NCS or LPHS. Common issues included doctors not taking their pain seriously, treating them with suspicion or skepticism, and missing their compression disorder on imaging. Patients had to do their own research, obtain multiple second opinions, and be strong self advocates to get diagnosed and obtain referrals for RA.

Commonly described symptoms included progressively worsening pain, nausea, and severe fatigue. Symptoms severely impacted participants' quality of life in key domains (Table). One patient said, "I'm completely housebound. I'm completely disabled by this. My entire day revolves around trying to alleviate the pain any way I can, dealing with the symptoms… It takes your life away." Patients managed symptoms by adjusting bodily positioning to relieve pressure/pain, using heating pads and/or ice packs, taking anti-nausea and pain medications, attending physical therapy, and using mobility aids such as wheelchairs, walks, and scooters. To cope with the emotional toll of their condition, they used strategies such as attending therapy, looking for silver linings, focusing on gratitude, meditating, using humor, and finding distractions.

Patients hoped to get back to normal life and be pain free after recovering from RA. Patient concerns about surgery centered around anesthesia, the large scar, pain management, the kidney being moved to a more vulnerable location, and the potential for other compressions to develop or become worse. However, they said that surgery was their "only choice" and "the benefits far outweigh the risks."

Conclusion: NCS and LPHS can devastate patients' lives, impacting their ability to socialize, work, and carry out activities of daily living. Patients hoped RA would alleviate pain and help get their lives back. More education is needed about LPHS and NCS for non-specialty providers so that patients can be diagnosed and treated earlier. Future research will explore whether RA meets patients' expectations.

Table. Impact of nutcracker syndrome or loin pain hematuria syndrome on patient's life

Domain	Quotes
Activities of daily living	"As soon as I get home, I go straight to bed just to lay down and relax because I'm out of mental and physical energy. Yeah. So I sleep a lot....My house sometimes gets to be a pigsty because it's hard to have that energy to clean. And I can't exercise really because activity makes the pain worse." (Patient 3)
Work	"I can't hold down a job… I can't work on narcotics." (Patient 7)
Social life	"We kind of had to just kind of be home people for the past two years. We couldn't really confirm plans with people because we'd never know how I was going to be feeling that day." (Patient 1)
Mental health	"It's a frustration that leads to a lot of tears and irritation on my part. Because I don't want to say no. I don't want to have to sit on the couch and not be a part of something because I have an invisible pain that no one else can understand." (Patient 5)
Romantic relationship	"Definitely my husband and I, our relationship has changed greatly…he's experiencing some caregiver strain…And so we recently had challenges with our relationship and me being more than a patient and him being more than a caregiver. Because it's very easy to get lost in those roles." (Patient 4)

Beyond the Game: Risk Factors for Mental Health and Well-Being in Adolescent Athletes

Sakar Gupta, Kristin Haraldsdottir, Jen Sanfilippo, Andrew Watson

Introductions: Although mental health and quality of life (QOL) have been increasingly recognized as important outcomes for participants, the factors influencing psychological health in youth participants are not well-defined. The purpose of this study was to identify independent risk factors for anxiety, depression, and QOL in adolescent soccer participants.

Methods: 668 youth soccer participants (13-18 years old) completed a survey on sleep, athletic identity (AI), prior injury, anxiety (Generalized Anxiety Disorder-7), depression (Patient Health Questionare-9), and QOL (PedsQL). Wilcoxon Rank Sum tests compared outcomes across gender and multivariable regression models evaluated independent predictors of mental health and QOL, with age, gender, prior week sleep, injury, AI, and racial/ethnic minority or not as covariates.

Results: Compared to males, female youth participants exhibited significantly worse symptoms of anxiety (4.1 [3.6-4.7] v 6.2 [5.7-6.6], p<0.001) and depression (3.8 [3.3-4.4] v 5.6 [5.1-6.1], p<0.001), and significantly lower overall QOL (81 [79-83] v 79 [77-80], p=0.02). Independent predictors of anxiety were age (β=0.28+/-0.072, p<0.001), female gender (β =-1.7+/-0.40, p<0.001), sleep (β =-0.88+/-0.16, p<0.001), AI (β =0.11+/-0.034, p=0.002), and prior injury (β=1.2+/-0.37, p=0.001), but not racial/ethnic minority status (β =0.35+/-0.39, p=0.37). Independent predictors of depression included age (β =0.29+/-0.070, p<0.001), female gender (β =-1.4+/-0.41, p<0.001), less sleep (β =-1.2+/-0.16, p<0.001), prior injury (β =0.88+/-0.37, p=0.019), and identifying as part of a racial/ethnic minority group (β=0.81+/-0.40, p=0.004), but not AI (β =0.049+/-0.035, p=0.16). Independent predictors of QOL were age (β=-0.60+/-0.19, p=0.001), sleep (β =2.6+/-0.43, p<0.001), prior injury (β =-3.7+/-0.98, p<0.001), and AI (β=-0.22+/-0.092, p=0.016), but not gender (β =1.8+/-1.1, p=0.10) or racial/ethnic minority status (β =-1.5+/-1.0, p=0.16). In all models, sleep had the greatest relative importance (38-56%).

Conclusion: Among elite youth soccer athletes, greater age, female gender, prior injury, and less sleep were independent predictors of anxiety and depression. Similarly, greater age, prior injury, less sleep, and higher AI were found to be independent predictors of QOL. Importantly, prior week sleep had the greatest influence on both mental health and QOL.These results can help identify athletes at risk of poor mental health and QOL to better facilitate intervention and management. Furthermore, stakeholders should recognize that insufficient sleep represents a powerful and modifiable risk factor for psychosocial outcomes among youth athletes.

Outcomes of Patients with Hip Arthritis and Intertrochanteric Fractures Treated with Surgical Fixation – Conversion to Total Hip Arthroplasty

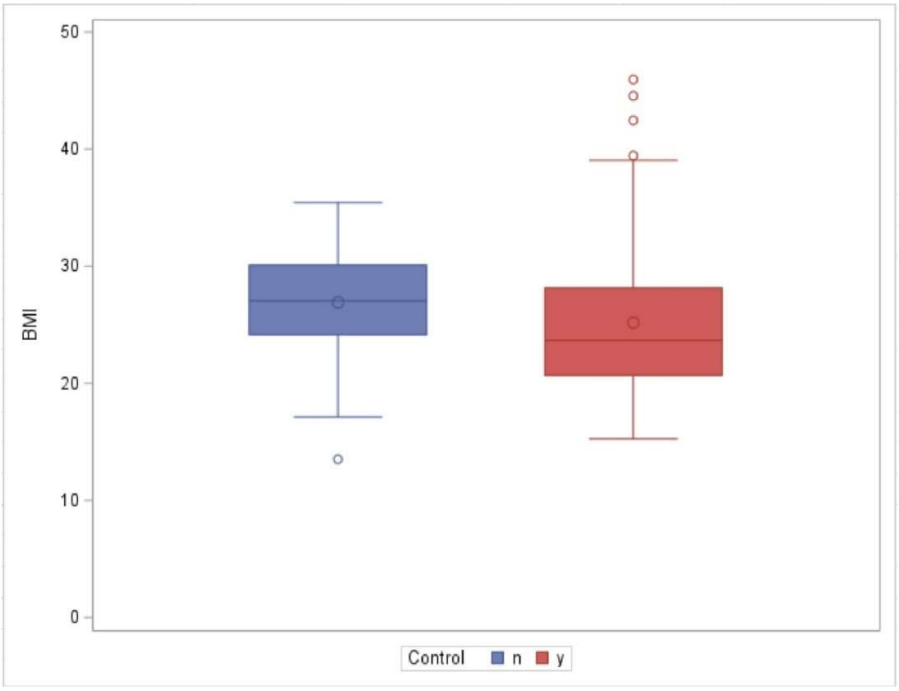
Kayla Nennig-Kniaz, Christian Shepler, Elizabeth Laning, Sam Mosiman MS, Jacquelyn Dunahoe MD, Paul Whiting MD

Introduction: Hip fractures are one of the most common injuries seen in adults, ages 65 and older, with approximately 320,000 cases annually. Intertrochanteric fractures are the most common type, making up approximately two-thirds of hip fractures presenting to emergency departments. Of these patients, approximately 1-2% will require a conversion to total hip arthroplasty (THA) within the first year. There is, however, very limited knowledge on the long term rates of conversion. With complications of conversion THAs estimated to be as high as 47%, understanding the mechanics of failure as well as how to preserve the longevity of the "native hip" prove crucial in improving patient outcomes. This study aimed to determine the long term survivability of a patient's "native hip" as well as explore whether higher grade arthritis or other factors increase odds of conversion.

Methods: Analysis consisted of two parts, mapping survival of the "native hip" on a Kaplan-Meier curve and a randomized sub-cohort analysis of potential factors impacting conversion rate. The retrospective cohort for the Kaplan-Meier curve consisted of n=1259 patients ages ≥ 65 admitted for hip fractures from January 1st, 2010 to May 1st 2025, who had follow-up with providers from the University of Wisconsin Department of Orthopedics and Rehabilitation. The subcohort included the conversion group (control=n) n=52 and a randomized subset sample of n=144 patients who did not require conversion (control=y). OTA fracture classification and K-L arthritis grade were evaluated using anteroposterior pelvis radiographs from emergency department admission and post surgical fixation confirmation.

Results: Preliminary data showed no statistically significant correlation between arthritis grade and odds of conversion. However, analysis did demonstrate a statistically significant increase in the odds of conversion in correlation with increasing BMI ($P<0.05$).

Conclusions: Further understanding about the relationship between hip fractures and the longevity of fixation methods in the elderly is critical to lowering the risk of complications and improving postoperative outcomes.



Bigger Lungs Are Associated With A Higher Airway Size To Lung Size Ratio (Dysanapsis Ratio) And Supranormal Airflow

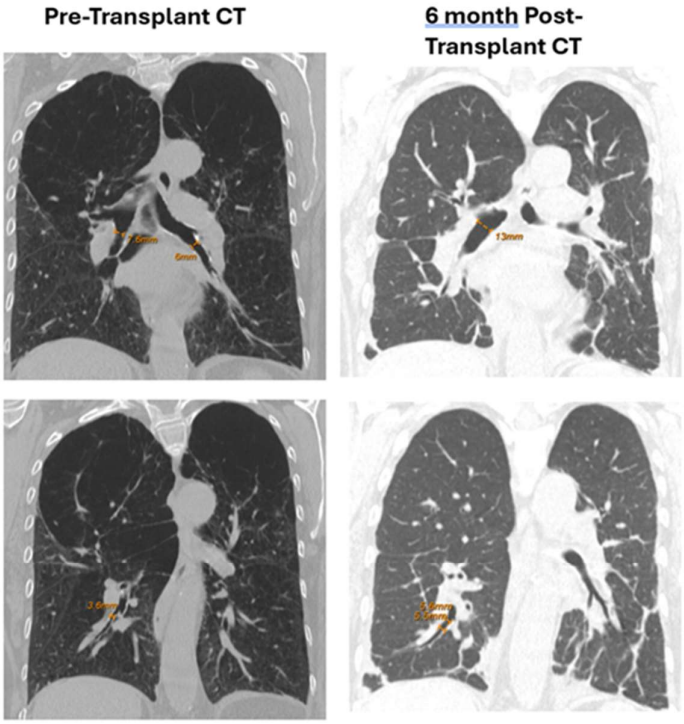
Heaven Kim, Nathan Siewert, Michael Eberlein M.D., Erin Lowery M.D., Daniel Mccarthy M.D., Yu Xia M.D.

Introduction: Donor to recipient size matching is an important aspect of lung transplantation. The donor to recipient predicted total lung capacity ratio (pTLC-ratio) is a commonly used metric, with 0.8 to 1.2 often considered an adequate sizing range. Taking the individual recipient's pathophysiology into account, we were able to accept substantially oversized lungs (pTLC-ratio 1.55) for our recipient with severe emphysema. In this report we describe post-transplant allograft function and the structure function relationship via the dysanapsis ratio.

Methods: Our recipient is a 64 year old female with severe COPD/Emphysema. She had severe hyperinflation with an actual actual TLC of 6.17 L (pTLC of 5.11 L). A donor offer from a 34 year old male with a pTLC of 7.73 liters was matched to her. The pTLC ratio was 1.55. The donor pTLC to recipient actual TLC ratio was 1.25 and the allograft size was considered to be acceptable. Bilateral lung transplant was performed via clamshell incision on VA ECMO without complications. At 24 hours and 72 hours she had PGD Grade 1. She was extubated at 48 hours, weaned to room air by day 11, and discharged home on day 23.

Results: Throughout her post-transplant course (she is now 1 year post-transplant) pulmonary function tests show excellent allograft function and supranormal expiratory airflows. We analyzed airway diameters and lung volumes on a pre-transplant and a 6 months post-transplant CT scan and calculated an airway size to lung size ratio (Dysanapsis ratio), figure 1.

Conclusion: An individualized approach based on the recipient's patho-physiology can allow for safe transplant options, beyond general sizing range considerations. Significant oversizing in our recipient was associated with excellent allograft function with supranormal expiratory airflows. The allograft structure function analysis via the dysanapsis ratio should be explored further.



Spirometry

	Pred	Patient	%Pred
FVC	2.85	2.39	84
FEV1	2.25	2.18	97
FEV1/FVC	79	91	
PEF	6.00	6.08	101
FEF 25/75	1.94	2.77	143

Dysanapsis - Ratio	Pre-Tx	6 mo Post-TX	Normal *
Bronchus Intermedius / Lung Volume	11.5 mm^2 / Liter	**46.9 mm^2 / Liter**	26 mm^2 / Liter
RB 9 / Lung Volume	2.6 mm^2 / Liter	**8.7 mm^2 / Liter**	5 mm^2 / Liter
LLL / Lung volume	7.2 mm^2 / Liter	**27.7 mm^2 / Liter**	14 mm^2 / Liter

Figure 1: Pre-transplant and 6 months post-transplant CT scan images in coronal view with airway dimension measurements. Airway size to lung size ratio (Dysanapsis ratio) calculations comparing pre-transplant, to post-transplant and normal values are in the table at bottom right (reference: doi:10.1152/japplphysiol.00562.2009). Spirometry at 12 months after transplant (top right); The green boxes highlight supranormal expiratory airflow.

Chronic Impella-Associated Thrombus During Prolonged Mechanical Circulatory Support Bridge to Heart Transplant

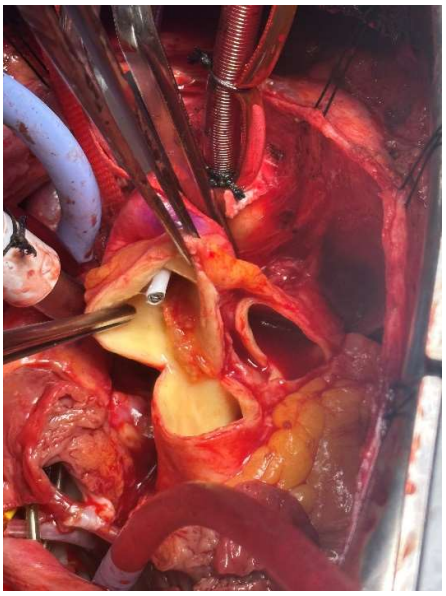
Nathan Siewert BS, Filippos Kontos MD, Peter Marogil DO, Evan Klein MD, David Murray MD, Veli Topkara MD, MSc, Yu Xia MD, MS

Introduction: Heart failure affects 1–3% of the population and remains a leading cause of morbidity and mortality1. For end-stage disease, cardiac transplantation is the gold standard, but donor shortages make mechanical circulatory support (MCS) increasingly important. The Impella 5.5 provides axial-flow left ventricular unloading and is favored for its less invasive profile compared with VA-ECMO. However, device-related thrombosis, reported in ~4% of cases, is a critical complication, particularly with prolonged support, risking embolic events and pump failure2-4. Anticoagulation strategies continue to evolve to mitigate this risk. We report a case of prolonged Impella 5.5 support bridging to transplantation complicated by a large, chronic appearing, Impella-associated thrombus without embolic or device-related sequela, emphasizing the need for anticoagulation and thrombus mitigation protocols.

Methods: A 51-year-old female veteran with cardiac sarcoidosis developed progressive cardiomyopathy after prior pacemaker placement for complete heart block, ICD with ablations for VT, and multiple clips for mitral regurgitation leading to stenosis. After a decade of stability, she reported worsening fatigue and dyspnea. Right heart catheterization showed CO 1.6 L/min and PCWP 27 mmHg, while echocardiography revealed LVEF 20–25% and severe tricuspid regurgitation.

Results: Despite milrinone improving CO, low CI with lactic acidosis prompted left axillary Impella 5.5 implantation (flowing 3.0 L/min on P4-6). The patient was systemically anticoagulated with bivalirudin with goal PTTs 40-60s along with a bicarbonate purge solution. At transplantation following 50 days of Impella support, her heart was markedly dilated with severe dysfunction. The Impella driveline was cross-clamped along with the aorta with a soft jawed clamp during recipient cardiectomy. At aortotomy, a chronic thrombus was found on the lesser curve of the aorta along the left side of the device and removed under direct vision (Figure 1). The remainder of the heart transplant operation and post-operative course were unremarkable.

Summary: Prolonged Impella 5.5 support in this patient was associated with a large, chronic appearing thrombus at explant without embolic or device-related sequelae in a patient anticoagulated with bivalirudin.



Dual Circuit Central and Peripheral VA ECMO as a Bridge to Bilateral Lung Transplantation

Olalekan Babalola BS, Nathan Siewert BS, Monika Pantha BS, Micheal Eberlein MD PhD, Daniel McCarthy MD, MBA, MEM, Erin Lowery MD MS, Yu Xia MD MS

Introduction: We report a case of successful bilateral lung transplantation in a patient with short telomere syndrome and pulmonary fibrosis requiring complex ECMO support as a bridge to transplant.

Methods: Our patient is a 43-year-old man, BMI 40, low-grade myelodysplastic syndrome, with end-stage lung disease due to pulmonary fibrosis and short telomere syndrome presented with worsening dyspnea and hypoxemia. Chest CT demonstrated progressive interstitial lung disease. He also had severe pulmonary hypertension with near systemic PA pressures. Despite his comorbidities, given his young age, he was evaluated and subsequently listed for bilateral lung transplantation. While listed, his respiratory status deteriorated, necessitating peripheral VA ECMO and tracheostomy. Due to North-South syndrome, an additional venous return cannula was added to the right internal jugular vein, which was still insufficient to provide adequate oxygenation. He was taken to the operating room and converted to central VA ECMO via right anterior thoracotomy. Despite 5 LPM of central VA ECMO flow, the patient still was hypoxic with saturations in the 80s, so his peripheral cannulas were left in place, with central ECMO delivering 4.5 liters/minute and peripheral VA ECMO delivering 2-2.5 liters per minute of flow. With this configuration of central and peripheral VV-AA ECMO, the patient was able to maintain saturations in the 80s and sit upright.

Results: A suitable donor became available 6 days later, and he underwent bilateral lung transplant via clamshell incision. Intraoperatively, a pulmonary artery drainage cannula was added to facilitate depressurization of the PA. The lung transplant operation was otherwise uneventful, and the patient was decannulated from ECMO in the operating room. He experienced grade 1 PGD at 24 and 72 hours and required significant physical rehabilitation post-transplant, discharging on post-operative day 72 on room air.

Conclusions: In rare instances, even central venoarterial ECMO does not provide adequate cardiopulmonary support as bridge to lung transplantation. The addition of another ECMO circuit may provide the additional support needed, particularly in obese patients with severe pulmonary hypertension.

ECpella Bridge to Orthotopic Heart Transplant in a Patient Initially Suspected of Antiphospholipid Syndrome

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Introduction: Antiphospholipid syndrome (APS) associated cardiomyopathy carries a poor prognosis, and management of cardiogenic shock in this population remains challenging due to hemodynamic instability and thrombotic risk. Here we describe a previously healthy patient who presented in cardiogenic shock, was treated for suspected antiphospholipid syndrome, and was successfully bridged to orthotopic heart transplant with ECpella support.

Methods: A 29-year-old man with no significant past medical history, family history of BAG3 mutation associated cardiomyopathy, presented with dyspnea and pleuritic chest pain for several days and lower extremity edema for two weeks. He was noted to be tachycardic on exam, with AST 132, ALT 598, total bilirubin 3.9, creatinine 1.1, and lactate 2.9. Echocardiogram demonstrated severely dilated left ventricle with EF 15% and severe mitral regurgitation with preserved RV function. Right heart catheterization demonstrated a cardiac index of 2.5 with CVP 20, PAP 45/30 (mean 33) with a PCWP of 21. CT scan demonstrated multiple splenic infarcts as well as bilateral pulmonary artery filling defects consistent with thrombus. His markers of end organ perfusion deteriorated on vasoactive agents alone but improved on insertion of a femoral intra-aortic balloon pump. An Impella 5.5 was inserted via the right axillary approach and kept on p9 with flows >5 liters per minute. He underwent evaluation for heart transplantation, during which he tested positive for anticardiolipin antibody consistent with catastrophic antiphospholipid syndrome. This was managed with high dose steroids, cellcept, plasma exchange, and systemic anticoagulation.

After a month of Impella 5.5 support, the patient was placed on the waitlist for heart transplantation. However, he had persistently elevated CVP despite diuresis, pulmonary hypertension from persistent mitral regurgitation, and rising creatinine, so he was escalated to peripheral venoarterial ECMO support via femoral cannulation.

Results: Seven days after escalation, a suitable donor became available and the patient underwent orthotopic heart transplant uneventfully. His post-operative course was complicated by return to the operating room for bleeding on post-operative day 1 and prolonged air-leak from the right lung which was managed with chest tube drainage. The patient was discharged on post-transplant day 34 with excellent graft function and continues to do well as an outpatient. Repeat antiphospholipid antibody testing at 12 weeks was negative.

Conclusion: A young patient presented with fulminant cardiogenic shock and initial concern for antiphospholipid syndrome. Prolonged mechanical circulatory support with the Impella 5.5 and subsequent escalation to VA-ECMO successfully bridged the patient to orthotopic heart transplantation.

Characterizing Social Determinants of Health in GI Cancer Surgery: Insights From the All of Us Research Program

Manar Al Rubaye BS, Kaleem Ahmed MD, Sheriff Issaka, Muhammad Maisam Ali, Benjamin Cher MD, Anas Awan, Sharon Weber MD, Nabeel Zafar MD

Introduction: Social Determinants of Health (SDoH) are increasingly recognized as critical contributors to cancer outcomes. Understanding SDoH among patients undergoing cancer surgery may reveal disparities that influence care and recovery. This study assessed the prevalence and variation of SDoH among patients undergoing gastrointestinal (GI) cancer surgery using a national dataset.

Methods: We conducted a cross-sectional analysis using the National Institutes of Health *All of Us* Research Program. Adults with GI cancer were identified using diagnosis codes, and surgery was confirmed using procedure codes. Participants who completed the SDoH survey were included. Descriptive statistics summarize demographics and SDoH domains: economic stability, healthcare access, neighborhood environment, and social context.

Results: Of 6,620 participants with GI cancer, 1,747 underwent surgery; 470 (26.9%) completed the SDoH survey. Mean age was 69.4 years; 82.1% were White and 61.3% had college degrees. Most had health insurance (96.6%) and stable housing (88.7%), though 25.5% reported poor housing quality and 7.6% reported food insecurity. PROMIS T-scores for physical and mental health were below average at 37.0 and 38.4, respectively.

Conclusion: Despite favorable SDoH profiles, GI cancer surgery patients reported below-average physical and mental health. These findings highlight the need to integrate multidomain SDoH data in cancer care research.

Table 1: Social Determinants of Health constructs for selected All of Us cohort

Construct	Mean (SD)	Tertile 1 (Low) N, (%)	Tertile 2 (Medium) N, (%)	Tertile 3 (High) N, (%)
Social Support	3.90 (0.52)	99 (0.21)	52 (0.11)	319 (0.68)
Loneliness	14.61 (4.80)	223 (0.48)	165 (0.35)	81 (0.17)
Perceived Discrimination	3.94 (0.54)	156 (0.33)	174 (0.37)	137 (0.30)
Perceived Stress	11.63 (7.01)	296 (0.63)	156 (0.33)	16 (0.04)
Physical Disorder	2.13, (0.25)	276 (0.59)	67 (0.14)	127 (0.27)
Global Physical Health	37.02 (1.90)	442 (0.94)	28 (0.06)	0 (0.00)
Global Mental Health	38.35 (1.86)	331 (.0.70)	139 (0.30)	0 (0.00)

A Crisis within a Crisis? Racial Disparities in Pancreatic Cancer Before and After COVID-19

Benjamin Cher, Alessandro Paro, Ping Zhu, Maisam Ali, Syed Nabeel Zafar

Introduction: The COVID-19 pandemic disrupted healthcare, affecting vulnerable populations disproportionately. The objective of this study was to assess whether the pandemic worsened disparities for patients with pancreatic adenocarcinoma (PDAC).

Methods: We included adult patients with PDAC from the National Cancer Database, years 2016-2022. Two groups were compared; non-Hispanic-White (NHW) and non-Hispanic-Black (NHB). We assessed factors typically disparate between these populations including presentation with metastatic disease, receipt of surgery among patients with non-metastatic disease, receipt of neoadjuvant chemotherapy if undergoing surgery, post-operative 90-day mortality, and overall survival. Difference-in-differences regression models were used to evaluate the association between the pandemic and racial disparities. Covariates included demographics, clinical, and facility-level variables. Parallel trends assumptions were verified by visual inspection of the trendlines.

Results: Of 223,740 patients, 191,921 (86%) were NHW, and 31,819 (14%) were NHB. Average age was 70 years (±11), and 52% were male. In multivariable analyses, both before and after the pandemic, NHB patients had lower survival, were more likely to present with metastatic disease, were less likely to undergo surgery, and were less likely to receive neoadjuvant therapy (all p<0.05, **Figure 1**). For both NHB and NHW patients, receipt of surgery decreased, while receipt of neoadjuvant therapy increased during the pandemic. The difference-in-differences analysis revealed no disproportional difference by race for any of the outcomes (p>0.05 for all).

Conclusion: At Commission on Cancer centers, the pandemic did *not* worsen the disparity gap amongst patients with PDAC. Nevertheless, racial disparities that existed prior to the pandemic persist and must be addressed.

Figure 1: Pandemic Impact on Racial Disparities in Outcomes for Patients with Pancreatic Adenocarcinoma, comparing non-Hispanic-Black versus non-Hispanic-White, post-COVID pandemic (2020-2022) versus pre-COVID pandemic (2016-2019)

	Adjusted Probability of Outcome** (Percent, 95% Confidence Interval)				Pandemic Impact on Racial Disparity (Odds Ratio for non-Hispanic-Black versus non-Hispanic-White,** Post- versus Pre-COVID, 95% Confidence Interval)
	Pre-COVID		Post-COVID		
Outcome	Non-Hispanic White	Non-Hispanic Black	Non-Hispanic White	Non-Hispanic Black	
Receipt of surgery					
non-metastatic disease (stages 1-3)	48.4 (48, 48.8)*	38 (37, 39.1)*	42.9 (42.5, 43.4)*	33.3 (32.2, 34.5)*	1.02 (0.94, 1.1)
stage 1 disease	43.2 (42.4, 43.9)*	33.6 (31.8, 35.4)*	42.2 (41.4, 42.9)*	31.7 (30, 33.5)*	0.95 (0.83, 1.09)
stage 2 disease	61.2 (60.6, 61.8)*	51.1 (49.4, 52.8)*	50.3 (49.4, 51.2)*	40.8 (38.6, 43)*	1.03 (0.91, 1.17)
stage 3 disease	32.3 (31.5, 33.1)*	24.7 (22.9, 26.4)*	35.3 (34.4, 36.2)*	27.3 (25.3, 29.3)*	1 (0.86, 1.17)
Receipt of neoadjuvant chemotherapy if undergoing surgery					
non-metastatic disease (stages 1-3)	31.9 (31.3, 32.4)*	25.9 (24.4, 27.3)*	46.8 (46.1, 47.5)*	39.8 (37.9, 41.7)*	1.01 (0.9, 1.14)
stage 1 disease	46.7 (45.6, 47.9)*	42.4 (39.2, 45.7)*	63.1 (62, 64.2)*	56.4 (53.2, 59.6)*	0.89 (0.72, 1.11)
stage 2 disease	27.6 (26.8, 28.3)*	22.6 (20.7, 24.5)*	38.9 (37.6, 40.1)*	33.9 (30.7, 37.1)*	1.05 (0.86, 1.28)
stage 3 disease	23.2 (22, 24.5)*	15.1 (12.2, 17.9)*	29 (27.5, 30.4)*	22 (18.6, 25.5)*	1.19 (0.86, 1.64)
Post-surgical 90 day mortality	5.4 (5.1, 5.7)	5.6 (4.7, 6.5)	5.4 (4.9, 5.8)	5.2 (4, 6.4)*	0.93 (0.68, 1.27)
Presentation with metastatic (stage 4) versus non-metastatic (stages 1-3) disease	49.8 (49.5, 50.1)*	53.8 (53, 54.5)*	50 (49.6, 50.3)*	53.6 (52.7, 54.4)*	0.98 (0.94, 1.03)
Overall Survival (Hazard ratio for Death and 95% Confidence Interval**, non-Hispanic-Black versus non-Hispanic-White)	-	1.10 (1.08, 1.13)*	-	1.11 (1.08, 1.14)*	1.00 (0.97, 1.04)

*Statistically Significant (p<0.05), comparing non-Hispanic Black versus non-Hispanic White
**Adjusted for age, sex, facility type, facility location, and Charlson-Deyo comorbidity score

HOUSES Index: A Novel, Patient-Level Measure of Socioeconomic Status Linking Real-World Housing Data to Surgical Outcomes in Pancreatic Ductal Adenocarcinoma

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Introduction: Health disparities research often relies on census-based social determinants of health (SDoH), which risks ecological fallacy and limits patient-level inference. The HOUsing-based SocioEconomic Status (HOUSES) index, a novel, patient-level SES metric derived from individual addresses, overcomes this limitation. We examined its association with short- and long-term outcomes after pancreatectomy for pancreatic ductal adenocarcinoma (PDAC).

Methods: We retrospectively analyzed data from all adults undergoing PDAC resection at a high-volume academic center (2016–2024). HOUSES geocodes unit size, value, bedrooms, and bathrooms into a weighted z-score (higher = better SES). Patients were divided by HOUSES quartiles and dichotomized (Q1 vs Q2–4). Outcomes included 30-day mortality, readmission, prolonged stay (≥75th percentile), major complications, and overall survival (OS; surgery to death/last follow-up). Associations were tested using multivariable logistic and Cox regression. For all outcomes, we created 3 models: Model 1 (unadjusted), Model 2 (adjusting for clinicopathologic, socioeconomic, and treatment-related covariates significant on univariable analysis), and Model 3 (Model 2 + census-level median household income and Area Deprivation Index [ADI]).

Results: Of 234 patients, mean age was 66.3 years, 41.9% were female; 95.8% non-Hispanic White; and 76.2% had stage I/II disease. Q1 patients (worse SES) were less likely to receive any chemotherapy (84.7% vs 94.9%, p<0.02); no other differences in baseline characteristics were observed. HOUSES demonstrated moderate correlations with ADI (Spearman ρ=-0.196) and median household income (ρ=+0.223). 30-day mortality occurred in 1.3%, unplanned readmission in 15.8%, prolonged stay in 23.1%, and major complications in 25.2% of patients. Q1 was associated with a prolonged length of stay in Model 1 (OR: 2.24, 1.04-5.26), though this association was attenuated in Models 2 and 3. Median follow-up time was 28.1 months, and median OS was 30.2 months. HOUSES was not associated with OS in Model 1; however, patients in Q2-4 had improved survival in Models 2 (HR: 0.60, 0.37-0.95) and 3 (HR: 0.61, 0.38-0.99) (**Table**).

Conclusion: HOUSES was associated with long-term outcomes post-PDAC resection after adjusting for clinicopathologic and traditional socioeconomic covariates. HOUSES may help identify patients at higher risk of adverse surgical outcomes – future work will examine its utility in other gastrointestinal cancers and integration into EHR-based risk models.

Table: Results of uni- and multivariable Cox proportional hazards models for predictors of OS after surgical resection for PDAC. Hazard ratios are provided with 95% confidence intervals.

Variable	Category	Model 1*	Model 2†	Model 3§
HOUSES (reference: Q1, ≤33)	Q2-4, >33	0.73 [0.48–1.13]	**0.60 [0.37–0.95]**	**0.62 [0.38–0.99]**
Insurance status (reference: Private)	Medicare	**0.08 [0.03–0.19]**	**0.07 [0.03–0.18]**	**0.08 [0.03–0.20]**
	Self/Medicaid	**1.56 [1.04–2.34]**	**1.82 [1.10–3.02]**	**1.93 [1.15–3.24]**
Rural residence (reference: Rural)	Urban	**0.59 [0.38–0.93]**	0.74 [0.46–1.21]	0.67 [0.40–1.12]
Pathological stage (reference: I/II)	III	**1.75 [1.13–2.70]**	**1.67 [1.04–2.69]**	**1.69 [1.02–2.81]**
Pathological grade (reference: G1)	G2/3	**2.14 [1.26–3.62]**	1.17 [0.64–2.11]	1.26 [0.70–2.29]
Histopathological response (reference: Major)	Minor	**3.38 [1.32–8.65]**	**3.88 [1.22–12.38]**	**3.35 [1.03–10.90]**
Receipt of vascular resection (reference: No)	Yes	**2.25 [1.46–3.47]**	1.14 [0.69–1.88]	1.17 [0.70–1.95]
National Area Deprivation Index (reference: ≤43)	44-64	1.05 [0.65–1.69]	NA	0.98 [0.54–1.78]
	≥65	1.54 [0.96–2.49]	NA	1.79 [1.00–3.23]
Median income (reference: <$50,000)	50,000-140,000	0.56 [0.08–4.06]	NA	0.58 [0.07–4.55]
	>140,000	0.98 [0.13–7.55]	NA	0.63 [0.07–5.66]

*Univariable analysis. †Included HOUSES, insurance status, rural residence, pathological stage, grade, and response, receipt of vascular resection. §Included census-level median household income and Area Deprivation Index in addition to all variables in Model 2. NA: Not applicable.

A Nationwide Assessment of Cancer Outcome Disparities Using Delta Mortality-to-Incidence Ratios (dMIRs)

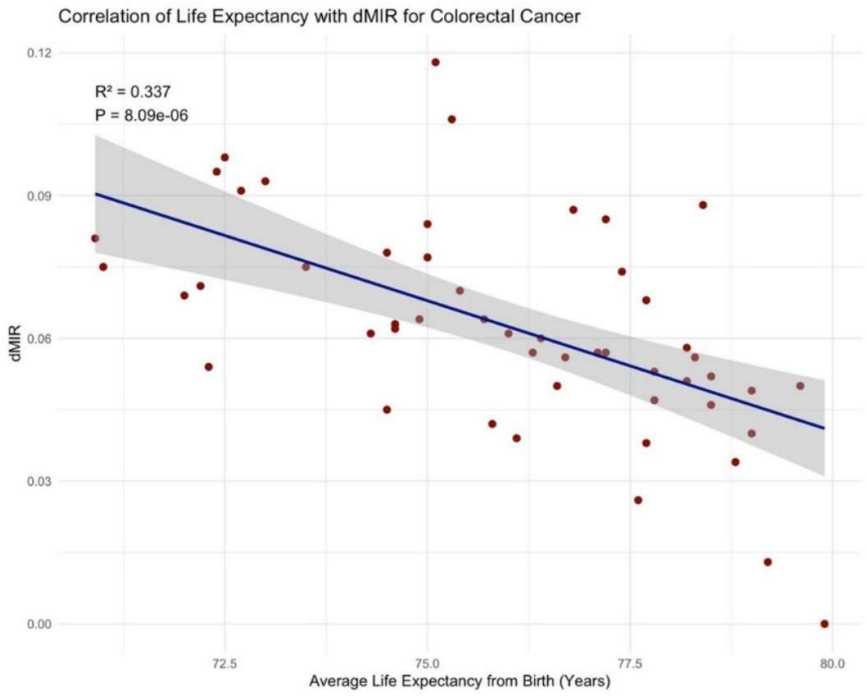
Madison Foley, Mary Hewitt, Sehar Salim Virani MBBS, Danish Ali, Muhammad Maisam Ali, Aimal Khan, Syed Nabeel Zafar

Introduction: Cancer remains a leading cause of morbidity and mortality in the United States, with over 2 million new cases diagnosed annually. The mortality-to-incidence ratio (MIR) measures cancer outcomes by dividing mortality by incidence. Delta MIR (dMIR) quantifies disparities by comparing each state's MIR to the best-performing state. We aimed to assess state-level cancer outcome disparities using dMIRs.

Methods: We extracted age-adjusted state-specific incidence and mortality rates for 33 cancers from 50 states and the District of Columbia using data from CDC WONDER (Centers for Disease Control and Prevention Wide-Ranging Online Data for Epidemiologic Research) database. ICD-10 codes were used to define each cancer site. For each cancer and state, MIR was calculated as the ratio of age-adjusted mortality to incidence. The state with the lowest MIR for each cancer (with ≥30 cases) was designated the benchmark. dMIR was calculated as the difference between a state's MIR and the best-performing state's MIR. We then correlated dMIR values with life expectancy for each cancer type using scatterplots.

Results: The median dMIR across all cancers was 0.066 (IQR: 0.074 0.112–0.038). Connecticut was the top-performing state, ranking lowest in MIR for 13 cancer types. For the most common cancers in the USA (breast, prostate, lung, and colorectal), the states with the lowest MIR were Hawaii for female breast (0.126) and colorectal (0.303), New Jersey for prostate (0.131), and Connecticut for lung and bronchus (0.635). Comparatively, the highest dMIR values, reflecting the greatest excess mortality, were observed in other non-epithelial skin cancers in Oklahoma (0.664), and bones and joints cancers in Arkansas (0.662). For colorectal cancer, the state with the highest dMIR was Nevada (0.118), followed by the District of Columbia (0.106), and Arkansas (0.098). For lung and bronchus cancer, the states with the highest dMIR values were Wyoming (0.177), Arkansas (0.158), and Alabama (0.156). For female breast cancer, the highest dMIR values were in Mississippi (0.080), Louisiana (0.078), and District of Columbia (0.076). Higher dMIR values were significantly associated with a lower life expectancy in all cancer sites combined ($r = 0.706$; $p < 0.01$) as well as colorectal cancer ($R = 0.337$, $p < 0.01$) (Figure).

Conclusion: dMIR can be used as a benchmarking tool to measure cancer mortality disparities between U.S. states dMIR correlates strongly with key health disparity metrics, such as life expectancy, and may help identify priority regions to guide targeted cancer control efforts.



Prevalence and Factors associated with Financial Toxicity Among Gastrointestinal Cancer Patients in Pakistan

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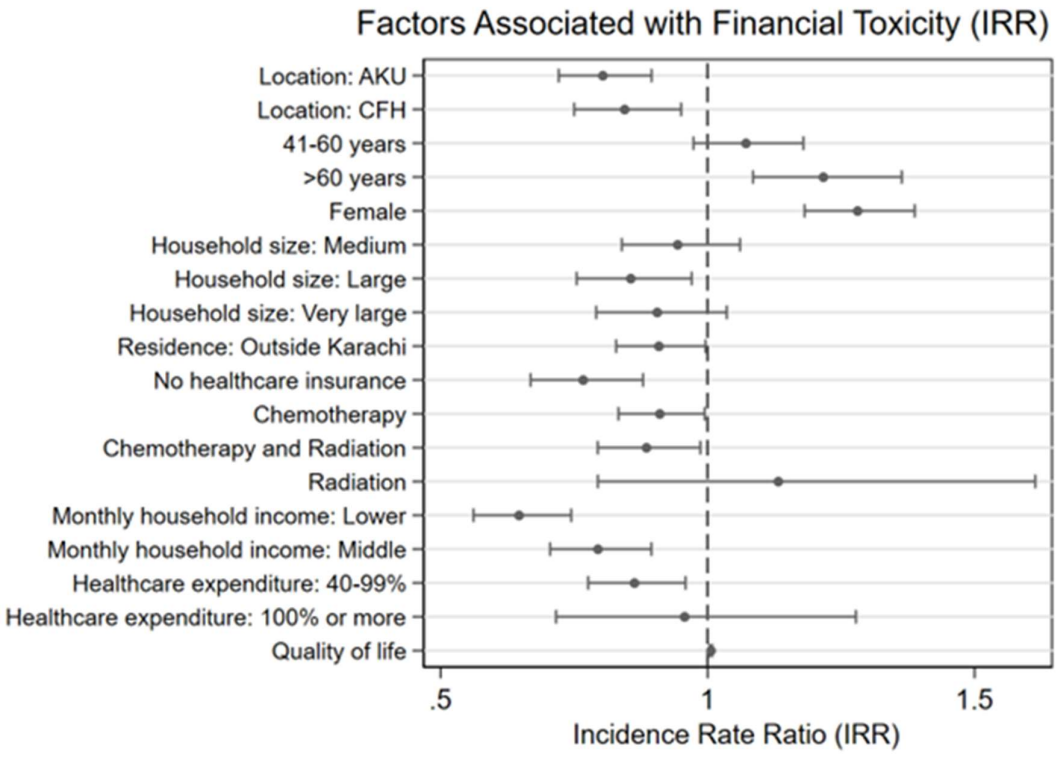
Introduction: Financial toxicity (FT) impacts cancer care in low- and middle-income countries (LMICs), affecting treatment adherence and quality of life. This study assesses FT prevalence and associated factors among gastrointestinal (GI) cancer patients across distinct healthcare systems in Pakistan.

Methods: A cross-sectional study was conducted across three tertiary care centers in Karachi: Aga Khan University Hospital (AKUH, private, fee-for-service), Jinnah Postgraduate Medical Center (JPMC, public, free), and Cancer Foundation Hospital (CFH, private-philanthropy, subsidized). FT was assessed using the Urdu version of the Comprehensive Score for Financial Toxicity–Functional Assessment of Chronic Illness Therapy (COST-FACIT). Multivariable negative binomial regression identified factors linked to high FT.

Results: Of 375 patients, 44.5% were from AKUH, 33.6% from JPMC, and 21.9% from CFH. Mean age was 50.8 ± 14.4 years, with 62.4% males. Only 8.3% had health insurance, and the median International Wealth Index (IWI) was 79.9 (IQR: 57.1–95.1). Catastrophic healthcare expenditure affected 41.7%. The mean COST-FACIT score was 16.0 ± 7.4, with 46.1% experiencing mild FT (score: 14–26) and 41.9% moderate FT (score: ≤14). Patients delaying or forgoing care had higher FT ($p < 0.001$). Borrowing money, selling assets, or cutting essential expenses were strongly associated with increased FT ($p < 0.001$). Patients at AKUH reported higher FT than JPMC (IRR = 0.84, 95% CI: 0.74–0.97). Younger patients (21–50 years) (IRR = 0.66, 95% CI: 0.46–0.95) and those receiving chemotherapy (IRR = 0.89, 95% CI: 0.81–0.98) experienced higher FT. Females (IRR = 1.36, 95% CI: 1.17–1.58) and higher socioeconomic status (IRR = 1.39, 95% CI: 1.06–1.83) were associated with lower FT.

Conclusions: Nearly 85% of GI cancer patients faced FT. Younger age, male gender, lower socioeconomic status, and systemic therapy were associated with higher FT. Subsidized care, financial support, and institution-specific strategies are critical to mitigating FT in LMIC healthcare systems.



Rule-Based Natural Language Processing for Detection of Suspicious Radiologic Pancreatic Findings

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Introduction: Earlier detection of pancreatic ductal adenocarcinoma (PDAC) is crucial to improving overall survival. To support the goal of earlier detection, we aim to develop a large language model (LLM) capable of accurately identifying new PDAC cases from cross-sectional imaging reports. To minimize the report volume needing LLM analysis, this study aimed to develop and test a simple rule-based approach using natural language processing (NLP) techniques to filter out clearly negative (normal pancreas) results from imaging reports.

Methods: Two authors reviewed a training set of 1,250 reports from patients diagnosed with PDAC at a high-volume center to extract keywords/phrases describing findings suspicious for malignancy, cyst, benign pathologies, or normal. These phrases informed the arguments of 4 of the 5 available modifiable parameters ('target', 'skip', 'absolute positive', and 'absolute negative' phrases) of an open-source NLP classifier. An additional 'relevance parameter' was added to only check for absolute positives and negatives when relevant to the pancreas in the report. The 'absolute positive' phrase parameter was modified to check these phrases against the NLP tool's negation algorithm to avoid naively marking the text as present, reducing false positives. A validation set of 1,001 randomly selected reports from patients who underwent cross-sectional imaging for any reason at our institution in 2024 was then independently classified by the two authors and the NLP tool. Imaging reports indicating previous pancreatectomy were excluded. The NLP classifier's performance was assessed through sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV), using the study team's manual annotations as the reference standard.

Results: There was near-perfect agreement between the authors in their classification of the validation set (Cohen's kappa of 0.95). Of 9.9% reports with 'positive' findings, malignancy, cyst, and benign findings were mentioned in 2.3%, 2.8%, and 4.8%, respectively. Analysis of the classifier revealed optimal sensitivity (100.0%) and NPV (100.0%), though it lacked specificity (65.0%) and PPV (24.1%). Using this method, we were able to automatically screen out 57.8% of the 1,001 reports, significantly reducing manual review and LLM computational burden.

Conclusion: Our rule-based approach performed well at filtering out negative (normal pancreatic findings), appropriately removing over half the reports needing further analysis. This is the first step towards developing LLMs that accurately detect potentially positive new PDAC cases and minimize computational burden.

Should the PREOPANC and JSAP-05 trials drive use of neo-adjuvant chemotherapy in patients with resectable pancreatic ductal adenocarcinoma? Assessing the evidence using the Robustness of Inference to Replacement

Benjamin Cher, Qinyun Lin, Kenneth Frank, Courtney Balentine, Syed Nabeel Zafar

Introduction: There is debate over whether patients with resectable exocrine pancreatic ductal adenocarcinoma (PDAC) should receive neo-adjuvant chemotherapy or up-front surgical resection. Two recently published randomized trials, PREOPANC and JSAP-05, found that NAC improved survival over up-front resection. The purpose of this study was to assess the strength of the findings of these trials, aiming to support more informed discussions among pancreatic surgeons about whether they should change clinical practice.

Methods: We evaluated the robustness of the PREOPANC and JSAP-05 trials using a novel method for sensitivity analysis called the Robustness of Inferences to Replacement (RIR). The RIR quantifies how much resampling from a null hypothesis population would be needed to change a study result (significant difference becomes non-significant). If the RIR is high, then a study is considered more robust because it is unlikely that repeating the study with a new sample would generate a different result.

Results: The main finding of PREOPANC (n=246) was that NAC increased overall survival (hazard ratio for death 0.73, 95% CI 0.56-0.96) compared to up-front resection. The RIR was 31 (out of 246), meaning that 31 NAC patients would have had to experience the same survival as up-front resection patients for the result to change, meaning that for the result to be wrong, sources of bias would have had to be responsible for 13% of the observed effect. The main finding of JSAP-05 (n=364) was that NAC increased overall survival (hazard ratio for death 0.73, 95% CI 0.56, 0.95) over up-front resection. The RIR was 52 (out of 364), meaning that for the result to be wrong, sources of bias would have had to be responsible for 14% of the observed effect.

Conclusions: The PREOPANC and JSAP-05 trials would have come to opposite conclusions (i.e., NAC was not beneficial) if as little as 13-14% of the observed difference between NAC and up-front resection was due to bias. This suggests that if the trials were repeated with different selection criteria or larger sample sizes, the results may be different. This analysis sheds doubt on the strength of the trials' findings. Further trials are needed to support decision-making for patients with resectable PDAC.

Uncovering the Roots of Inequity: Social Determinants and Racial Disparities Among Gastrointestinal Cancer Patients

Manar Al Rubaye BS, Kaleem Ahmed MD, Sheriff Issaka BS, Muhammad Maisam Ali, Lily Stalter, Anas Awan, Sharon Weber MD, Nabeel Zafar MD

Introduction: Social Determinants of Health (SDoH) profoundly influence cancer outcomes, yet their distribution among racially diverse gastrointestinal (GI) cancer patients remains understudied. This study examines racial differences in SDoH between non-Hispanic White (NHW) and Non-White (including Asian, African American, and Hispanic) patients with gastrointestinal (GI) cancers using data from the All of Us Research Program.

Methods: A total of 6,620 participants with GI cancer were identified using ICD-10 and SNOMED codes, of whom 1,831 completed the SDoH survey and were included in the analysis. Descriptive statistics summarized SDoH constructs such as social cohesion, support, and neighborhood disorder. Variables were categorized using validated scoring tools or grouped into tertiles. Group comparisons used chi-square, t-tests, or Wilcoxon rank-sum tests.

Results: Among 1,831 GI cancer patients, 1,478 (80.7%) were NHW and 255 (13.9%) Non-White. NHW participants were older (71.0 vs. 64.2 years) and reported greater social cohesion (3.9 vs. 3.6, $p<0.001$) and support (3.9 vs. 3.7, $p<0.001$). Non-White patients reported higher perceived discrimination (1.7 vs. 1.5, $p=0.016$), daily spiritual experience (4.5 vs. 3.7, $p<0.001$), neighborhood disorder (2.2 vs. 2.1, $p<0.001$), food insecurity (23.6% vs. 5.8%, $p<0.001$), and housing issues (41.8% vs. 21.8%, $p<0.001$). Delayed care (47.1% vs. 26.8%, $p<0.001$) and unaffordability of care (9.9% vs. 3.4%, $p<0.001$) were also more common.

Conclusion: Significant racial disparities in SDoH were observed among GI cancer patients. Non-White individuals faced greater economic hardship, environmental disadvantage, and barriers to healthcare access.

Socioeconomic and Geographic Variation in Response to Trauma Medical Home Intervention

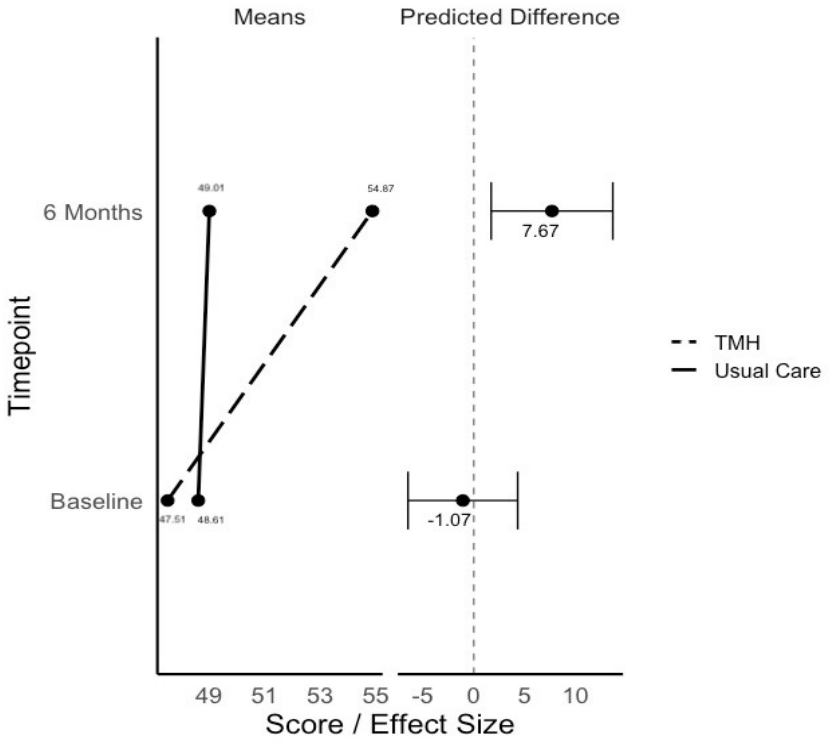
Ben Zarzaur MD, MPH, Emma Holler MPH, Damaris Ortiz MD, Anthony Perkins MS, Sujuan Gao PhD, Dustin French PhD, Babar Khan MD, Malaz Boustani MD, MPH

Introduction: Many injury survivors experience long-lasting biopsychosocial challenges after hospital discharge. Geographic context and neighborhood socioeconomic status can shape recovery trajectories. Coordinated care models seek to improve these outcomes. One such model, Trauma Medical Home (TMH), uses a nurse care coordinator working with trauma surgeons, pulmonary critical care physicians, geriatricians, nurses, psychologists, and primary care providers, following standardized protocols to support recovery for older adults after injury. A multi-center randomized controlled trial showed modest benefit of TMH overall. However, whether its impact differs across geographic and socioeconomic subgroups remains unclear. We hypothesized that TMH would provide greater benefit for patients living in rural areas and those from more socioeconomically deprived neighborhoods, measured using the Area Deprivation Index (ADI).

Methods: The parent trial enrolled adults aged ≥50 years with an Injury Severity Score ≥9 across four Level I trauma centers. For this subgroup analysis, participants were stratified by rural versus urban residence and by ADI (with high ADI defined as the top 20%). Outcomes included SF-36 Physical and Mental Component Scores (PCS, MCS), depression (PHQ-9), anxiety (GAD-7), physical function (SPPB), and healthcare utilization. Interaction effects between TMH and rural/urban status or ADI were examined at baseline, 6 months, and 12 months.

Results: A total of 430 patients were included (216 TMH, 214 usual care). At baseline, rural participants had fewer years of education compared with urban participants (12.4–12.8 vs. 14.3–14.6 years, p=0.008). Across rural and urban groups, TMH showed similar effects on quality of life, psychological outcomes, physical function, and healthcare utilization at 6 and 12 months. Stratification by ADI revealed more variation than rural/urban status alone. In highly disadvantaged urban neighborhoods, baseline mental health scores were similar between TMH and usual care groups. By 6 months, TMH participants had significantly higher MCS scores (54.9 ± 8.8 vs. 49.0 ± 13.1; predicted difference 7.7, 95% CI 1.7–13.6, p=0.012), demonstrating a clinically meaningful benefit. Improvements were less pronounced in other strata.

Conclusion: TMH was associated with the greatest improvements in mental health scores among patients with high socioeconomic disadvantage. The effect was most pronounced in urban settings, where ADI gaps are largest. Coordinated care interventions like TMH may improve long-term outcomes among vulnerable patients in higher ADI areas. This may mitigate disparities in long-term care. Moreover, these results point to the value of embedding structured care coordination, mental health assessment, and social support services within the TMH framework as drivers of this benefit.



Education
Research Abstracts

Can Global Surgery Participation Ameliorate Symptoms of Burnout?

Jasmine Craig MD, Nada Botros BS, Rosaline Reynolds MD, Michael Bentz MD

Background: Among academic plastic surgery programs, interest in global surgery has grown, as has concern about burnout. The purpose of this study is to explore potential factors associated with burnout, with particular focus on participation in global surgery as a possible protective factor.

Methods: A survey was designed to collect personal and professional characteristics, and measure burnout using the validated modified Maslach Burnout Inventory instrument. A cross-sectional sample of faculty and trainees at US academic plastic surgery programs were invited to participate in the study, via email solicitation and distribution through the American Council of Academic Plastic Surgeons membership listserv. Standard summary statistics were used to characterize the sample. Univariate and multivariate analyses were conducted to evaluate risk and protective factors for burnout symptoms.

Results: Personal and professional characteristics of the 84 survey respondents are summarized in Table 1. 77% of survey respondents reported having global surgery experience. As a result of global surgery participation, 97% reported gaining deeper appreciation and gratitude for their chosen profession and their ability to make a difference in people's lives, and 94% reported renewed enthusiasm for personal and professional goals. Those with global surgery experience did not differ significantly in burnout symptoms compared to those without global surgery experience (p>0.05). Overall, 19% of all survey respondents experienced burnout symptoms at least once per week, with 31% feeling that their work schedule did not leave enough time for personal/family life. Characteristics associated with greater burnout included non-male gender identity (p=0.016) and being a resident (p=0.037). Non-male identity was independently associated with burnout in multivariate analysis (OR 12.2, p = 0.006).

Conclusion: Plastic surgeons who engage in global surgery find it valuable in cultivating commitment and engagement in a surgical career. This may be protective against burnout, including for residents and those of non-male gender identity who have greater associated prevalence of burnout. Recruitment for larger sample size is currently ongoing to increase power analysis to more thoroughly explore these associations. This data will then be enhanced with qualitative interviews to more closely examine motivations for participating in global surgery, career satisfaction, and sense of burnout.

Table 1. Personal and Professional Characteristics

	N (%) or Median (Q1, Q3) N= 84
Age, median	48.5 yrs (37, 62.5)
Gender	
Male	66 (78.6)
Female	17 (20.2)
Other	1 (1.2)
Relationship status	
Single	15 (17.9)
Married	63 (75.0)
Partnered	5 (5.9)
Widowed or widower	1 (1.2)
Ever divorced	
Yes	15 (17.9)
No	67 (79.8)
Missing	2 (2.3)
*Partner/spouse works outside home**	
Yes	45 (67.2)
No	22 (32.8)
Have children	
Yes	61 (72.6)
No	23 (27.4)
*Age of youngest child***	
<5 yr	16 (26.2)
5-12 yr	11 (18.0)
13-18 yr	8 (13.1)
19-22 yr	4 (6.6)
>22 yr	22 (36.1)
Training level	
Attending	68 (80.9)
Resident	16 (19.1)
Years in practice/training	
<3 yrs	11 (22.0)
3-6 yrs	20 (25.0)
7-9 yrs	5 (16.2)
10-19 yrs	15 (29.4)
20-30 yrs	13 (1.5)
>30 yrs	20 (5.9)
Hours worked per week	
<40 hrs	5 (5.9)
40-59 hrs	29 (34.5)
60-79 hrs	32 (38.1)
80-89 hrs	14 (16.7)
>90 hrs	4 (4.8)
Number of nights on call per week	
0	19 (22.6)
1-2	49 (58.3)
2-3	12 (14.3)
4-5	3 (3.6)
6-7	1 (1.2)
*Primary practice setting****	
Private	8 (11.7)
Academic medical center	53 (77.9)
Veterans hospital	1 (1.5)
Active military practice	1 (1.5)
Not in practice or retired	1 (1.5)
Other	4 (5.9)
*Academic rank^^*	
Instructor	2 (3.0)
Assistant professor	17 (25.8)
Associate professor	17 (25.8)
Full professor	30 (45.4)
*Primary method for determining compensation****	
Salaried, no incentive pay	18 (26.5)
Salaried, bonus pay based on billing	27 (39.7)
Incentive pay based entirely on billing	18 (26.5)
Other	5 (7.3)
Work schedule leaves enough time for personal/family life	
Strongly disagree	9 (10.7)
Somewhat disagree	17 (20.2)
Neither agree nor disagree	13 (15.5)
Somewhat agree	27 (32.1)
Strongly agree	18 (21.4)
Global surgery experience	
No	19 (22.6)
Yes	65 (77.4)
*Most recent global surgery experience^*	
<1 mo ago	4 (6.3)
2-6 mo ago	8 (12.5)
7-12 mo ago	16 (25.0)
1-2 yrs ago	18 (28.1)
>2 yrs ago	18 (28.1)

*67, **N=61, ***N=68, ^N=64, ^^N=66

Impact of a Coordinated Outreach Effort on Referral Volume to a Multidisciplinary Craniosynostosis Clinic

Jessica Blum MD, MSc, Aidan O'Shea ScB, Myiah Quach BS, Kendall Hansen BSN, RN, Kim Trimble BSN, RN, Nastassja Petermann DNP-FNP, Catharine Garland MD, Daniel Cho MD, PhD

Background: Recent research into disparities in craniosynostosis care has revealed barriers to accessing high quality craniofacial care that impact outcomes. Many challenges exist in connecting patients with concerning head shape differences to craniofacial teams: most primary care providers (PCPs) have never had formal training in evaluating head shape differences and many have never seen a child with craniosynostosis. To improve access to our multidisciplinary craniosynostosis clinic, an outreach program was developed and implemented to educate community PCPs about craniosynostosis and provide information about our team.

Methods: In coordination with our institution's provider relations team, a coordinated outreach effort to area PCPs was implemented over a 10-month period. A craniofacial surgeon provided training on the diagnosis and treatment of craniosynostosis as well as information on placing appropriate referrals, and an informational flyer about the multidisciplinary clinic was given to all providers. A retrospective analysis of patients evaluated at our multidisciplinary craniosynostosis clinic at a tertiary children's hospital was performed for the three calendar years before the outreach effort as well as the most recent 12 months.

Results: Outreach efforts consisted of one recorded educational lecture for a large tertiary healthcare system, five in-person Grand Rounds lectures at community hospitals, six introductory meetings at department meetings, and strategic visits to primary care practices. In the three years preceding the outreach efforts, an average of 75 new patients per year were seen in consultation in the multidisciplinary craniosynostosis clinic with 21.9% of referrals being diagnosed with craniosynostosis. In the most recent 12 months following completion of the outreach efforts, 123 new patients were seen in the clinic with a diagnosis rate of 21.1%. This represents a 65% increase in referral volume without an increase in non-craniosynostosis referrals to the dedicated craniosynostosis clinic resulting from our outreach efforts.

Conclusions: Many PCPs struggle with identifying children with craniosynostosis and making efficient referrals to dedicated craniofacial surgery teams. With targeted outreach efforts by established craniofacial teams, access to high quality craniofacial care can be enhanced by improving awareness of craniofacial teams, increasing diagnostic confidence, and facilitating communication between referral providers and surgeons.

Quantification of Microsurgical Skill Using DeepLabCut

Ilia Mikhailenko, Robert Johnson, Adarsh Patel, Lauren Feeley B.S., Aaron Dingle Ph.D., Samuel Poore M.D., Ph.D., Weifeng Zheng M.D.

Introduction: Microsurgical training is the cornerstone of plastic surgerical education; however, in most instances, microsurgical skill assessments are subjective and qualitative. The lack of standardization results in inconsistent feedback and may hinder trainee improvement. The objective of this study is to incorporate deep learning into surgical education to make objective metrics for skill assessment, allowing for more effective training and improved patient outcomes.

Methods: An open-source deep learning tool called DeepLabCut (DLC) was utilized to track microsurgical instruments during surgical procedures. A prototype model was trained to follow the location of microsurgical instruments during video recordings. The labeled data included a variety of tools and scenarios to ensure the model's robustness.

Trajectories of instruments will be analyzed for smoothness and jitter. Smoothness refers to the continuity and fluidity of instrument motion, with fewer abrupt changes in velocity indicating greater proficiency and control. Jitter represents high-frequency, involuntary instrument tremors that can compromise precision, with greater jitter indicating reduced stability during microsurgery.

To evaluate smoothness, the X-Y position data of surgical instruments will be compiled over the duration of the procedure using our DLC model and then convert it into velocity data. A spectral arc length of the velocity profile will be done in the frequency domain, with lower values representing smoother motion.

Jitter will be assessed by applying a high-pass filter to the instrument trajectory data. This process removes low-frequency components associated with intentional movement, and the remaining high-frequency components are indicative of involuntary tremors. The power of this high frequency filtered signal will be computed to represent the intensity of the jitter. A higher power value corresponds to increased tremor and reduced control.

Results: The prototype successfully tracked multiple instruments in real time with an acceptable degree of accuracy. Preliminary analysis demonstrated the model's capability to extract relevant movement in the X-Y plane. Translation of the X-Y position data into quantifiable movement metrics remains a work in progress.

Conclusion: This model represents a major leap toward standardized, data-driven evaluation in microsurgical training. It has the potential to revolutionize microsurgical education by providing objective analysis of microsurgical skill and feedback tailored specifically to the needs of the trainees. Further work will be devoted to the refinement of the scoring framework and validation of the model's accuracy via expert assessment.

Training Undergraduates to Deliver Fundamental Microsurgery Concepts to Pre-Medical Students

James King, Nnadozie Uchegbu MS, Esther Wang, Myiah Quach BS, Aaron Dingle PhD, Weifeng Zeng MD, Samuel Poore MD, PhD

Introduction: Microsurgery is a complex subspecialty of plastic surgery, and exposure to the field for non-medical students is often brief. Additionally, microsurgery instructors are scarce. The goal of this study was to determine the ability of novice microsurgery educators to deliver a standardized microsurgery curriculum to undergraduate and high school students. We also assessed the impact of early microsurgery exposure on the participants' enthusiasm for a career in surgery and more specifically microsurgery.

Methods: Three individuals (JEK, EW, NU) were trained as novice microsurgery educators by UW-Madison's Director of Microsurgical Education (WZ). The training method utilized a preexisting microsurgery curriculum developed by WZ and SOP for plastic surgery residents. Progress for the trainees was tracked using pre- and post-surveys measuring confidence. The three novice educators then delivered lessons of similar format to three separate cohorts (total n = 11) consisting of both undergraduate and high school students interested in a career in medicine. Pre- and post-training surveys assessed metrics such as participants' mood, confidence with surgical instruments and techniques, and enthusiasm for medicine and surgery as a career.

Results: Across the three cohorts, significant improvements were seen in participants' reported confidence in multiple skills defined in the survey. None of the participants reported to have been affected by extreme stress or agitation. No significant change was found in participants' interest in surgery or microsurgery as a career.

Conclusions: Novice microsurgery educators can successfully deliver a standardized microsurgery curriculum to pre-medical students. Significant improvements in participant confidence to perform multiple skills across each of the three cohorts suggest that novice microsurgery educators are effective at delivering microsurgery basics despite their limited expertise. Larger sample sizes from more diverse backgrounds would aid in the assessment of the course's impact on enthusiasm for medicine. An inherent limitation of this study in measuring that variable was the preexisting interest in medicine for all participants. A more objective assessment of skill improvement would also aid in validation of the education delivered by the novice microsurgery educators.

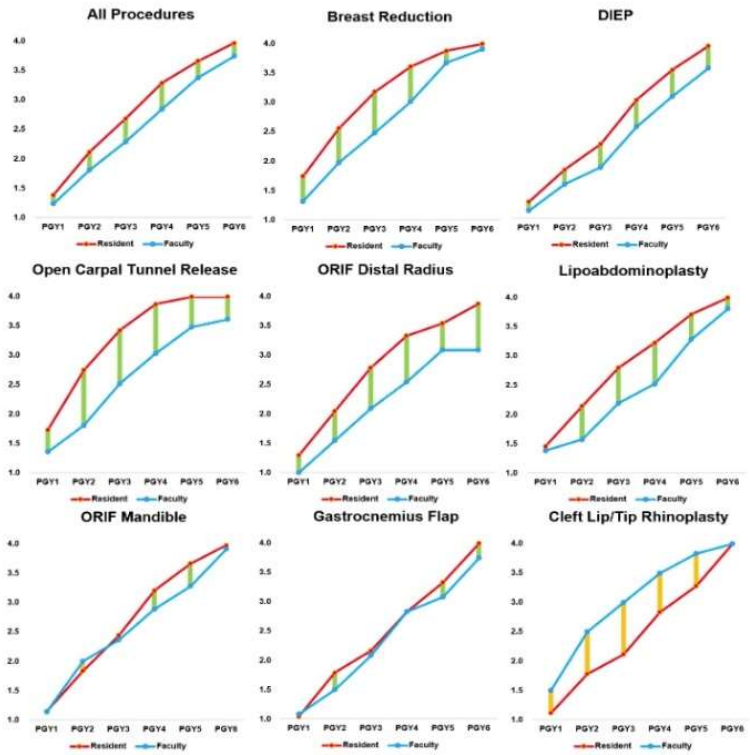
Exploring Perceptions of Autonomy in Plastic Surgery: A Comparison of Resident and Faculty- Generated Maps

Jasmine Craig MD/MPH, Kirsten Gunderson MD, Myiah Quach BS, Brian Gander MD, Michael Bentz MD, Katherine Gast MD

Background: Clear progression of operative autonomy is a cornerstone of surgical education, yet residents and faculty often hold different assumptions about what level of independence is appropriate at each stage of training. Misaligned expectations can lead to frustration, inefficiency, and variability in operative experiences. We piloted an autonomy mapping initiative using the Zwisch scale across eight commonly performed procedures to evaluate how resident and faculty perceptions align by PGY level, and to identify key gaps that can inform curriculum development.

Methods: Residents and faculty were asked to independently complete autonomy maps for eight procedures, with 6-18 key steps per procedure, including breast reduction(10 steps), lipoabdominoplasty (10), open carpal tunnel release (9), gastrocnemius flap(13), cleft lip/tip rhinoplasty (10), DIEP(18), and ORIF of mandible(10) and distal radius fractures(13). Each respondent rated expected levels of autonomy at every PGY level using the Zwisch framework of Show & Tell, Active Help, Passive Help, and Supervision Only. Faculty only completed procedures that are regular parts of their practice. Resident and faculty responses were de-identified and compiled by PGY level. Data analysis assesses the degree of congruence between resident and faculty responses, highlight procedures with high variability, and examine trends across years of training.

Results: The response rate for both residents and faculty were 57.8% (n=11/19) and 85.7%(n=12/14), respectively, totaling 4,364 autonomy data points. Kruskal-Wallis Test demonstrated significantly different distribution between resident and faculty groups ($p<0.001$) for all procedures. Mean agreement between resident and faculty ratings was the highest with ORIF of mandible and gastrocnemius. Procedures such as breast reduction and DIEP showing the greatest divergence. Alignment was most consistent at PGY1, while variability increased for procedures at the PGY3-4 levels. Preoperative markings and microsurgery anastomoses were consistently the procedural step with the least autonomy across PGY years. Trends in variability across procedures will be reported in detail once data compilation is complete.



Conclusion: Autonomy mapping provides a structured and transparent framework to clarify expectations between residents and faculty. Preliminary findings suggest that some procedures show strong alignment, while others reveal significant gaps in perceived readiness. These results can inform program-wide discussions on entrustment, enhance transparency, and improve resident understanding of progression. Additionally, awareness around delayed autonomy for certain steps can foster targeted educational initiatives to improve resident capability. This model is scalable and may ultimately promote more equitable and structured advancement in plastic surgery training.

The Financial Costs of Pursuing a Plastic Surgery Residency

Myiah Quach BS, Emily Zona BS, Jasmine Craig MD, MPH, Malibongwe Murapa, Samuel Poore MD, PhD, Suzanne Inchauste MD

Background: Integrated plastic surgery residency is one of the most competitive specialties to match as a medical student. Applicants looking to distinguish themselves from their peers invest heavily in dedicated research years, multiple away rotations, and conference attendance. Previous studies have been conducted assessing the costs of each of these components individually, but there has yet to be a comprehensive analysis of the financial toxicity to becoming a competitive plastic surgery residency applicant.

Methods: The authors reviewed the literature regarding the costs associated with applying into integrated plastic surgery. This included multiple PubMed queries and literature searches regarding the associated costs including away rotations, research fellowships, conference attendance, publication fees, residency applications, and interview travel.

Results: Significant costs were identified. The average matched applicant is likely to submit at least 85 applications, complete 12-13 interviews, complete 2-3 away rotations, publish at least once, and attend at least two plastic surgery conferences prior to entering the match. Our estimation for the costs associated with this process is $69,281 (Table 1). This is likely an underestimation as there are many costs we are unable to generalize including exact costs for items such as gas, parking, emergency funds, variations with methods of transport, lodging, shared expenses between peers, institutional discounts, etc.

Conclusion: The financial investment associated with becoming a successful applicant with an average chance of matching is substantial and unattainable for many without significant external supplementation. These costs are often considered necessary to gain experience and connections within the field but exacerbate existing disparities and limit access to the field. Additional efforts must be made to improve accessibility and limit financial barriers for PRS applicants such as subsidized travel, virtual interview options, and broad structural reforms within the match process.

Table 3. Total cost breakdown of expenses for the average applicant related to matching into integrated PRS residency.

Expense	Total Estimated Cost Based on the Average Applicant
Application Fees	$1,980
Interview Costs (12)	$7,738
Research Year (unpaid)	$39,000
Away rotations (3)	$14,841
Open-Access Journal APC	$2,781
National Conference Attendance (2)	
Registration (2)	$562
Hotel (2)	$2,536
Total Cost	$69,438

Assumptions in parentheses are as outlined in the manuscript text.

Cultivating a supportive culture: A qualitative assessment of upstander intervention amongst surgeons

Amber Sheth MD, MPH, Lulieth Martinez Gonzalez, Natalia Iding BS, Shannon Cannon MD, Sarah Jung PhD

Introduction*:* The field of surgery has an imperative to cultivate an inclusive workplace to promote wellness of both healthcare staff and patients. Upstander intervention, defined as intervening upon witnessing discrimination, is an important technique for responding to mistreatment and fostering an inclusive workplace environment. Although attending surgeons are often leaders in the clinical and operative environment, relatively little education is dedicated to helping attending surgeons support the needs of a diverse workforce; prior work by our group demonstrated a need for education around conscientious intervention in the face of witnessing discrimination.

Methods*:* To address this gap and develop an upstander training program for attending surgeons, semi-structured interviews of 20 attending surgeons at four institutions were conducted to assess institutional climate toward upstanding, experiences with prior upstander training, and suggestions for the development of an upstander training program. An inductive coding methodology was utilized to determine key themes by four research teams members through a constant comparative method.

Results*:* Participants described departmental climates favorable to upstander intervention and an interest in participating in upstander training. However, they reported a variety of personal and interpersonal barriers to being an upstander. Personal barriers to upstanding included not knowing what to say, while interpersonal barriers focused on navigating team dynamics and relationships in the setting of witnessing discrimination. Nuanced descriptions of hierarchy, and sensitivity to the needs of minoritized colleagues and patients characterized participant responses. Participants also described structural barriers to participating in upstander training, highlighting the need for institutional support when implementing upstander training.

Conclusions*:* Our study furthers the development of an upstander training program that is relevant to the needs of attending surgeons within diverse and multidisciplinary learning environments. Through the development of an upstander training program, this investigation promotes psychological safety, positive leadership, and supports an inclusive culture of surgery.

Teaching Informed Consent: A Scoping Review

Carly Sobol, Gabrielle Moore, Kimberly Kopecky, Leslie Christensen, Michael Blackie, Margaret Schwarze, Lauren Maggio

Introduction*:* Informed consent discussions are a critical and routine task for surgeons and surgical trainees. Surgical trainees have reported that they lack competence and confidence in obtaining consent. Despite its importance, there is no standardized training for medical students or surgery residents to learn skills for conducting informed consent discussions. Given the critical gap regarding informed consent education, this scoping review aims to characterize and describe the currently available educational curricula designed to teach informed consent communication to surgical trainees including medical students on surgery clerkships and surgery residents.

Methods: On 1/16/2025 the authors searched MEDLINE, Embase, ERIC, Education Source, Web of Science Core Collection, and MedEdPortal without date limitations for studies addressing informed consent education. Studies describing educational interventions to teach U.S. trainees were included. Studies reporting attitude, opinions, or beliefs without an educational intervention were excluded. We applied the Arksey and O'Malley framework to inform study stages and followed the PRISMA-ScR reporting guidelines. The AMA Code of Medical Ethics, Section 2.1.1, Informed Consent definition, was used as the gold standard to compare studies against.

Results: We identified 6,126 studies from databases and after removal of duplicates 4,337 studies were screened of which sixteen studies met criteria for data extraction. Graduate Medical Education learners were the focus of most studies with a wide range of teaching methods implemented by a variety of instructors including attending surgeons, risk management personnel, and peers. Defined elements of informed consent taught to learners was variable in the nine studies reporting definitions and only two studies included all of the AMA defined informed consent elements (figure 1). We found no overlap in the assessment tools used by the studies.

Conclusion: Future efforts should address the fundamental problem of what defines informed consent elements and subsequently what and how best to teach these elements to surgical learners.

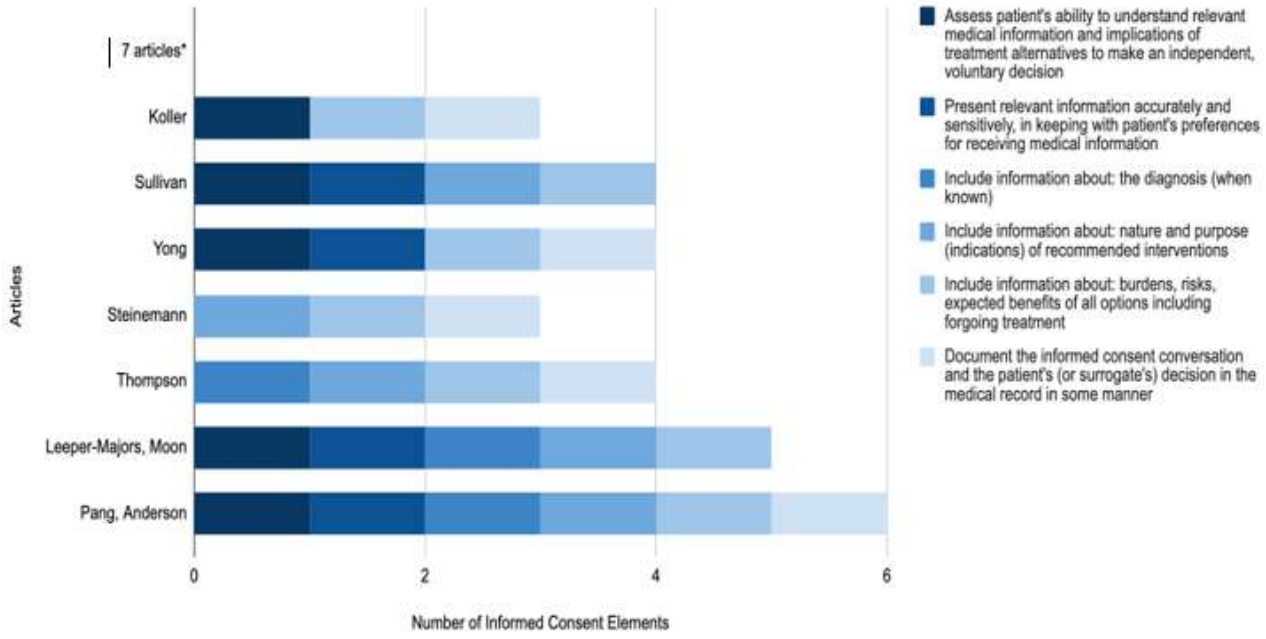


Figure 1. Number of Informed Consent Elements Described by Studies in Alignment with the Gold Standard AMA Definition. *No reported informed consent elements included in manuscripts: Kava, Haglund, Smink, Skinner, Wade, Patki, Newcomb

Developing a Synthetic Blood Vessel for Microsurgery Education

Sarah Hu, Christopher Djurasovic, Hannah Peterson, Aaron Dingle Ph.D., Samuel Poore M.D., Ph.D.

Introduction: Microsurgery training involves using artificial blood vessels for micro-anastomosis practice. A current issue in the field is that these vessels are extremely expensive to purchase, which prevents many students from receiving training. This project focuses on the design of a two-part 3D-printed cylinder-shaped mold and the identification of an appropriate material for the creation of synthetic blood vessels for use in micro-anastomosis training. Creation of new synthetic vessels would lower the many barriers and costs associated with traditional methods of microsurgical education.

Methods: Precise measurements were initially taken of the inner lumen of the commercial blood vessels, which were 1-3mm with a wall thickness of 0.1 mm. A two part mold was constructed in Solidworks. The mold consisted of 4 cylindrical holes with a diameter of 1.2mm. It was then rendered and processed in Bambu studio to be 3D printed. For the material of the synthetic vessel, the silicone Eco-flex 00-10 with the addition of a surface tension diffuser was tested and chosen for the qualities of grip and texture to match commercial vessels. The silicone was laid into the mold that had a 1mm rod through the middle; this resulted in an inner lumen. Once cured, the mold is pulled apart, and the vessel is removed from the rod. To test the synthetic vessels, a standard micro-anastamosis procedure was performed. The performance of the vessel was judged under the criteria of inner lumen consistency and the texture of the vessel.

Results: The silicone demonstrated adhesive properties to the mold while removing it, resulting in inconsistent results after the curing process. After undergoing the micro-anastamosis procedure, it was noted by the surgeon that the texture of an intact vessel was more accurate to a real vessel than the commercial vessels. Specifically, the new ones being easier to grip. Issues remain in obtaining a consistent wall thickness. This may have occurred due to the rod driving downwards due to gravity while the silicone cured. More improvement can occur in the removal of excess silicone and the reliability of the process to produce usable vessels.

Conclusion: Future mold prototypes may lead to increased consistency of the inner lumen thickness. More research needs to occur on finding a mold release that will allow the vessel to detach from the mold without ripping. This project would greatly benefit the accessibility of microsurgery by decreasing the barriers of entry, thus improving global training access.

Microtia Prosthetics: The Creation of a Silicone Ear for a Low Cost Alternative

Sarah Hu, Lauren Feeley B.A., Eli Wu B.S., Aaron Dingle Ph.D., Samuel Poore M.D. Ph.D.

Introduction: Microtia is a congenital abnormality where the ear may not be fully formed. There is a high prevalence of microtia in Vietnam, with origins from the Agent Orange chemical used in the Vietnam War. By developing silicone prosthetic ears with different levels of detail, the need for prosthetic ears in low-income countries can be gauged. An aim of this project is to determine the level of interest in a low cost temporary ear for Vietnamese children.

Methods: An alginate mixture is created by blending 1 part water and 1 part alginate powder in a paper cup. A mold of an ear is obtained by flipping the paper cup upside down onto the ear. Confirm that the alginate has covered the entire ear, and wait 5 minutes for the alginate to solidify. Gently remove the alginate from the ear, and make sure that there are no imperfections. Pour a 1:2 mixture of water to plaster into the ear mold, and leave it for 24 hours to solidify. Peel the alginate from the plaster. Use a 3D scanning app on a mobile device to get a scan of the plaster ear. Then import it into a 3D processing software to mirror the ear. Once mirrored, 3D print the ear and create another alginate mixture to pour onto it. Once that is cured, separate the two and pour a mixture of Dragonskin silicone into the new mold. The alginate mold is peeled off after 40 minutes. The qualifiers of the accuracy of the ear include color, texture, and structural realism.

Results: Ears have been produced with much success. They are structurally accurate and are textured within reason. A colored powder added to the silicone mixture adds realism. An aspect to improve on includes altering the size of the ear to fit children instead of adults. Further research can be done to find a solution to prevent air bubbles from forming in the silicone ear.

Discussion: Exploration of different options for creating the ear mold is intended, such as considering a three-part mold. The use of wax would also improve moldability and reduce computer requirements and technological skill. Additionally, bubbles in silicone products can be minimized by mixing the silicone with an additive to alter the texture of the product. Lastly, color theory can be explored to mimic differences in skin coloring, and the addition of details to make the ear more realistic can also be used.

A Plastic Surgeon's Practical Guide to TikTok

Sakar Gupta, Nada Botros, Alisha Khosla, Emily Zona, Peter Wirth, Venkat Rao

Introduction: The rapid rise in social media use has dramatically redefined how plastic surgeons build their practices, educate patients, and engage with their audience. With over 1.6 billion active monthly users, TikTok ranks among the most popular social media platforms, especially for those aged 18–29, trailing just behind Instagram's 2 billion users. However, compared to Instagram, plastic surgery content on TikTok generates significantly higher engagement, averaging 438,261 interactions per post versus Instagram's 275,565. Studies show 64% of women considering aesthetic procedures use social media to guide their choices, underscoring the need to understand effective navigation of platform-specific outreach methods.

Methods: This guide synthesizes evidence from existing literature and real-world insights to present a comprehensive strategy for plastic surgeons seeking to maximize TikTok's unique audiovisual platform and personalized algorithms. In addition to detailing the fundamentals of TikTok's algorithm, we provide considerations for profile optimization and leveraging features such as pinned videos, link integration, and consistent cross-platform branding. Content strategy recommendations emphasize use of a variety of formats including educational segments, patient testimonials, myth-busting discussions, before-and-after showcases, and the integration of trending sounds and hashtags, to maximize engagement and reach on the platform. We also outline how to leverage TikTok Pro analytics to monitor engagement, audience growth, demographic trends, and content performance, while also maintaining ethical and professional standards essential to social media marketing in plastic surgery.

Results: Effective TikTok engagement strategies demonstrate rapid growth in profile visibility and audience engagement. Educational and authentic videos build patient-surgeon trust and professional credibility, while capitalizing on trends and interactivity enhances profile visibility. Direct quantitative metrics, such as views, likes, comments, and clicks allow surgeons to actively assess and tailor their content strategy in real-time. Built-in analytical tools identify ideal posting times, viewer preferences, and high return on investment content categories. TikTok's youthful demographic trends highlight the need to tailor content to younger patients' preferences and aesthetic concerns. Finally, it is essential to uphold ethical and legal standards, including obtaining social media–specific consent, ensuring patient anonymity, and adhering to the American Society of Plastic Surgeons' code of ethics and professional guidelines.

Conclusion: Among the myriad of new social media platforms, TikTok has emerged as a powerful driver for growing a plastic surgery practice. A comprehensive, ethical, and data-driven strategy can help surgeons distinguish their practice and build sustainable, credible, and trustworthy relationships with their audience and future patients.

Revolutionizing Clinical Documentation: A Practical Review of AI Transcription Services

Ferris Zeitouni MS, Nada Botros MA, Alisha Khosla BS, Marion McKinney BS, Jasmine Craig MD, MPH, Luis Alamo-Irizarry MD, Venkat Rao MD, MBA

Introduction: Rising physician burnout, driven by increased administrative load and documentation burden, has led to the widespread adoption of AI-powered transcription services in hospitals. These tools generate clinical notes from patient encounters and have shown the ability to significantly reduce documentation burden and streamline workflows. This article provides clinicians with a primer on the capabilities, limitations, and practical considerations for implementing six popular AI transcription services.

Methods: We conducted a review of five widely used AI transcription platforms, including Abridge, Microsoft Dragon Copilot, Heidi, Freed, and Epic's assistants (Emmie, Art, and Penny), to compare similarities, capabilities, unique benefits, and limitations.

Results: Across platforms, core features include encounter transcription, automated note generation, multilingual capabilities, custom templates, and HIPAA compliance. Platforms with deep integration into electronic health records (EHR) (e.g., Abridge, Microsoft Dragon Copilot) offer greater workflow automation, summarizing prior notes, drafting referral letters and after-visit summaries, and preparing orders, but require significant training and onboarding. More user-friendly options (e.g., Heidi, Freed) provide rapid note creation with minimal setup, though with limited EHR integration. Industry partnerships have facilitated the current development of novel features, including point-of-care prior authorization, a virtual assistant to schedule visits, answer patient questions related to appointments, and suggest relevant screenings.

Conclusions: Physicians should evaluate the advantages and logistical challenges for implementation of AI transcription tools, while also considering liability. Each platform offers unique benefits and limitations, and while these tools may enhance physician workflow, they also present risks for both patients and providers.

Surgical Gowns Through Time: Historical Context and Modern Advancements

Nada Botros MA, Sakar Gupta BS, Ferris Zeitouni MS, Myiah Quach BS, Venkat Rao MD, MBA

Intro: Surgical gowns have undergone substantial evolution since their adoption in the late 19th century to meet modern-day regulatory and practical standards. Early photographs and written accounts demonstrate their rise in use alongside advances in aseptic techniques and infection control in the early 20th century. Gowns have since played a critical role in reducing contamination and protecting both patients and healthcare workers from infectious exposure. Here, we provide a comprehensive overview of the historical evolution of surgical gowns alongside a detailed analysis of the usability, cost-effectiveness, and sustainability of contemporary surgical gowns in use today.

Results: Modern surgical gowns are broadly classified into disposable and reusable types, each with distinct material composition, performance, and environmental profiles. Disposable gowns are typically made from spunbound polypropylene-based nonwoven fabrics, which offer strong initial fluid resistance, but are intended only for single use. Reusable gowns are typically composed of woven polyester-cotton blends, often treated with barrier coatings, and designed to withstand multiple laundering cycles while maintaining microbial barrier integrity. Current literature comparing the two types' relative efficacy in preventing surgical site infections (SSIs) remains mixed, reflecting variability in study design and clinical setting. The choice between gown types further involves balancing comfort, cost, and environmental impact. Reusable gowns generally offer greater breathability and comfort during lengthy procedures, along with superior durability and sustained barrier protection after multiple sterilization cycles. Recent evidence suggests they also reduce solid waste by up to 93% and greenhouse gas emissions by approximately 30%, despite requiring water and energy for laundering. Disposable gowns provide the advantage of convenience and immediate sterility, with lower upfront cost and ease of disposal, which may reduce contamination risks associated with improper gown handling. However, frequent replacement of disposable gowns contributes to higher long-term costs and solid waste. Regulatory frameworks, including AAMI PB70 standards and FDA classifications, guide gown selection by setting barrier performance level and safety requirements for both types, ensuring reliable protection across various surgical environments.

Conclusion: The evolution of surgical gowns highlights a continuous pursuit for improved infection control, cost-efficiency, and environmental sustainability. In our analysis of the benefits and drawbacks of modern surgical gowns, we aim to offer valuable insights that guide selection and innovation, prioritizing safety and efficacy in operative settings.

Impella 5.5 Bridge to Orthotopic Heart Transplantation Following Mitral Valve Dehiscence After a Commando Procedure

Monika Pantha

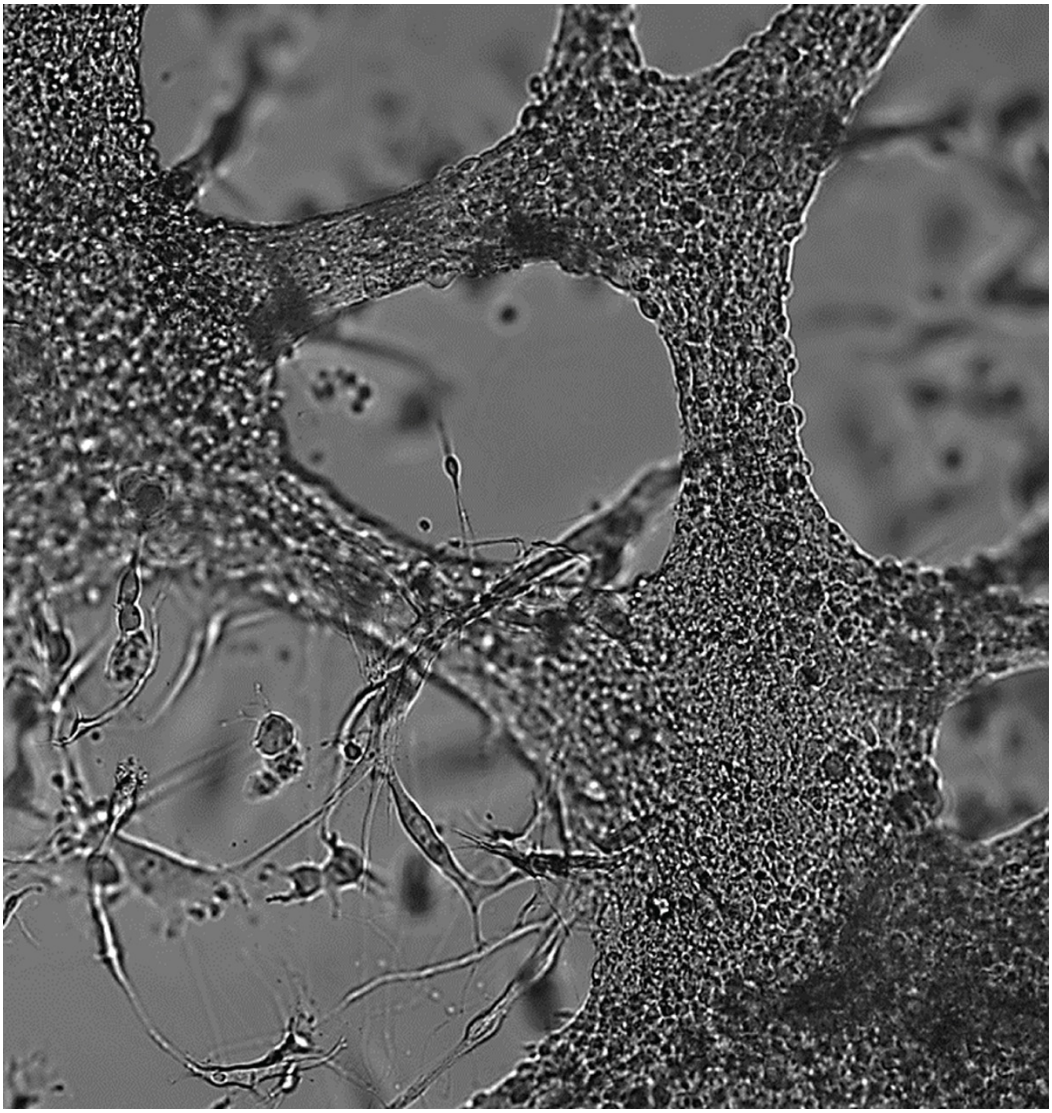
Introduction: To describe the use of the Impella 5.5 as temporary mechanical circulatory support (MCS) to optimize hemodynamics and facilitate orthotopic heart transplantation (OHT) in a patient with recurrent mitral valve dehiscence following a Commando procedure, and to discuss the role of Impella 5.5 in post-transplant graft failure.

Methods: A previously healthy 36-year-old man with Streptococcus gordonii endocarditis involving both the aortic and mitral valves underwent mechanical double-valve replacement, complicated by recurrent endocarditis, valve dehiscence, and heart failure. He subsequently underwent a Commando procedure with bioprosthetic aortic and mitral valve replacements and extensive annular reconstruction. This hospital course was complicated by the need for peripheral VA ECMO, AKI requiring dialysis, and the development of dry gangrene of his right toes. He was discharged two months after the Commando operation but was immediately readmitted with symptoms of heart failure. TEE demonstrated posterior dehiscence of the mitral bioprosthesis with torrential perivalvular leak and potential vegetation on the left atrial side of the valve. Cardiac index was 1.3-1.5 L/m2. An Impella 5.5 was placed via right axillary approach across the aortic bioprosthesis and achieved flows of 5 liters per minute on p9. Due to a small ventricle, the Impella inflow was positioned 3.5 cm into the left ventricle. This configuration allowed healing of toe amputations, ambulation, and improvement in functional status and nutrition to allow for listing status 2 for a high-risk heart transplant in a young patient.

Result: After 31 days of Impella 5.5 support, the patient underwent redo sternotomy and heart transplant with a young DCD donor recovered with NRP and Sherpapak. Total ischemic time was 326 minutes. While the cardiac function was good in the first several days (cardiac index >3 on dual inotropes), the patient ultimately had early graft failure requiring VA ECMO, tracheostomy, AKI requiring dialysis, and transverse colectomy for ischemic colitis. He was able to be decannulated from VA ECMO but the heart allograft continued to deteriorate over time and the patient expired on post-transplant day 95 from multi-system organ failure.

Conclusion: This case demonstrates the feasibility of using the Impella 5.5 as bridge to heart transplantation in a complex patient after two valve operations including a Commando operation for prosthetic valve endocarditis. Ultimate patient mortality was multifactorial including donor and recipient factors.

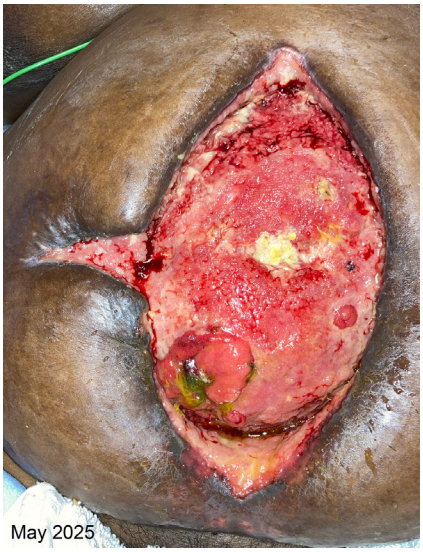
Surgery Science Images

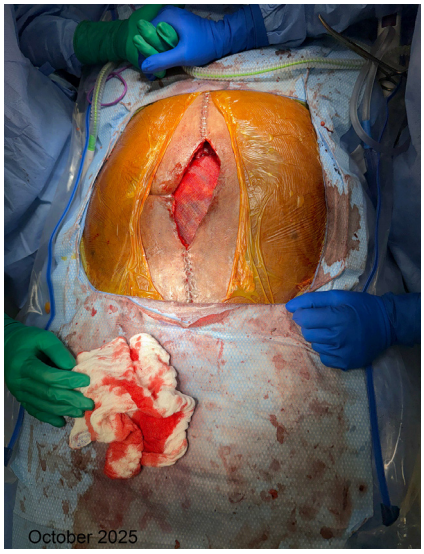


Early Sparks of Connectivity in a Dish

Credit Line: Ligi Milesh, PhD (Le Lab)

Caption: This confocal image captures the early sparks of connectivity within a 3D planar cerebral organoid — a miniature brain-like structure grown in a dish. At this formative stage, delicate neuronal projections emerge from dense clusters of cells, initiating the earliest circuits of communication. These organoids are engineered under physiologically relevant oxygen concentrations that foster self-organization and mimic aspects of early human brain development. The image reflects both the beauty and the significance of organoid research: revealing how primitive neural networks first take shape in vitro and offering a powerful platform for advancing our understanding of brain development, cancer biology, and regenerative medicine.





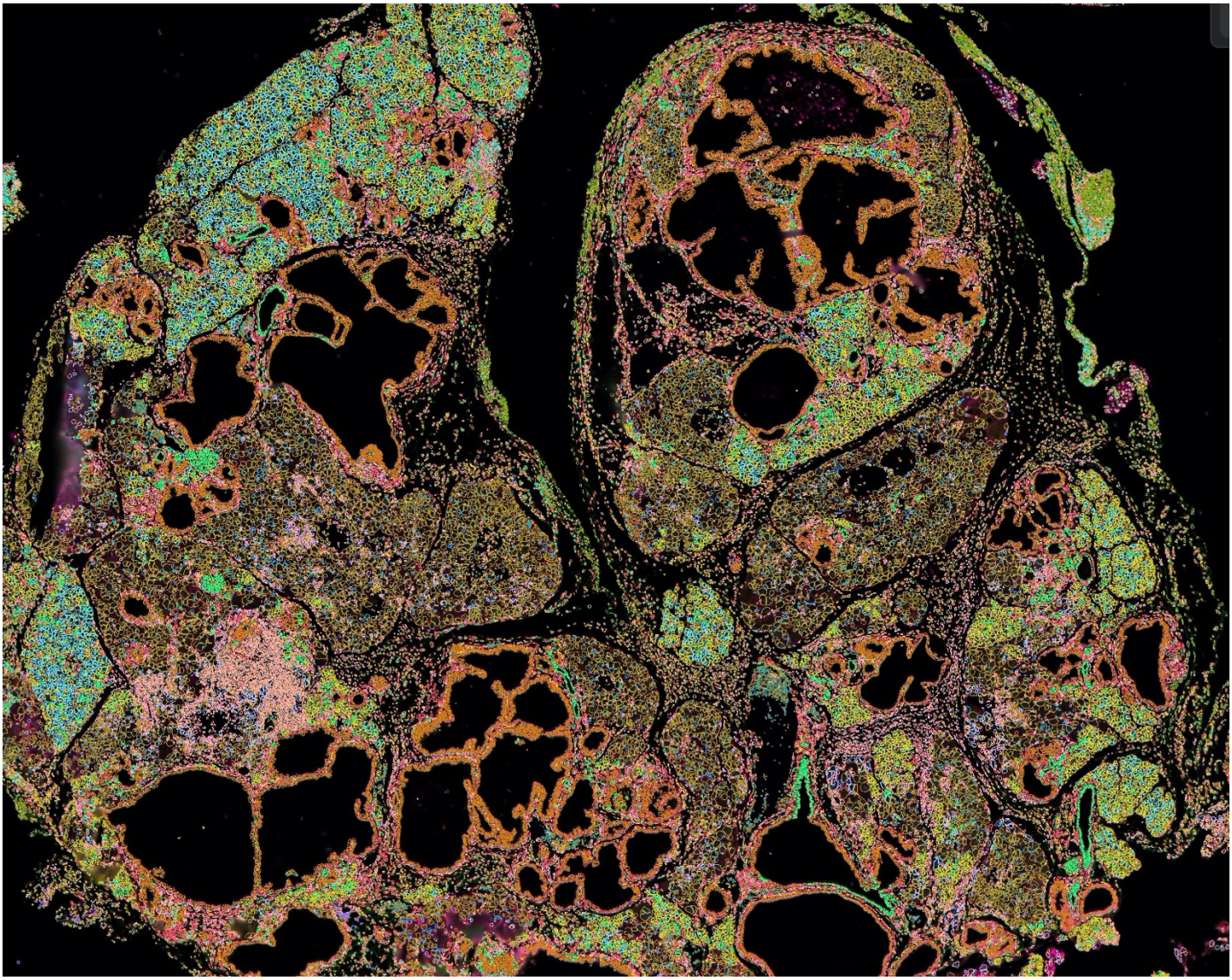
Long Suffering

Credit Line: Dr Katherine Bakke, Dr David Melnick, Meriter EGS Team

Specific Role: Katherine Bakke is an Assistant Professor within the Division of Acute Care and Regional General Surgery

Brief Caption:

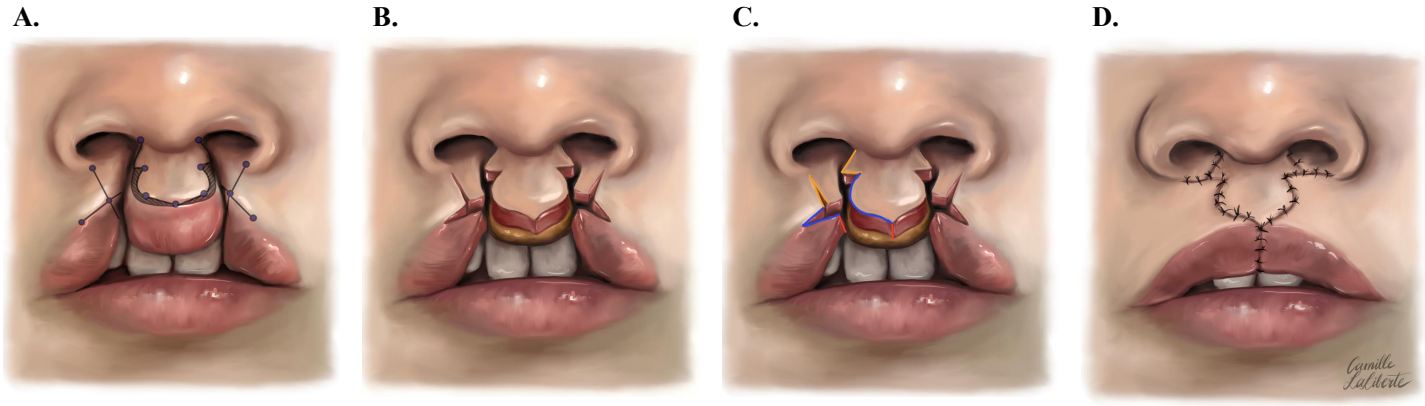
- This image depicts the evolution of an enterocutaneous fistula over 7 months, culminating in a fistula take-down surgery. At the conclusion of the surgery, the surgeon and resident spontaneously held hands, demonstrating the relief, awe, and gratitude they felt after an 8 hour operation.
- **How was the image taken?** Photography
- **What is an interesting fact about the object or phenomenon?** Not only is it interesting to see the evolution of this patient's enterocutaneous fistula over the course of 7 months, but the culminating image of the patient's new abdomen, and the surgeons holding hands, as if in prayer over the patient, speaks to the highly emotional bonds that are created with a patient over many months of suffering.
- **How is this object, phenomenon, and/or method of image-making important to your research or discipline?** These images speak to the many challenges and rewards of surgery—the initial despair of many surgeries failing and leading to a devastating complication, the body's rapid ability to heal and adapt, the extreme emotions that come with operating on patients with complex problems, and the great satisfaction that accompanies a good outcome.



Genetics of Pancreatic Cancer Development

Credit Line: Patrick Carney, Ronnekleiv-Kelly Lab, Resident, Division of Surgical Oncology

Caption: This image depicts a mouse pancreas that is starting to develop a specific type of genetically driven pancreatic cancer. The image was captured using the Xenium spatial transcriptomics platform, a new technology which allows us to look at gene expression at the single cell level. This technology is helping us to understand how a specific genetic mutation causes pancreatic and liver cancer. By visualizing the cellular and corresponding genetic changes over time we can understand how tumors develop and uncover potential new therapeutic targets.

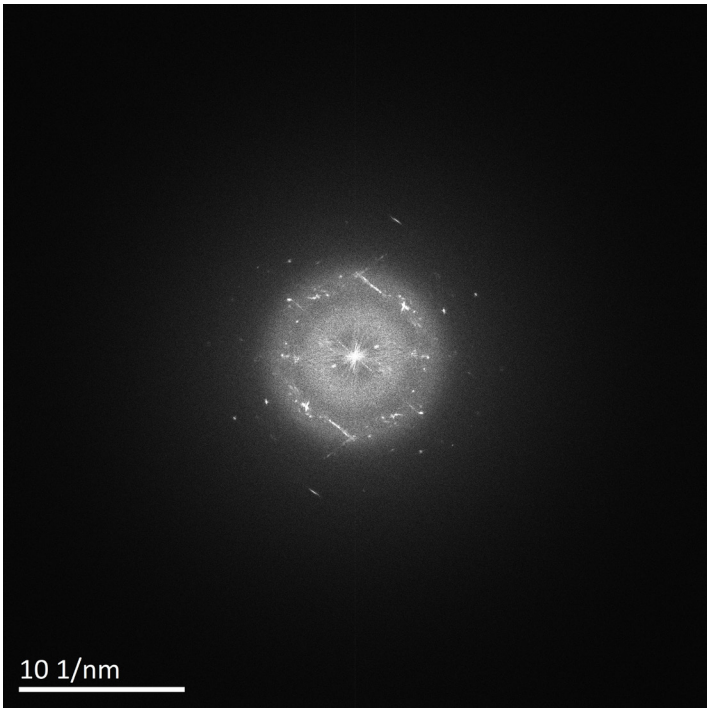


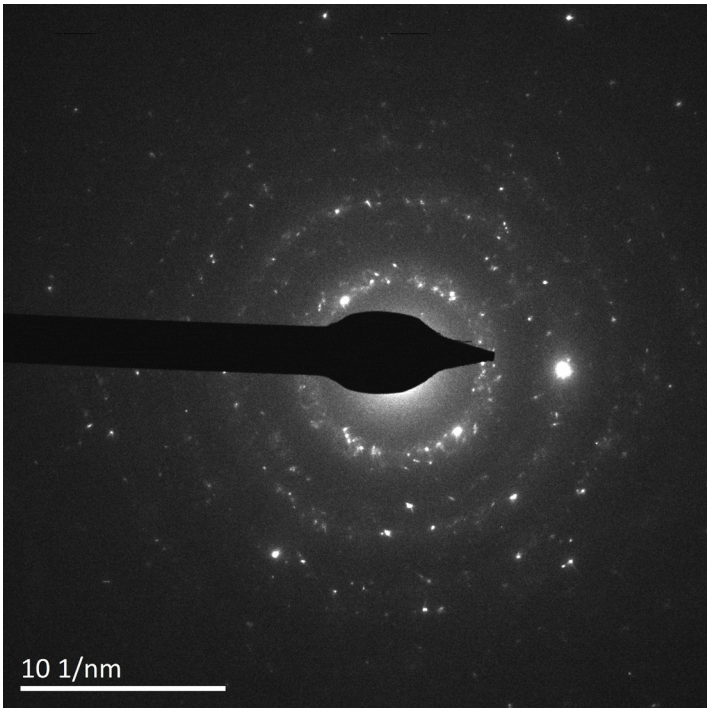
Primary Cleft Lip and Palate Repair in Adults: The Mulliken, Dehaan, and Delaire Technique

Credit Line: Camille J. LaLiberte, BS[1]; Emily E. Zona, BS[1]; Aidan W. O'Shea, ScB[1]; Myiah P. Quach, BS[1]; Sakar Gupta, BS[1]; Jasmine N. Craig, MD, MPH[1]; Catharine B. Garland, MD[1]; Daniel Y. Cho, MD, PhD[1]

Specific Roles: Medical Student Illustrator and Researcher
1. Division of Plastic Surgery, University of Wisconsin School of Medicine and Public Health, Madison WI

Description: In developed countries, primary repair of cleft lip and palate is ideally done within 3-6 months of age. However, some adolescent and adult patients may not have access to early surgical intervention within this critical period, which leads to delayed presentation and increased complexity in primary repair. Although the widely used techniques for primary bilateral cleft lip in adults uses similar approaches to pediatric patients, it is not widely depicted visually in literature. Thus, these illustrations provide a reference for surgical planning with various landmarks and depict how to apply these techniques (Mulliken, Dehaan, and Delaire) on an adult patient with mature facial and dental features. This image was created via digital sketchbook.



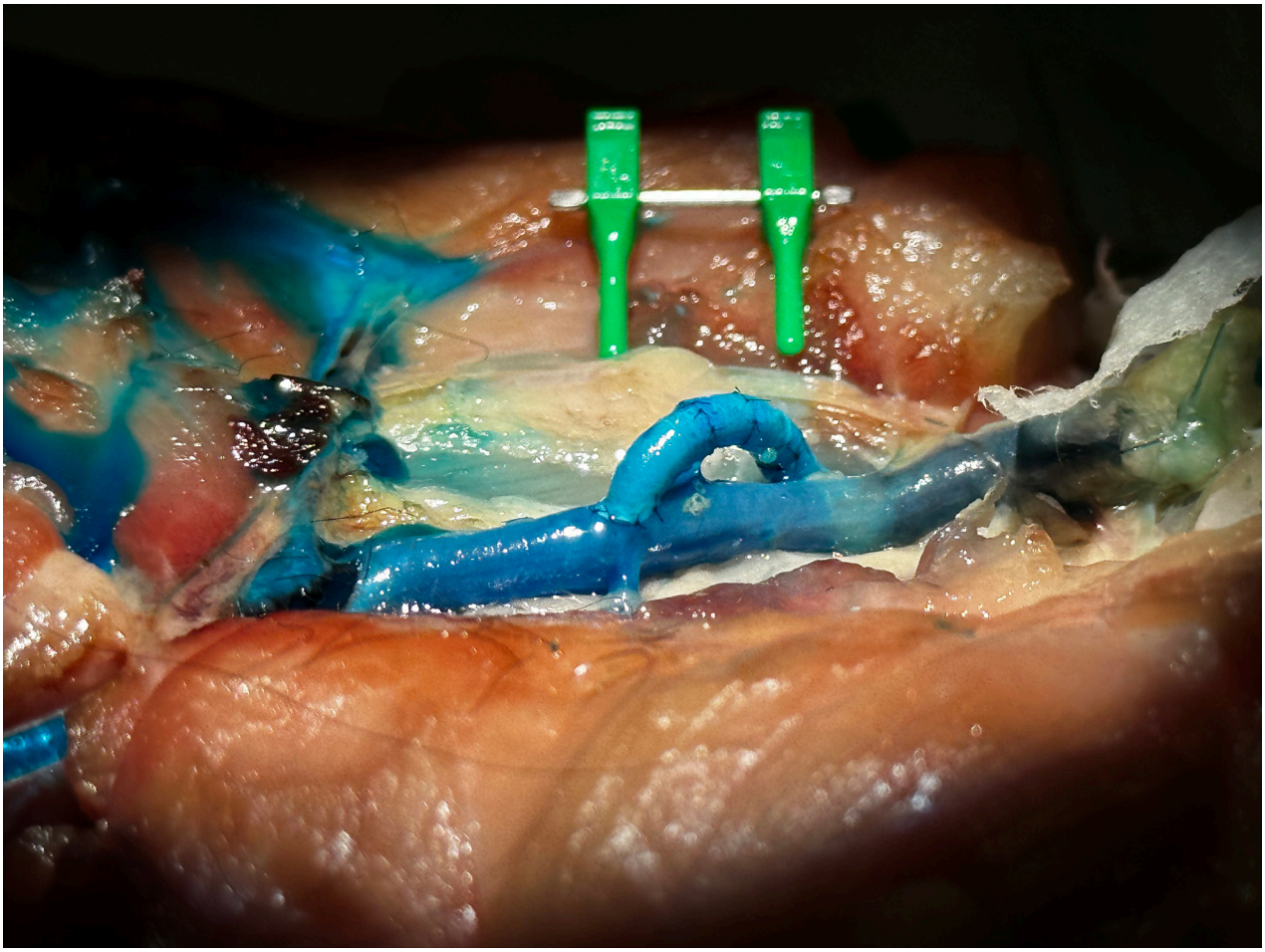


Crystalline structures of Silver Nanoparticles

Credit Line: Pālca Shìbalé, Hagey Laboratory, Stanford, CA

Specific Role: UW Dept of Surgery General Surgery Resident, Research

Caption: Image A depicts a crystalline (showing sharp rings/spots) structure of Silver Nanoparticles synthesized in the Hagey Laboratory and captured with Transmission Electron Microscopy. The average particle size depicted is less than 20nm. Further nanoscale analysis (Image B) demonstrates specific electron diffraction rings that correspond to known silver planes. This technique allows us to confirm a silver structure that can be used as a framework for injured cells to attach, grow, and organize that mimics the body's own cellular support systems. Relevant in our investigations of wound healing and tissue regeneration



Bridge of life

Credit Line: Photo taken by M. Kristine Carbullido, MD; Microsurgery and Regenerative Medicine (MSRM) Lab

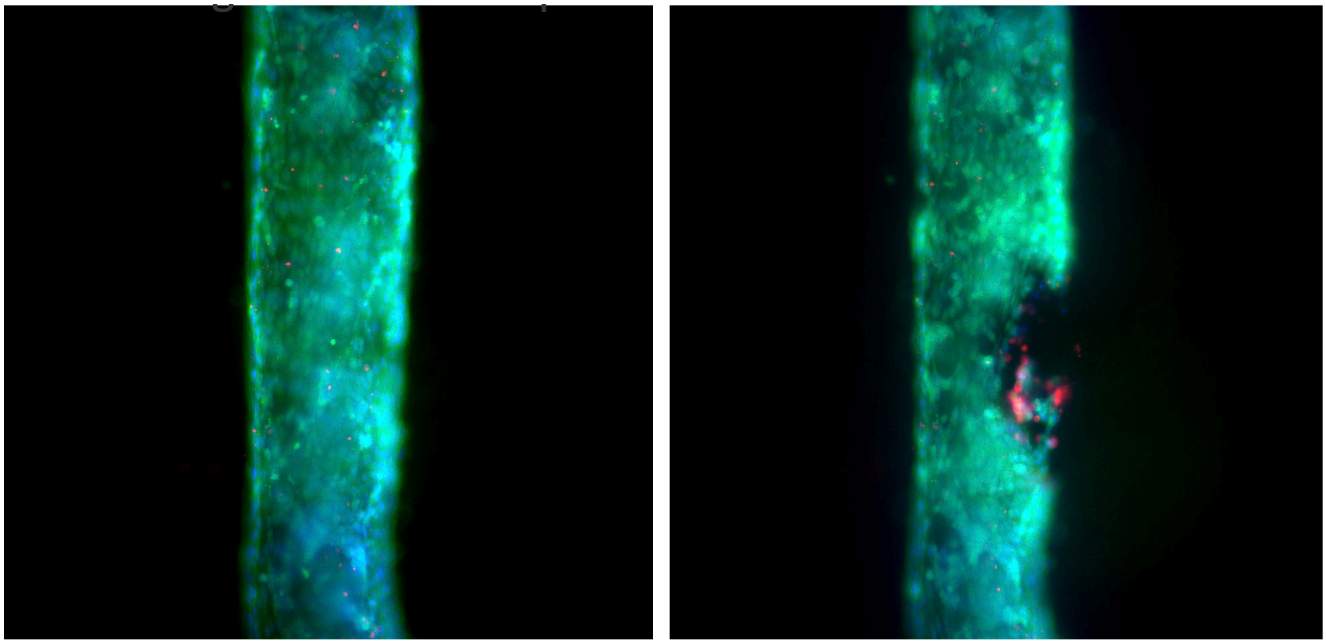
Specific Role: Division of Plastic Surgery

Caption: This is a photo taken through the lens of a surgical microscope depicting an end to side anastomosis using a blue-blood chicken thigh model developed by the MSRM lab. The photo depicts successful anastomosis with excellent simulated "blood flow" indicated by the ballooning effect of the vessels. These vessels are roughly 1.0-1.5 mm in diameter. This is a demonstration of the impact the MSRM lab has made on teaching microsurgery from within the University of Wisconsin all the way to an international level. Success of this technique allows for complex surgical reconstruction that is applicable to many disciplines with free tissue transfer to reconstruct the body in form and function.

Microsurgery Is Still Performed by People

Credit Line: Makenna Ash, MD, Division of Plastic and Reconstructive Surgery

Brief Caption: A ChatGPT generated an image of a female surgeon performing microsurgery. The engine generated the above image. Artificial Intelligence can do many things but apparently it still doesn't know that hair goes inside the scrub cap in the OR. Proof that surgical jobs are safe for now!



Stab Wound

Credit: Kelsea Sholty: Microtechnology, Medicine and Biology Lab in collaboration with Miloš Buhavac, Division of Acute Care Surgery

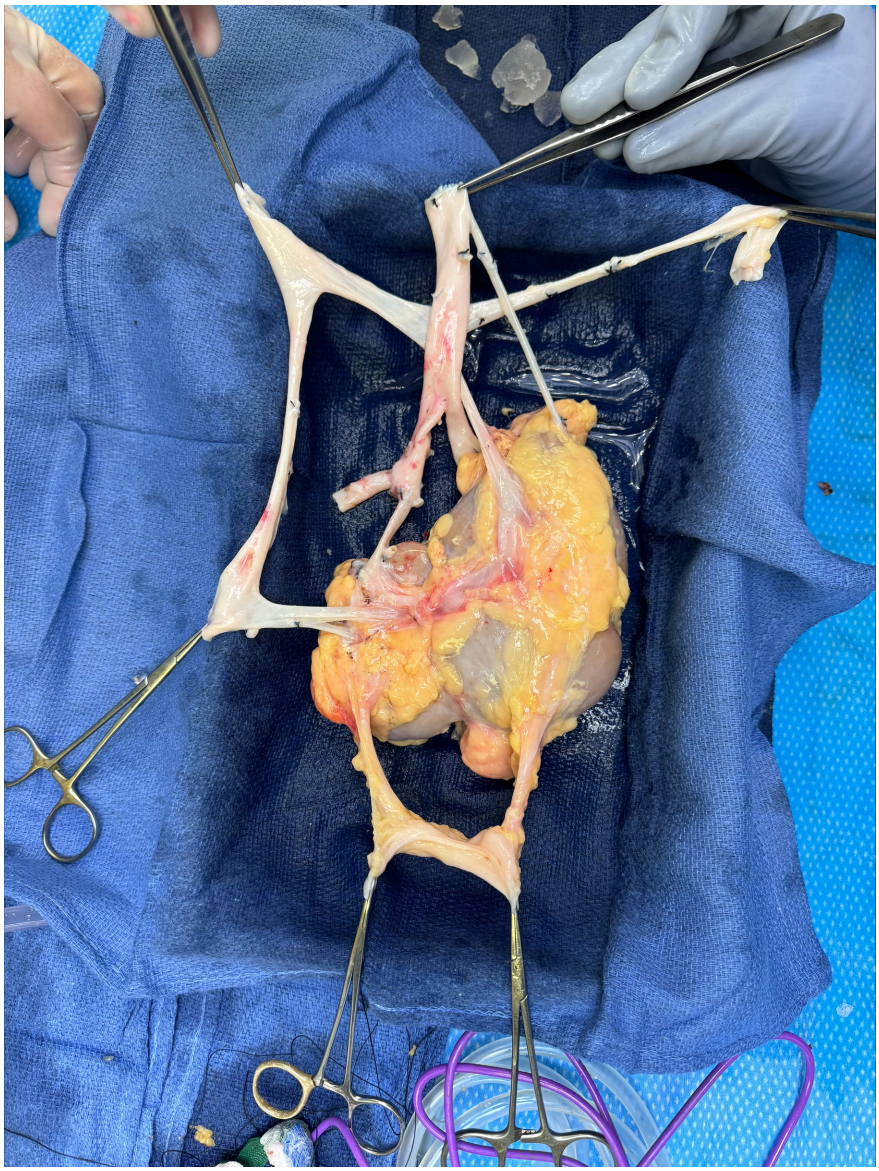
Caption: This is picture of a micro-physiologic system, aka organ on a chip, designed to allow us to study the response of the human body to trauma. Using a special imaging system called Luminex MAGPIX, we can simultaneously test for several different proteins, nucleic acids, etc to better understand what happens in real-time to the endothelium, immune response and clotting system when a vessel is injured. This approach has the promise of eventually replacing animal models of bleeding and injury.

Red-billed Tropicbird

Credit: Miloš Buhavac, MD, Division of Acute Care Surgery

Specific Role: Trauma/ACS Surgeon

Caption: The Red-billed Tropicbird is one of the Galapagos' cliff-nesting seabirds. Taken with a Nikon D850 camera with a 200-500 f5.6, this little bird spends almost its entire life far from land. Although a graceful and agile flyer, these birds are also strong swimmers and catch their prey by diving into the water and spearing fish and squid. Only coming to land to rest, this little bird is fearless explorer. Reminding us to approach our goals with a tireless dedication, the Red-billed Tropicbird is an inspiration to all who dare to brave the unknown.



Transplanting the un-transplantable

Credit: Dr. Jon Odorico, Dr. Anthony Emmott, Dr. Meaghan Clark, and Devashish Joshi

Specific Role: Professor

Caption: Here we show an en-bloc cross-fused ectopic kidney that had been rejected by all regional transplant centers and procured by one of our previous transplant fellows. The kidney itself had a KDPI of 9%, negative virtual cross match, and cPRA of 0% - however the unique anatomy was a deterrent to many transplant centers. The donor kidney contains 5 renal arteries with one recipient anastomosis (from aorta, left common iliac, left external iliac, and right external iliac), 2 renal veins with 2 recipient anastomoses, and 2 ureters with two separate anastomoses. The kidney was transplanted into a young recipient with end stage renal disease via an extra-peritoneal midline incision to the right pelvis/iliac fossa. The patient continues to recover well and recently reached her 1-year transplant anniversary.

The Art of Adipose

Credit: Ahmed Afifi, MD; Armin Edalatpour, MD; Madeline Tierney, MD

Specific Role: Attending and residents in Division of Plastic Surgery

Caption: This series of pieces depicts the balance between alloplastic and autologous reconstruction, both of which are important in the art of plastic surgery. They were taken on an iPhone camera after a case involving both forms of breast reconstruction. The juxtaposition of fat suspended against a background of silicone is a demonstration of the mixed media that so often occurs in our field.

UNIVERSITY OF WISCONSIN DEPARTMENT OF SURGERY