ADVENTURES IN RESEARCH

Science!

ABSTRACTS + IMAGES + PRESENTATIONS

PROGRAM BOOK

WELCOME

Welcome to the 14th Annual University of Wisconsin Department of Surgery Research Summit!

Among the many words that could describe the research process, "adventure" may be the most apt. From the wild ride that is the funding process, to the unanticipated issues that can arise in study implementation, all the way to the exhilarating reveal of the results, the quest to advance our respective scientific disciplines can be thrilling, surprising, challenging, and extraordinary.

"**Adventures in Research**" is therefore the theme of the 2023 Department of Surgery Research Summit.

Our goal for this summit is to highlight the key themes and remarkable stories of the multidimensional fields of basic, clinical, translational, educational, and health services science that are occurring within our Department. Our hope is that the innovative methods and captivating stories we hear today will inspire all of us to extend and transform our own research adventures tomorrow. The breadth and diversity of research that is being conducted across the 11 divisions in our Department is truly astounding, and the knowledge that we can gain from one another is limitless.

This year's summit will feature keynote speaker Dr. Oluwadamilola "Lola" Fayanju, the Helen O. Dickens Presidential Associate Professor at the University of Pennsylvania Perelman School of Medicine and Chief of the Division of Breast Surgery at Penn Medicine. Fitting with our focus on adventure, Dr. Fayanju will be addressing how our scientific endeavors can be fueled not only by our desire to improve patient outcomes but also by the challenges and barriers that we face.

The summit also features two panels. The morning "Highlight Reel" panel is comprised of experienced and seasoned researchers in the Department who will each share the story of how they developed their research program. The afternoon "Red Carpet Research" panel includes early- and mid-career researchers who will talk about their most recent line of work and how it led to successful funding. During both panels, the challenges and the opportunities these innovative researchers have experienced will be discussed.

We're also very fortunate to feature two researchers during the afternoon "Million-Dollar Wager" session who will share the story of their adventures on projects that they initially thought would never amount to anything, but which they managed to bring to fruition through a combination of grit, collaboration, and innovation.

We are thrilled to be re-united in person with you for today's epic research journey. May it re-ignite our passion for the adventure of research and inspire us to take those adventures to the next level.

KEYNOTE SPEAKER

Oluwadamilola "Lola" Fayanju, MD, MA, MPHS, FACS

Dr. Fayanju is the Helen O. Dickens Presidential Associate Professor in the Perelman School of Medicine at the University of Pennsylvania and the Chief of the Division of Breast Surgery for the University of Pennsylvania Health System, aka Penn Medicine. She is also Surgical Director of the Rena Rowan Breast Center in the Abramson Cancer Center, Director of Health Equity Innovation at the Penn Center for Cancer Care Innovation (PC3I), and a Senior Fellow in the Leonard Davis Institute of Health Economics (LDI) at the University of Pennsylvania. She is an academic breast surgical oncologist whose research focuses on redressing health disparities; improving prognostication and management of aggressive breast cancer variants; generating value in oncology, particularly through the collection and application of patient-reported outcomes (PROs); and promoting

diversity and inclusion in healthcare and research. She received her undergraduate degree in History and Science and an MA in Comparative Literature from Harvard. She received her MD and a master's of population health sciences (MPHS) from Washington University in St. Louis, where she also completed her residency in General Surgery. She completed fellowship training in Breast Surgical Oncology at The University of Texas MD Anderson Cancer Center. In 2019, she was recognized by the National Academy of Medicine as an Emerging Leader in Health and Medicine Scholar. Her research is supported by funding from the National Institutes of Health (NIH), and she has published in a variety of journals including Annals of Surgery, Cancer, and JAMA.

PANELISTS

Courtney Balentine, MD, MPH

Courtney Balentine, MD, MPH, completed his residency training in general surgery at Baylor College of Medicine, where he also obtained an MPH from the University of Texas and participated in the VA Health Services Research fellowship program. He came to UW for fellowship training in endocrine surgery before joining the University of Alabama at Birmingham as an Assistant Professor. While in Birmingham, Dr. Balentine received a K award from AHRQ and PCORI, a GEMSSTAR grant from NIA, and completed a training program in implementation science. He subsequently took a position at UT Southwestern in Dallas and obtained a Beeson K76 grant from NIA while continuing to develop expertise in implementation science and clinical trials. Dr. Balentine then returned to UW in 2022, where he is actively growing a research program that focuses on improving outcomes for older adults having endocrine and general surgery procedures.

Jacqueline Garonzik Wang, MD, PhD

Jacqueline Garonzik Wang, MD, PhD, is an Associate Professor of Surgery at the University of Wisconsin School of Medicine and Public Health. She also serves as the Surgical Director of the Kidney Transplant Program. She was born and raised in Baltimore and completed her undergraduate studies in Public Health Sciences at the Johns Hopkins University. She obtained her medical degree at Emory University School of Medicine in Atlanta, Georgia and then returned to Baltimore to complete her general surgery training as a Halsted Resident at the Johns Hopkins Hospital. Additionally, she obtained a PhD in Clinical Investigation at the Johns Hopkins Bloomberg School of Public Health. She completed her fellowship in Abdominal Transplant and Hepatobiliary Surgery at Washington University and Barnes-Jewish Hospital in St. Louis, Missouri and then joined the Johns Hopkins faculty as a transplant surgeon in 2016. She subsequently accepted a position at UW-Madison in 2021. Her areas of clinical expertise include hepatobiliary surgery, liver, pancreas, and kidney transplantation and living kidney and liver donation.

Angela Gibson, MD, PhD, FACS

Angela Gibson, MD, PhD, FACS, graduated from the Medical Scientist Training Program in 2009 from the University of Wisconsin School of Medicine and Public Health, where she also completed her surgical residency in 2014. Subsequently, she completed a visiting Burn Surgery fellowship at the University of California, Davis, and a fellowship in Surgical Critical Care at the University of Wisconsin. Certified by the American Board of Surgery in General Surgery and Surgical Critical Care, Dr. Gibson specializes in burn, trauma, emergency surgery, and surgical critical care and treats complex wounds. She is the Medical Director of Wound Healing Services at UW Health, a program that she developed. Her research interests focus on epithelial regeneration in burn injury, evaluation of advanced tissue products, human skin model development for wound healing, and understanding the burn wound microenvironment using advanced imaging techniques. Dr. Gibson leads a basic and translational science laboratory studying wound healing and clinical trials involving her burn patients.

Tiffany J. Glass, PhD

Tiffany J. Glass, PhD, is a Scientist II in the Department of Surgery, Division of Otolaryngology-Head and Neck Surgery. She completed her PhD in molecular, cellular, developmental biology & genetics at the University of Minnesota. Dr. Glass's research uses mouse models of Down Syndrome (DS) to investigate developmental vocal communication, feeding, and swallowing challenges associated with DS. She leads a project to examine postnatal changes in the tongue of a mouse model of DS at different timepoints during maturation to better understand the biological underpinnings of feeding and swallowing difficulties in DS during early childhood. A separate project studies how aging and chromosomal differences impact swallowing function in mouse models of DS at advanced adult ages. This work is supported through the NIH INCLUDE (INvestigation of Co-occurring conditions across the Lifespan to Understand Down syndromE) Project, which is a trans-NIH initiative to address health and quality-of-life needs for people with DS.

Dixon B. Kaufman, MD, PhD, FACS

Dixon Kaufman, MD, PhD, FACS, received his medical, general surgical, and transplant surgery training at the University of Minnesota (1979-1992). He was a faculty member at the Feinberg School of Medicine of Northwestern University (1992- 2011), rising to the rank of tenured Professor as the endowed Fowler McCormick Professor of Surgery. He is currently the Ray D. Owen Tenured Professor of the Division of Transplantation, Director of the UW Health Transplant Center, and Co-director of the UW Center for Biomedical Swine Research and Innovation (CBSRI). He is actively involved in transplantation research. His basic research, clinical research, and clinical practice efforts are all inter-related. Over the years, they have focused on the immunobiology of islet transplantation and kidney transplant immunological tolerance induction. These have been supported by the National Institutes of Health through the Clinical Islet Transplant Consortium and the Non-human Primate Tolerance Consortium Study Group. He is also leading the UW CBSRI efforts investigating kidney xenotransplantation using gene-edited swine as donors into pre-clinical non-human primate large animal recipients.

Brian W. Pogue, PhD

Brian W. Pogue, PhD, is the Chair of the Department of Medical Physics and Professor of Medical Physics, Radiology, and Human Oncology at the University of Wisconsin Madison, as well as Adjunct Professor of Engineering Science at Dartmouth University. He maintains an active research laboratory in both locations. This work has led to 12 issued and 29 pending US patents, and more than 450 peer-reviewed papers. Dr. Pogue is a Fellow member of Optica, SPIE, AIMBE, and the National Academy of Inventors, and is the Editor-in-Chief of the Journal of Biomedical Optics, the oldest and highest impact journal dedicated to the field of biomedical optics and biophotonics. Dr. Pogue's research is at the intersection of medical physics and biomedical engineering, where the invention of new tools can have an impact on cancer imaging and therapy. His particular focus is in the design and engineering of optical devices that are used to image or characterize disease or guide decisions in disease treatment.

Samuel Poore, MD, PhD

Samuel Poore, MD, PhD, is currently a tenured Associate Professor of Surgery at the University of Wisconsin, the Section Chief of Plastic Surgery at the William S. Middleton Veterans Administration Hospital in Madison, Wisconsin, and has a joint appointment in the Department of Biomedical Engineering. He is a member of the UW Health Breast Center. Dr. Poore received his medical training and doctorate from Brown University in Providence, Rhode Island, and completed his residency in Plastic and Reconstructive Surgery at the University of Wisconsin-Madison. He then did a fellowship in microsurgery and research at the Bernard O'Brien Institute of Microsurgery in Melbourne, Australia. Dr. Poore specializes in microvascular surgery with an emphasis on breast reconstruction, upper and lower extremity reconstruction, and head and neck reconstruction. In addition, Dr. Poore directs the University of Wisconsin Microsurgical Training Laboratory with a focus on developing novel microsurgical simulators, and leads the multi-institutional Annual UW Microsurgery Training Course.

Sean M. Ronnekleiv-Kelly, MD, FACS

Sean Ronnekleiv-Kelly, MD is an assistant professor in the Department of Surgery, Division of Surgical Oncology at the University of Wisconsin School of Medicine and Public Health, Madison WI. He specializes in treating patients with gastrointestinal malignancies and sarcoma with a clinical focus on hepatic, biliary, and pancreatic malignancy. Dr. Ronnekleiv-Kelly's research focuses on pancreatic and liver cancer (fibrolamellar carcinoma). Specifically, his laboratory uses complex pre-clinical mouse models of cancer in conjunction with in vitro studies to understand how an environmental sensor class of proteins (including aryl hydrocarbon receptor and circadian proteins) affects pancreas and liver cancer development and spread. Additionally, his laboratory seeks to understand how these proteins impact the various cell populations in the cancer tumor microenvironment, and how to target them for therapeutic effect.

Margaret (Gretchen) Schwarze MD, MPP, FACS

Gretchen Schwarze MD, MPP is the Morgridge Professor of Vascular Surgery and an Associate Professor in the Departments of Surgery and Medical History and Bioethics at the University of Wisconsin. She received her medical degree from Harvard Medical School and master's degree in public policy from the John F. Kennedy School of Government. She completed residency training at the Massachusetts General Hospital. Her fellowship training in vascular surgery and clinical ethics was at the University of Chicago Hospital and Clinics. She is a practicing vascular surgeon and health services researcher who also directs the hospital ethics committee and the ethics curriculum for the UW School of Medicine and Public Health. Her research interests focus on high-stakes decisions and end-of-life care for older patients with complex illnesses. She is an alumna of the Greenwall Faculty Scholar and the Cambia Foundation Sojourns Scholar programs. She is currently funded by the National Institute on Aging for multiple studies about decision making for older adults.

Corrine Voils, PhD

Corrine Voils, PhD is the Morgridge Distinguished Chair in Health Services Research in the Department of Surgery at the University of Wisconsin-Madison (UW) and a Research Career Scientist and Director of Health Services Research at the William S. Middleton Memorial Veterans Hospital. She is also Director of the Wisconsin Surgical Outcomes Research Program and Vice Chair for Diversity, Equity, and Inclusion in the UW Department of Surgery. Dr. Voils received her PhD in experimental psychology with a concentration in social psychology from the University of Kentucky. She completed a postdoctoral fellowship and was a career development awardee in health services research in the Center for Health Services Research in Primary Care at the Durham Veterans Affairs Medical Center. One area of research is developing and evaluating behavioral interventions to enhance long-term weight loss. Dr. Voils is a Fellow of the Society of Behavioral Medicine.

PROGRAM

University of Wisconsin Department of Surgery
14th Annual Research Summit: *Adventures in Research*
Thursday, January 19, 2023 | Union South

AM

7:30   **Registration & Light Breakfast, Varsity Hall**

8:00   **Welcome & Opening Remarks, The Marquee**
Cynthia Kelm-Nelson, PhD, Program Co-Chair
David Al-Adra MD, PhD, Program Co-Chair

8:15   **Keynote Address: "Frustration as Fuel: Using Patient Outcomes and Structural Challenges to Power Your Research", The Marquee**
Oluwadamilola "Lola" Fayanju, MD, MA, MPHS
Helen O. Dickens Presidential Associate Professor
Chief, Division of Breast Surgery, University of Pennsylvania

Moderator: Cynthia Kelm-Nelson, PhD

9:15   **Highlight Reel, The Marquee**
Moderator: David Al-Adra, MD, PhD

- Samuel Poore, MD, PhD
- Corrine Voils, PhD
- Dixon Kaufman, MD, PhD
- Gretchen Schwarze, MD, MPP

10:15   **Break**

10:30   **Abstract Oral Presentations**

- **Agriculture Breakout** (pg. 8)
  Moderator: Nathan Welham, PhD

- **Industry Breakout** (pg. 9)
  Moderator: Jessica Schumacher, PhD

- **Landmark Breakout** (pg. 10)
  Moderator: Aaron Dingle, PhD

- **Northwoods Breakout** (pg. 11)
  Moderator: Matthew Brown, PhD

11:45   **Lunch, Varsity Hall**
*Voting ends for the Visual Abstracts and Surgery Science Image Contest at 2:15 PM

PROGRAM

1:00   **Million-Dollar Wager, The Marquee**
Moderator: Cynthia Kelm-Nelson, PhD

- Brian Pogue, PhD
- Angela Gibson, MD, PhD

2:00   **Break**

2:15   **Red Carpet Research, The Marquee**
Moderator: David Al-Adra, MD, PhD

- Sean Ronnekleiv-Kelly, MD
- Courtney Balentine, MD, MPH
- Tiffany Glass, PhD
- Jackie Garonzik Wang, MD, PhD

3:15   **Research Update, The Marquee**
Rebecca Minter, MD
A.R. Curreri Distinguished Chair, Department of Surgery

4:00   **Awards & Closing Remarks, The Marquee**
Cynthia Kelm-Nelson, PhD, Program Co-Chair
David Al-Adra MD, PhD, Program Co-Chair

4:15   **After Party Reception, Lounge area located outside Varsity Hall**

PROGRAM

Top Abstract Oral Presentations – Breakout Rooms (10:30 – 11:45 AM)
Breakout rooms will run simultaneously. Attendees can select their preferred breakout room to attend.
A two-minute transition period is included between speakers.

Agriculture Breakout
Moderator: Nathan Welham, PhD
Judges: Luke Funk, MD, MPH and Lee Wilke, MD
Admin/Tech Contact: Sally Gray

- **10:30-10:45 AM*** – Clayton Marcinak, MD
  - *Neighborhood Disadvantage and Post-Operative Complications After Pancreatectomy for Pancreatic Ductal Adenocarcinoma*
  - Authors: Clayton T. Marcinak, MD, Roberto J. Vidri, MD, Corinne E. Praska, MD, Jomol Mathew, PhD, Matthew Churpek, MD, PhD, MPH, Majid Afshar, MD, Sharon M. Weber, MD, Patrick R. Varley, MD, MS, Daniel E. Abbott, MD, Noelle K. LoConte, MD, and Syed Nabeel Zafar, MBBS, MPH
- **10:45-11:00 AM*** – Weifeng Zeng, PhD
  - *Embryonic Stem Cell Derived In Vitro Endothelialization of Interposition ePTFE Grafts in Rhesus Macaques*
  - Authors: Weifeng Zeng, MD, John P. Maufort, Sarah Lyon, Nicholas J. Albano, Jue Zhang, Dave Vereide, James A. Thomson, Samuel O. Poore, MD, PhD
- **11:00-11:15 AM*** – Ashley Kates, PhD
  - *Impact of a Probiotic Intervention on Oral Microbial Profiles in Older Patients with Dysphagia at Risk for Aspiration Pneumonia*
  - Authors: Celia Deckelman, MA, Ashley Kates, PhD, Jonah Dixon, BS, Colleen Riley, BS, Nasia Safdar, MD, PhD, Susan Thibeault, PhD, CCC-SLP, Nicole Rogus-Pulia, PhD, CCC-SLP
- **11:15-11:30 AM*** – Corrine Voils, PhD
  - *Evaluation of the Veterans Affairs Pharmacogenomic Testing for Veterans (PHASER) Program: Barriers and facilitators to patient uptake of pharmacogenomic testing*
  - Authors: Karina Melendez, BS, Diana Gutierrez-Meza, MPH, Esra Alagoz, PhD, Nina Sperber, PhD, R. Ryanne Wu, MD, Deepak Voora, MD, Abigail Silva, PhD, Kara Gavin, PhD, Allison Hung, MPH, Megan C Roberts, PhD, Corrine Voils, PhD
- **11:30-11:45 AM*** – Peter Nichol, MD, PhD
  - *Risk Modeling of Errors in the Surgical Instrument Cycle, Insights to solutions for an Expensive and Persistent Problem*
  - Authors: Peter Nichol, MD, PhD, Mark Saari

*Two-minute transition period included between speakers.

PROGRAM

Industry Breakout
Moderator: Jessica Schumacher, PhD
Judges: David Aufhauser, MD and Susan Thibeault, PhD
Admin/Tech Contact: Katrina Bell

- **10:30-10:45 AM*** – Alyssa Wiener, MD
  - *A 4-arm Randomized Trial of Topical Pain Control for Breast Cancer Sentinel Node Radiotracer Injections*
  - Authors: Alyssa A. Wiener, MD, Jessica R. Schumacher, PhD, Scott B. Perlman, MD, Lee G. Wilke, MD, Meeghan A. Lautner, MD, MSc, Laura M. Bozzuto, MD, MS, Bret M. Hanlon, PhD, Heather B. Neuman, MD, MS
- **10:45-11:00 AM*** – Peter Nicksic, MD
  - *Peripheral and Trigeminal Nerve Stimulation Improve Functional Outcomes of Nerve Recovery in a Rodent Forelimb Gap Repair Model*
  - Authors: Peter J. Nicksic, MD, D'Andrea T. Donnelly, BA, Weifeng Zeng, MD, Allison J. Seitz, BS, Kip A. Ludwig, PhD, Samuel O. Poore, MD, PhD, Aaron J. Suminski, PhD, Aaron M. Dingle, PhD
- **11:00-11:15 AM*** – Quinn Steiner, BS
  - *Diversity in Plastic Surgery Match: Effect of Program Chair, Program Director and Faculties' Race and Gender on Matched Applicants*
  - Authors: Quinn Steiner, BS, Armin Edalatpour, MD, Allison Seitz, BS, Michael L. Bentz, MD, Ahmed M. Afifi, MD
- **11:15-11:30 AM*** – Heather Jennings
  - *Immune Effects of Extracellular Vesicles Generated During Normothermic ex vivo Liver Perfusion*
  - Authors: Heather Jennings, BS, Stacey McMorrow, MS, Kris Carlson, BS, Peter Chlebeck, BS, Bret Verhoven, BS, David Al-Adra, MD, PhD
- **11:30-11:45 AM*** – Dawda Jawara, MD
  - *Socioeconomic disparities and bariatric surgery outcomes: A qualitative analysis*
  - Authors: Jacqueline A. Murtha, MD, MPH, Esra Alagoz, PhD, Dawda Jawara, MD, Catherine R. Breuer, MS, Lindsey Eierman, MPH, Chloe S. Lam, Dorothy Farrar-Edwards, PhD, Corrine I. Voils, PhD, Luke M. Funk, MD, MPH

*Two-minute transition period included between speakers.

PROGRAM

Landmark Breakout
Moderator: Aaron Dingle, PhD
Judges: Elise Lawson, MD, MSHS and Lola Fayanju, MD, MA, MPHS
Admin/Tech Contact: Danielle French

- **10:30-10:45 AM*** – Bradon McDonald, PhD
  - *Genome-wide analysis of aberrant position and sequence of plasma DNA fragment ends in patients with cancer*
  - Authors: Karan K. Budhraja, PhD, Bradon R. McDonald, PhD, Michelle D. Stephens, BS, Tania Contente-Cuomo, MS, Havell Markus, MS, Maria Farooq, MBBS, Patricia F. Favaro, DVM, PhD, Sydney Connor, BS, Sara A. Byron, PhD, Jan B. Egan, PhD, Brenda Ernst, MD, Timothy K. McDaniel, PhD, Aleksandar Sekulic, MD, PhD, Nhan L. Tran, PhD, Michael D. Prados, MD, Mitesh J. Borad, MD, Michael E. Berens, PhD, Barbara A. Pockaj, MD, Patricia M. LoRusso, DO, Alan Bryce, MD, Jeffrey M. Trent, PhD, Muhammed Murtaza, MBBS, PhD
- **10:45-11:00 AM*** – Kirsten Gunderson, MD
  - *Zero-Depth vs. Penile Inversion Vaginoplasty: A Comparison of Surgical Techniques and Postoperative Outcomes*
  - Authors: Armin Edalatpour, MD, Allison J. Seitz, BS, Kirsten Gunderson, MD, Peter Wirth, MD, Katherine Rose, MD, Katherine M. Gast, MD, MS
- **11:00-11:15 AM*** – Aiping Liu, PhD
  - *The effect of anatomic location on pig models of burn injury and wound healing*
  - Authors: Aiping Liu, PhD, Alex Cheong, PhD, Sameeha Hassan, BS, Jen Meudt, PhD, Elizabeth Townsend, MD, Dhanu Shanmuganayagam, PhD, Lindsay Kalan, PhD, Angela Gibson, MD, PhD
- **11:15-11:30 AM*** – Karlie Haug, MD
  - *Training Nephrologists to Use Best Case/Worst Case for Dialysis Decisions for a Multisite Randomized Clinical Trial with Older Adults with Kidney Failure*
  - Authors: Karlie L. Haug, MD, Amy Zelenski, PhD, Anne Buffington, MPH, Kyle J. Bushaw, MS, Taylor Bradley, BS, Lily Stalter, MS, Toby C. Campbell, MD, MS, Margaret L. Schwarze, MD, MPP, FACS
- **11:30-11:45 AM*** – Juan Favela, MD
  - *Effect of cold atmospheric plasma dose fractionation on neuroblastoma cell line SKNAS and normal human dermal fibroblasts*
  - Authors: Juan Favela, MD, Bindu Nair, PhD, Ha Nguyen, PhD, Ligi Milesh, PhD, Hau Le, MD

*Two-minute transition period included between speakers.

PROGRAM

Northwoods Breakout
Moderator: Matthew Brown, PhD
Judges: David Francis, MD, MS and Rebecca Minter, MD
Admin/Tech Contact: Katie Dorst

- **10:30-10:45 AM*** – Julia Illiano
  - *Protein restriction augments weight loss and glucose improvements following sleeve gastrectomy*
  - Authors: Julia Illiano, BS, Luiz Lopez, Odin Shaepkens, Dudley Lamming, PhD, David A Harris, MD
- **10:45-11:00 AM*** – Yu Xia, MD
  - *Mid-term Outcomes of Heart Transplants from HCV NAT+ Donors*
  - Authors: Y. Xia, MD, S. T. Kim, MD, J. Hermsen, MD, R. Dhingra, MD, M. Johnson, MD, A. Ardehali, MD
- **11:00-11:15 AM*** – David Barnett, MD
  - *Visual system prodromal biomarkers in a mouse model of Parkinson disease*
  - Authors: David GS Barnett, MD, Freya M Mowat, BVSc, PhD, and Michelle R Ciucci, PhD, CCC-SLP
- **11:15-11:30 AM*** – Rebecca Williams-Karnesky, MD, PhD
  - *Heterogeneity of Patients with Primary Hyperparathyroidism: Implications for Interpretation of Intraoperative PTH*
  - Authors: Rebecca Williams-Karnesky, MD, PhD, MEdPsych, Alexander Chiu, MD, Nicole Lunardi, MD, Elisa Marten, MS, Dawn Elfenbein, MD, MPH, Simon A. Holoubek, DO, MPH, Kristin Long, MD, MPH, Erin MacKinney, MD, David F. Schneider, MD, MS, Rebecca Sippel, MD, Courtney J. Balentine, MD, MPH
- **11:30-11:45 AM*** – Steven Moura, MA
  - *Objective Residency Applicant Assessment Using a Linear Rank Model*
  - Authors: Ellen C. Shaffrey, MD, Steven P. Moura, MA, Pradeep K. Attaluri, MD, Peter J. Wirth, MD, Alyssa Schappe, BS, Armin Edalatpour, MD, Venkat K. Rao, MD, MBA

*Two-minute transition period included between speakers.

ACKNOWLEDGEMENTS

We would like to thank the following individuals who served on the **2023 Research Summit Committee** and made invaluable contributions to the planning of this event.

David Al-Adra, MD, PhD

Katrina Bell

Collin Brown

Kaitlin Dorst

Danielle French

Sally Gray

Nicole Jennings, MA

Cynthia Kelm-Nelson, PhD

Karen Lynch

Rebekah Olson

Sarah Pavao

Nicole Smialek, MBA

Susan Thibeault, PhD

Lee Wilke, MD

We also wish to recognize the **abstract reviewers** who served on our Program Committee. The following individuals generously donated their time to review the 84 abstracts that were submitted:

Courtney Balentine, MD

Julia Berian, MD

Randi Cartmill, MS

Daniel Cho, MD, PhD

Kelly Collins, MD

Miranda Cullins, PhD

Dawn Elfenbein, MD, MPH

Luke Funk, MD, MPH

Angela Gibson, MD, PhD

Luis Hidalgo, PhD

Sarah Jung, PhD

Dixon Kaufman, MD, PhD

Hau Le, MD

Aiping Liu, PhD

Vlasta Lungova, PhD

Entela Lushaj, MD

Heather Neuman, MD,MS

Manabu Nukaya, PhD

Jon Odorico, MD

Sudha Pavuluri Quamme, MD, MS

Nicole Rogus-Pulia, PhD

Jessica Schumacher, PhD

Carrie Thiessen, MD, PhD

Lee Wilke, MD

Yu Xia, MD, MS

Nabeel Zafar, MD

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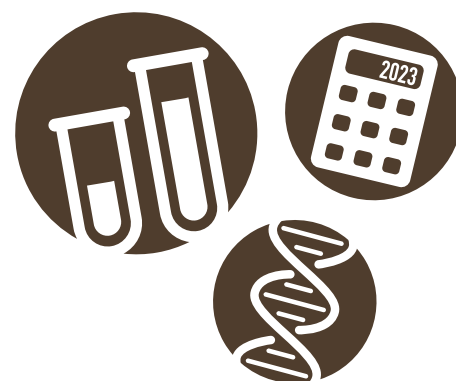
David Aufhauser, MD

Matthew Brown, PhD

Aaron Dingle, PhD

David Francis, MD, MS

Luke Funk, MD, MPH

Elise Lawson, MD, MSHS

Rebecca Minter, MD

Jessica Schumacher, PhD

Susan Thibeault, PhD

Nathan Welham, PhD

Lee Wilke, MD

LIST OF ABSTRACTS

Research Summit Oral Abstracts

Alphabetized by PI/Lab within each group.

Group One: Basic Science and Translational Research

Al-Adra

Immune effects of extracellular vesicles generated during normothermic ex vivo liver perfusion; *Heather Jennings, BS, Stacey McMorrow, MS, Kris Carlson, BS, Peter Chlebeck, BS, Bret Verhoven, BS, David Al-Adra, MD, PhD*

Heterotopic auxiliary whole liver rat transplant model with arterial blood supply for allograft tolerance studies; *Bret Verhoven, BS, Weifeng Zeng, MD, Peter Chlebeck, BS, Heather Jennings, BS, Samuel Poore, MD, PhD, David Al-Adra, MD, PhD*

Carchman

Assay validation for frequency of PI3K mutations at each phase of anal carcinogenesis; *Hillary Johnson, MD, MS, Kirsten Dennison, Muhammed Murtaza, MBBS, PhD, Evie Carchman, MD, FACS*

The application of the topical protease inhibitor Saquinavir in a transgenic mouse model; *Evan Yao, BS, Laura Gunder, MS, Tyra Moyer, BS, Hillary Johnson, MD, Evie Carchman, MD*

Ciucci

Early voice deficits in the TgF344-AD rat model of Alzheimer's disease; *Denis Michael Rudisch, MM, Charles Lenell, PhD, John A. Russell, PhD, Jared S. Cullen, BS, Nadine P. Connor, PhD, Michelle R. Ciucci, PhD*

Visual system prodromal biomarkers in a mouse model of Parkinson disease; *David G.S. Barnett, MD, Freya M. Mowat, BVSc, PhD, Michelle R. Ciucci, PhD, CCC-SLP*

Gibson

SWIG fluorescence imaging highlights necrotic burn tissue requiring excision*; Jocelyn C. Zajac, MD, Aiping Liu, PhD, Adam Uselmann, PhD, Christie Lin, PhD, Sameeha E. Hassan, BS, Lee Faucher, MD, Lauren Nosanov, MD, Angela L.F. Gibson, MD, PhD*

The effect of anatomic location on pig models of burn injury and wound healing; *Aiping Liu, PhD, Alex Cheong, PhD, Sameeha Hassan, BS, Jen Meudt, PhD, Elizabeth Townsend, MD, Dhanu Shanmuganayagam, PhD, Lindsay Kalan, PhD, Angela Gibson, MD, PhD*

Harris

Protein restriction augments weight loss and glucose improvements following sleeve gastrectomy; *Julia Illiano, BS, Luiz Lopez, Odin Shaepkens, Dudley Lamming, PhD, David A Harris, MD*

Kelm-Nelson

Oral administration of resveratrol alters inflammatory profiles in a prodromal model of Parkinson disease; *Sarah A. Lechner, BS, Abby J. Haglin, Taylor A.R. Kaldenberg, BS, Danielle R. Rosenblum, BS, Peyton E. Vogt, BS, Elizabeth Hoeppner, Amy Regenbaum, BS, David G.S. Barnett, MD, Stephen C. Gammie, PhD, Cynthia A. Kelm-Nelson, MS, PhD*

Female Pink1-/- rats have down-regulated synaptic signaling in the vocal fold thyroarytenoid muscle that may influence hypophonia; *David G.S. Barnett, MD, Sarah A. Lechner, BS, Stephen C. Gammie, PhD, Cynthia A. Kelm-Nelson, PhD*

Kisat

Plasma metagenomic sequencing to quantify microbial DNA in trauma patients; *Megan Nedden, BS, Michelle Stephens, BS, Clayton Marcinak, MD, Sydney Thompson, Elise Dietmann, Caitlin Pepperell, MD, Ben Zarzaur, MD, MPH, David Andes, MD, Bradon McDonald, PhD, Mehreen Kisat, MD, MS*

Odorico

Evaluating markers for human β cell functional maturation; *Sakar Gupta, Daniel M. Tremmel, Anna E. Mikat, Jon S. Odorico, MD, Sara D. Sackett, PhD*

University of Wisconsin Human Islet Core – A crucial resource in the fight against diabetes; *Peter Chlebeck, BS, Sara D. Sackett, PhD, Samantha Mitchell, BS, Ayesha P. Khan, MBBS, Jon Odorico, MD*

Poore and Dingle

Peripheral and trigeminal nerve stimulation improve functional outcomes of nerve recovery in a rodent forelimb gap repair model; *Peter J. Nicksic, MD, D'Andrea T. Donnelly, BA, Weifeng Zeng, MD, Allison J. Seitz, BS, Kip A. Ludwig, PhD, Samuel O. Poore, MD, PhD, Aaron J. Suminski, PhD, Aaron M. Dingle, PhD*

PRC-210 extends preservation time of vascularized composite allografts; *Grant R. Seils, Weifeng Zeng, MD, Ian Valerio, MD, Samuel O. Poore MD, PhD, William E. Fahl, PhD, Aaron M. Dingle, PhD*

Combined central and peripheral nerve stimulation improves functional recovery of mixed nerve injury in a rat forelimb peripheral nerve injury model; *Sahand C. Eftekari, BS, Peter J. Nicksic, MD, D'Andrea T. Donnelly, BA, Anna Jesch, Aaron J. Sumisnki, PhD, Samuel O. Poore, MD, PhD, Aaron M. Dingle, PhD*

Embryonic stem cell derived in vitro endothelialization of interposition ePTFE grafts in rhesus macaques; *Weifeng Zeng, MD, John P. Maufort, Sarah Lyon, Nicholas J. Albano, Jue Zhang, Dave Vereide, James A. Thomson, Samuel O. Poore, MD, PhD*

The necessary anatomy for an osseointegrated neural interface sheep model; *Lucas Sears, BS, Alison Karczewski, MD, Aaron Dingle, PhD, Samuel Poore, MD, PhD*

Thibeault

Microbial gut-larynx axis and laryngeal immunity; *Ran An, PhD, Christina Kendziorski, PhD, Federico E. Rey, PhD, Susan L. Thibeault, PhD*

Contribution of resident commensal and pathogenic microbial communities on vocal fold mucosal integrity and function; *Vlasta Lungova, PhD, Madhu Gouda, Susan L. Thibeault, PhD*

Group Two: Clinical Science and Health Services Research

Afifi

Evaluation of the ability of lasers to attract and retain patients in an academic cosmetic surgery center; *Armin Edalatpour, MD, Peter Wirth, MD, Pradeep Attaluri, MD, Lily Stalter, MS, Ellen C. Shaffrey, MD, Ahmed Afifi, MD*

The nuances of abdominal free flap harvest: Technical and patient factors affecting abdominal donor site morbidity in autologous breast reconstruction; *Armin Edalatpour, MD, Pradeep Attaluri, MD, Ellen Shaffrey, MD, Allison Seitz, BS, Samuel O. Poore, MD, PhD, Ahmed M. Afifi, MD*

Aufhauser

Use of CT metrics to predict pancreas transplant outcomes; *Colin Snook, BS, David Aufhauser, MD*

Balentine

How can we objectively evaluate the effectiveness of protocol-driven calcium and calcitriol supplementation after thyroidectomy?; *Rebecca Williams, MD, PhD, MEdPsych, Alexander Chiu, MD, Nicole Lunardi, MD, Elisa Marten, MS, Dawn Elfenbein, MD, MPH, Simon Holoubek, DO, MPH, Kristin Long, MD, MPH, Erin Mackinney, MD, David F Schneider, MD, MS, Rebecca Sippel, MD, Courtney Balentine, MD, MPH*

Heterogeneity of patients with primary hyperparathyroidism: Implications for interpretation of intraoperative PTH; *Rebecca Williams-Karnesky MD, PhD, MEdPsych, Alexander Chiu, MD, Nicole Lunardi, MD, Elisa Marten, MS, Dawn Elfenbein, MD, MPH, Simon A. Holoubek, DO, MPH, Kristin Long, MD, MPH, Erin MacKinney, MD, David F. Schneider, MD, MS, Rebecca Sippel, MD, Courtney J. Balentine, MD, MPH*

Berian

Exploring benefits and barriers to perioperative comprehensive geriatric assessment: A qualitative analysis; *Julia R. Berian, MD, MS, Randi S. Cartmill, MS, Esra Alagoz, PhD*

Cho

Reducing the relative radiation risk from diagnostic computed tomography for craniosynostosis; *Daniel Y. Cho, MD, PhD, Catharine Garland, MD, Nastassja L. Peterman, ARNP, Liana Cheung, MBBS, Scott P. Bartlett, MD, Jesse A. Taylor, MD, Arastoo Vossough, MD, PhD, Jordan W. Swanson, MD, MSc*

Ciucci

Healthy adults demonstrate pressure and timing differences between volitional and spontaneous swallows: a pharyngeal high-resolution manometry study; *Maryann N. Krasko, MS, Sarah Ladin, Nicole E. Schaen-Heacock, MS, CF-SLP, Suzan Abdelhalim, MD, Corinne A. Jones, PhD, CCC-SLP, Michelle R. Ciucci, PhD, CCC-SLP, Timothy M. McCulloch, MD, FACS*

DeBiasi

National analysis of short-term outcomes following valve replacement for radiation heart disease; *Andreas R. de Biasi, MD, Hannah Waldman, Manasa Venkatesh, MS, Glen Leverson, PhD, Entela B. Lushaj, MD, PhD, Yu Xia, MD, MS, Satoru Osaki, MD, PhD, Chris Rokkas, MD, PhD, MBA, Malcolm DeCamp, MD*

Funk

Patient and provider perceptions about communication after bariatric surgery: A qualitative analysis; *Chloe S. Lam, BS, Dawda Jawara, MD, Esra Alagoz, PhD, Jacqueline A. Murtha, MD, MPH, Corrine I. Voils, PhD, Luke M. Funk, MD, MPH*

Racial disparities in nutrient deficiencies among bariatric surgery patients: A systematic review; *Dawda Jawara, MD, Jacqueline A. Murtha, MD, MPH, Daniel M. Ufearo, Bryan M. Gannon, PhD, Luke M. Funk, MD, MPH*

Socioeconomic disparities and bariatric surgery outcomes: A qualitative analysis; *Jacqueline A. Murtha, MD, MPH, Esra Alagoz, PhD, Dawda Jawara, MD, Catherine R. Breuer, MS1, Lindsey Eierman, MPH, Chloe S. Lam, Dorothy Farrar-Edwards, PhD, Corrine I. Voils, PhD, Luke M. Funk, MD, MPH*

Weight change trends: A quantitative analysis of an NIH-partnered dataset; *Dawda Jawara, MD, Jacqueline A. Murtha, MD, MPH, Manasa Venkatesh, MS, Craig Krebsbach, Jen Birstler, MS, Lily Stalter, MS, Bret M. Hanlon, PhD, Luke M. Funk, MD, MPH*

Garland

Mandibular distraction osteogenesis in Pierre Robin infants: A literature review and retrospective analysis on feeding and growth outcomes; *Armin Edalatpour, MD, Allison J. Seitz, BS, Vik Patel, BS, Lisa Block, MD, Katherine Rose, MD, Delora Mount, MD, Catherine B. Garland, MD*

Gast

Postoperative outcomes following periareolar versus double incision gender-affirming mastectomies; *Armin Edalatpour, MD, Allison J. Seitz, BS, Aleah M. Warden, BS, Kirsten Gunderson, MD, Peter J. Wirth, MD, Katherine Rose, MD, Katherine Gast, MD*

Zero-depth vs. penile inversion vaginoplasty: A comparison of surgical techniques and postoperative outcomes; *Armin Edalatpour, MD, Allison J. Seitz, BS, Kirsten Gunderson, MD, Peter Wirth, MD, Katherine Rose, MD, Katherine M. Gast, MD, MS*

Ingraham

Communication challenges and opportunities for improvement during interhospital transfers of emergency general surgery patients: The physician perspective; *Diana Gutierrez-Meza, MPH, Megan Saucke, MA, Esra Alagoz, PhD, Angela Ingraham, MD, MS*

Jiang

Do the nonlinear dynamic acoustic measurements, nonlinear energy difference ratio, and spectrum convergence ratio correlate with perceptual evaluation of esophageal voice speakers?; *Fan Zhang, MD, Duy Duong Nguyen, MD, PhD, Catherine Madill, PhD, Yi Zhang, MD, Sebastian Kiehn, Jiachen Sun, BS, Nicole Haderlein, BS; Sara Haines, BS, Logan Klein, BS, Cai Li, MD, Jack J. Jiang, MD, PhD*

Lawson

Colonoscopy access and quality measurement in rural Wisconsin; *Jessica Schumacher, PhD, Jennifer Weiss, MD, MS, Jeremy Levin, MHA, Matt Gigot, MPH, Elise Lawson, MD, MSHS*

Lobeck

Indications, resource allocation, and outcomes associated with EXIT procedures – A North American Fetal Therapy Network (NAFTNet) survey; *Devashish Joshi, MD, Michael Stellon, MD, Kathleen Antony, MD, Michael Beninati, MD, Francois L. Luks, MD, PhD, Michael Puricelli, MD, Inna N. Lobeck, MD*

Maloney

Consequences of anastomotic leaks after minimally invasive esophagectomy: A single-center experience; *Grigor S. Simitian, David J. Hall, Glen Leverson, Entela B. Lushaj, Erik Lewis, Kelsey A. Musgrove, Daniel P. McCarthy, James D. Maloney*

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McCarthy

Body mass index does not impact long-term survival of patients with idiopathic pulmonary fibrosis undergoing lung transplantation; *Entela B. Lushaj, MD, PhD, Malcolm DeCamp, MD, James Maloney, MD, Nilto De Oliveira, MD, Daniel McCarthy, MD, MBA, MEM*

Michelotti

Predictors of hand therapy non-compliance following flexor tendon repair: A retrospective cohort study; *Armin Edaltpour, MD, Matthew T. McLaughlin, BS, Allison J. Seitz, BS, Steven P. Moura, MA, Brett F. Michelotti, MD*

Neuman

A 4-arm randomized trial of topical pain control for breast cancer sentinel node radiotracer injections; *Alyssa A. Wiener, MD, Jessica R. Schumacher, PhD, Scott B. Perlman, MD, Lee G. Wilke, MD, Meeghan A. Lautner, MD, MSc, Laura M. Bozzuto, MD, MS, Bret M. Hanlon, PhD, Heather B. Neuman, MD, MS*

Re-examining time from breast cancer diagnosis to primary surgery; *Alyssa A. Wiener, MD, Bret M. Hanlon, PhD, Jessica R. Schumacher, PhD, Kara A. Vande Walle, MD, Lee G. Wilke, MD, Heather B. Neuman, MD, MS*

Barriers and facilitators to the implementation of a web-based decision aid in surgery clinics (Alliance A231701CD); *Jennifer L. Tucholka, PA, Jessica R. Schumacher, PhD, Patricia McNamara, BS, Angelina Tan, MS, David Zahrieh, PhD, Selina Chow, MD, Catherine R. Breuer, MS, Grace McKinney, BS, Heather B. Neuman, MD*

Receipt of preventive care and health promotion counseling in early stage breast cancer survivors; *Laura K. Krecko, MD, Jessica R. Schumacher, PhD, James E. Haine, MD, Amye J. Tevaarwerk, MD, Kristine L. Kwekkeboom, PhD, RN, FAAN, Trista J. Stankowski-Drengler, MD, MS, Catherine R. Breuer MS, Jennifer L. Tucholka, PA, Courtney Maxcy, MPH, Heather B. Neuman, MD, MS*

Nichol

Risk modeling of errors in the surgical instrument cycle, insights to solutions for an expensive and persistent problem; *Peter Nichol, MD, PhD, Mark Saari*

Poore

Management of symptomatic neuromas: A narrative review of the most common surgical treatment modalities in amputees; *Sahand C. Eftekari, BS, Peter J. Nicksic, MD, Allison J. Seitz, BS, D'Andrea T. Donnelly, BA, Aaron M. Dingle, PhD, Samuel O. Poore, MD, PhD*

Assessment of racial disparities in reconstructive breast surgery receipt and outcomes in Wisconsin; *Zeeda H. Nkana, BS, Kasey Leigh Wood, BS, Kirsten A. Gunderson, MD, Rachel Weber, BS, Erin L. Doren, MD, MPH, Aaron M. Dingle, PhD, Samuel O. Poore, MD, PhD*

Understanding prosthetic embodiment and assessing its value to amputee patients; *Sahand C. Eftekari, BS, Lucas Sears, Steven Moura, BS, Sydney Garelick, Ellen C. Shaffrey, MD, Samuel O. Poore, MD, PhD*

From tip of brush to tip of knife: Aesthetics of post-mastectomy breast reconstruction and the fine arts; *Kasey Leigh Wood Matabele, BS, Zeeda H. Nkana, BS, Allison J. Seitz, BS, Armin Edalatpour, MD, Ashish Y. Mahajan, MD, Samuel O. Poore, MD, PhD*

Surgical management of adult acquired buried penis syndrome: A systematic review of postoperative outcomes*; Armin Edalatpour, MD, Allison J. Seitz, BS, Jacqueline S. Israel, MD, Samuel O. Poore, MD, PhD*

Surgical management of adult acquired buried penis syndrome: A review of the Wisconsin classification system and postoperative outcomes; *Allison J. Seitz, BS, Armin Edalatpour, MD, Jacqueline S. Israel, MD, Matthew D. Grimes, MD, Daniel H. Williams, MD, Samuel O. Poore, MD, PhD*

Puricelli

Perinatal airway obstruction: A quantitative analysis of fetal goiter; *Maya N. Matabele, MS, Christie Cheng, MD, Manasa Venkatesh, MS, Inna Lobeck, MD, Michael D. Puricelli, MD*

Rao

Medical malpractice lawsuits involving cosmetic surgeries and minimally invasive procedures not performed by plastic surgeons; *Steven Moura, MA, Ellen C. Shaffrey, MD, Chloe Lam, BS, Peter J. Wirth, MD, Pradeep K. Attaluri, MD, Venkat K. Rao, MD, MBA*

Rogus-Pulia

Impact of a probiotic intervention on oral microbial profiles in older patients with dysphagia at risk for aspiration pneumonia; *Celia Deckelman, MA, Ashley Kates, PhD, Jonah Dixon, BS, Colleen Riley, BS, Nasia Safdar, MD, PhD, Susan Thibeault, PhD, CCC-SLP, Nicole Rogus-Pulia, PhD, CCC-SLP*

Schwarze

Clinical momentum associated with overtreatment at the end-of-life; *Sarah I. Zaza, MD, Kyle J. Bushaw, MA, Anne Buffington, MPH, Karlie Haug, MD, Taylor Bradley, BS, Elle L. Kalbfell, MD, Margaret L. Schwarze, MD, MPP*

Training nephrologists to use Best Case/Worst Case for dialysis decisions for a multisite randomized clinical trial with older adults with kidney failure; *Karlie L. Haug, MD, Amy Zelenski, PhD, Anne Buffington, MPH, Kyle J. Bushaw, MS, Taylor Bradley, BS, Lily Stalter, MS, Toby C. Campbell, MD, MS, Margaret L. Schwarze, MD, MPP, FACS*

Thibeault

Factors affecting time to re-injection for the treatment of presbyphonia-induced glottal insufficiency; *Anumitha Venkatraman, PhD, CCC-SLP, David Francis MD, Susan Thibeault, PhD, CCC-SLP*

Thiessen

Support needs for living kidney donor candidates: Results from a multicenter, mixed-methods study; *Amelia Daley, BS, Arhat Dwa, Esra Alagoz, PhD, Jackie Gannon, MA, Sienna Li, BS, Danielle Dobosz, JD, Kristie Kennedy, JD, Daniel Gray, MD, Adam Mussell, MA, Peter Reese, MD, PhD, Elisa Gordon, PhD, Sanjay Kulkarni, MD, MHCM, Carrie Thiessen, MD, PhD*

Xia

Normothermic regional perfusion in donation after circulatory death heart donors may not have a detrimental effect on lung transplant outcomes; *Yu Xia, MD, Samuel T. Kim, Erin Lowery, James Maloney, MD, Malcolm DeCamp, MD, Daniel McCarthy, MD, Abbas Ardehali*

Ex-vivo lung perfusion may have a detrimental impact on lung transplants from donation after circulatory death donors; *Yu Xia, MD, Samuel T. Kim, James Maloney, MD, Malcolm DeCamp, MD, Erin Lowery, Daniel McCarthy, MD, Abbas Ardehali*

Mid-term outcomes of heart transplants from HCV NAT+ donors; *Yu Xia, MD, Samuel T. Kim, Joshua Hermsen, Ravi Dhingra, Maryl Johnson, Abbas Ardehali*

Zafar

Prioritizing cancer care in low and middle-income countries using delta mortality-to-incidence ratios; *Thomas Diehl, MD, Sheida Pourdashti, BS, Daniel Schroeder, BS, Syed Nabeel Zafar, MD, FACS*

Development and implementation of a peri-operative surgical registry in Hawassa, Ethiopia; *Taylor J. Jaraczewski, Thomas Diehl, Yonas Nigussie, Winta Melaku, Tinbete Esayas, Chris Dodgion, Girma Tefera, Belay Mellesse, Syed Nabeel Zafar*

Barriers and facilitators to collecting surgical outcome data in low- and middle- income countries (LMICs): An international survey of stakeholders; *Taylor Jaraczewski, MD, Thomas Diehl, MD, Ewen Harrison, MB ChB, PhD, FRCS, Girma Tefera, MD, FACS, Muhammad Rizwan Khan, MBBS, Asad Latif, MBBD, Belay Mellese, MD, Kelly McQueen, MD, MPH, FASA, Syed Nabeel Zafar, MD, MPH, FACS*

Group Three: Education Research

Afifi

Diversity in plastic surgery match: Effect of program chair, program director and faculties' race and gender on matched applicants; *Quinn Steiner, BS, Armin Edalatpour, MD, Allison Seitz, BS, Michael L. Bentz, MD, Ahmed M. Afifi, MD*

Poore and Dingle

Quality control in plastic surgery research; *Grant Seils, Anna Jesch, Aaron Dingle, PhD*

Latex infused porcine abdominal model: A novel microsurgery simulator for deep inferior epigastric perforator dissection; *Ellen C. Shaffrey, MD, Weifeng Zeng, MD, Peter J. Nicksic, MD, Sahand Eftekari, BS, Jennifer M. Frank, BS/AS, Aaron M. Dingle, PhD, Samuel O. Poore, MD, PhD*

Diversity drives representation: An internal audit into gender representation in citation practices of a single surgical laboratory; *Yunee Lo, Gabriela A. Fioranelli, Matthew J. Laluzerne, D'Andrea Donnelly, Sarah M. Lyon, Aaron M. Dingle, PhD*

Microsurgical simulation training enhances medical student acting internship experience; *Rosaline Zhang, MD, Weifeng Zeng, MD, Aaron Dingle, PhD, Samuel Poore, MD, PhD*

Microsurgical education streaming: A method to provide remote education to international microsurgeons; *Sahand C. Eftekari, BS, Weifeng Zeng, MD, Ellen C. Shaffrey, MD, Samuel O. Poore, MD, PhD*

Creating an augmented reality microsurgery training kit for surgery residents: A proof of concept; *Sahand C. Eftekari, BS, Ellen C. Shaffrey, MD, Samuel O. Poore, MD, PhD*

Rao

Predicting a successful plastic surgery resident applicant – The linear rank model; *Ellen C. Shaffrey, MD, Steven P. Moura, MA, Pradeep K. Attaluri, MD, Peter J. Wirth, MD, Alyssa Schappe, BS, Armin Edalatpour, MD, Venkat K. Rao, MD, MBA*

Voils

Evaluation of the Veterans Affairs Pharmacogenomic Testing for Veterans (PHASER) Program: Barriers and facilitators to patient uptake of pharmacogenomic testing; *Karina Melendez, BS, Diana Gutierrez-Meza, MPH, Esra Alagoz, PhD, Nina Sperber, PhD, R. Ryanne Wu, MD, Deepak Voora, MD, Abigail Silva, PhD, Kara Gavin, PhD, Allison Hung, MPH , Megan C Roberts, PhD, Corrine Voils, PhD*

Research Summit Visual Abstracts

Alphabetized by PI/Lab within each group.

Group One: Basic Science and Translational Research

Al-Adra

Ex vivo lentiviral gene delivery to kidneys; *Grace Heise, Bret Verhoven, Rahul Das, Heather Jennings, David Al-Adra, MD, PhD*

Glass

Vocal phenotypes in two mouse models of Down syndrome; *Charles Lenell, PhD, CCC-SLP, Nadine P. Connor, PhD, CCC-SLP, Tiffany J. Glass, PhD*

Jiang

A diffusion model for 5-aminolevulinic acid delivery into canine vocal fold epithelium and lamina propria; *Sebastian Kiehn, Matthew Silverman, Jack J Jiang MD, PhD*

Kelm-Nelson

Daily injections of resveratrol alter limb motor function and inflammatory profiles in the Pink1-/- rat; *Sarah A. Lechner, David G.S. Barnett, and Cynthia A. Kelm-Nelson, PhD*

Group Two: Clinical Science and Health Services Research

Pitt

The relative importance of treatment outcomes to patients with low-risk thyroid cancer: A comparison by treatment choice; *Catherine B. Jensen, MD, Megan C. Saucke, MA, Kyle J. Bushaw, MA, Sophie Dream, MD, Abbey Fingeret, MD, Masha J. Livhits, MD, Aarti Mathur, MD, PhD, Alexandria McDow, MD, Sanziana Roman, MD, Corrine I. Voils, PhD, Justin Sydnor, PhD, Susan C. Pitt, MD, MPHS*

Poore

Assessment of racial disparities in reconstructive breast surgery receipt and outcomes in Wisconsin; *Zeeda H. Nkana, BS, Kasey Leigh Wood BS, Kirsten A. Gunderson, MD, Rachel Weber, BS, Erin L. Doren, MD, MPH, Aaron M. Dingle, PhD, Samuel O. Poore, MD, PhD*

Research Summit Surgery Science Images

Alphabetized by PI/Lab.

Al-Adra and Dingle-Poore

Heterotopic auxiliary whole liver transplant in rat: *Bret Verhoven, Weifeng Zeng*

Brown

Teratoma: Monster tumor: *Matthew E. Brown, Sierra Raglin*

Carchman

Dual L1/K14 immunofluorescence in MmuPV1-infected mouse cervical epithelium: *Laura Gunder, Evie Carchman*

Connor

Fischer 344/Brown Norway rat genioglossus muscle: *Julia Mordarski*

Glass

Intrinsic tongue of Ts65Dn Down syndrome mouse: *Ben Chatwin*

Jiang

The booth: *Katerina Smereka and Kyle Harkin*

Kelly

Utility of intraoperative fluorescence in assessment of tissue perfusion: *Kaitlyn Kelly*

Le

When science meets mindfulness – My approach towards productive research: Ligi Milesh

Lobeck

Half-born; Ex-utero intrapartum treatment: *Inna Lobeck, Casey Winchester, Michael Puricelli, Michael Beninati*

Poore and Dingle

Teaching microsurgery international livestream: *Weifeng Zeng, Sahand Eftekari*

Schwarze

A swanky Sankey: What surgeons talk about when they talk about surgery: *Lily N. Stalter, Nathan D. Baggett, Bret M. Hanlon, Anne Buffington, Elle L. Kalbfell, Amy B. Zelenski, Robert M. Arnold, Justin T. Clapp, Margaret L. Schwarze*

ABSTRACTS FOR ORAL PRESENTATION
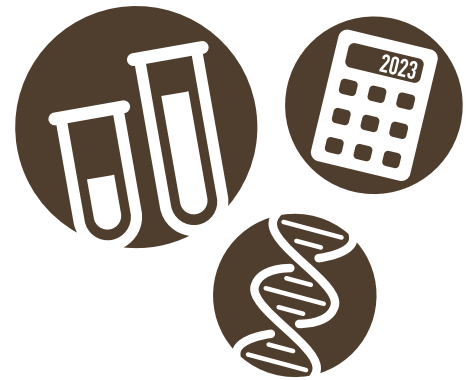
Basic Science and Translational Research Abstracts

Immune Effects of Extracellular Vesicles Generated During Normothermic ex vivo Liver Perfusion

Heather Jennings; Stacey McMorrow; Kris Carlson; Peter Chlebeck; Bret Verhoven; David Al-Adra

Introduction: Extracellular vesicles (EVs) play an important role in transplant rejection by delivering donor major histocompatibility complex (MHC) molecules to recipient antigen presenting cells (APCs). This phenomenon is known as cross-decoration and the degree to which cross-decorating contributes to liver rejection or tolerance in a transplant setting has not been characterized. Normothermic *ex vivo* liver perfusion (NEVLP) allows for the collection of EVs produced by the liver in a near physiological setting. Our experimental goal is to determine the immunoregulatory effects of EVs, and we hypothesize these EVs will be primarily anti-inflammatory.

Methods: Lewis rat livers underwent NEVLP for four hours. Perfusate samples were taken before the liver was placed on the machine (T=0) and at the end of perfusion (T=4). Small EVs were isolated utilizing size exclusion chromatography and quantified using Nanosight tracking analysis. Small RNA was isolated using a Qiagen miRNeasy kit. Isolated miRNA for eight samples was sequenced at the UW Biotechnology Center. EVs were also mixed with allogenic Brown Norway rat antigen presenting cells to assess cross decorating efficiency.

Results: An average of 1.23E9 number of particles were present after four hours of perfusion. Differential expression of miRNA from samples taken at 0 hr and 4 hr of the perfusion revealed six miRNAs were found to be upregulated during the perfusion, five of which are anti-inflammatory. The miRNAs found to be anti-inflammatory were rno-miR-378a-3p, rno-miR-192-5p, rno-miR-150-5p, rno-miR-29a-3p, rno-miR-142-5p and the inflammatory miRNA was rno-miR-122-5p. Lewis derived EVs were shown to be able to cross decorate Brown Norway APCs as demonstrated by cytometry.

Conclusions: We demonstrate the liver produces EVs during NEVLP that primarily contain anti-inflammatory miRNA and are capable of cross-decorating allogenic APCs. Future studies will investigate the immunological function of these EVs using mixed cellular reactions. Therapeutic opportunities are available during NEVLP that are not possible with traditional liver storage methods. Given the critical role of EVs in the recipient immune response, by modifying the immune environment of the liver prior to transplantation to that of an anti-inflammatory environment the EVs produced by the liver could result in an anti-inflammatory nature.

Heterotopic Auxiliary Whole Liver Rat Transplant Model with Arterial Blood Supply for Allograft Tolerance Studies

Bret Verhoven; Weifeng Zeng; Peter Chlebeck; Heather Jennings; Samuel Poore; David Al-Adra

Small animal transplant models are indispensable research tools for organ tolerance studies investigating possible therapeutic interventions. Orthotopic liver transplantation in the rat is a technically demanding surgical procedure requiring advanced microsurgical skills, which motivated us to develop a less complicated heterotopic method that can be performed faster with no anhepatic time and considerably less post-surgery stress for the recipient animal. This heterotopic transplant protocol involves two main steps: (1) excising the liver from the donor rat; and (2) transplantation of the whole liver into the recipient rat. During excision of the donor liver, the supra-hepatic vena cava (SHVC) and hepatic artery (HA) are ligated. The left kidney of the recipient is removed and the donor liver positioned with the portal vein (PV), infra-hepatic vena cava (IHVC), and bile duct facing the renal vein and artery. The recipients' renal vein is anastomosed end-to-end with the IHVC of the liver and the PV arterialized with the renal artery using a 0.35mm diameter stent. The bile duct is attached end-to-end with the recipients' ureter permitting discharge of bile via the bladder. The average duration of the transplantation was 130 min with a cold ischemia time of around 35 min; the warm ischemia time was less than 25 min. After eight days, H&E histology of the auxiliary liver from a syngeneic transplant showed normal hepatocyte structure and no significant parenchymal alterations.

Assay Validation for Frequency of PI3K Mutations at Each Phase of Anal Carcinogenesis

Hilary Johnson; Kirsten Dennison; Muhammed Murtaza; Evie Carchman

Introduction: The incidence and mortality of anal cancer have increased over the last two decades. There is a gap in knowledge regarding the prevalence and timing of mutations in the dysplasia to cancer pathway, limiting our ability to identify patients at the greatest risk for developing anal cancer. Mutations in the catalytic subunit of Phosphatidylinositol (3,4,5)-trisphosphate Kinase (PI3K) are detected in 20% of anal cancers, making it the most common mutation. We hypothesize that genomic aberrations affecting PI3K are an early event in anal carcinogenesis that can help identify which patients with anal dysplasia are at highest risk for future cancer development. Our goal was to validate digital PCR (dPCR) assays to detect the three most common mutations of PI3K in anal cancer: E545K, H1047R, and H1047L.

Methods: Reference DNA samples with three PI3K mutations (E545K, H1047R, and H1047L) were identified from institutional sources. DNA was extracted from formalin-fixed, paraffin-embedded (FFPE) slides with the QIAamp DNA FFPE Tissue kit following manufacturer's instructions. Commercially available microfluidic dPCR assays for the E545K, H1047R, and H1047L mutations (Qiagen dPCR LNA mutation assays) were selected for validation and tested using 25-50ng of template DNA at a normalized concentration (5ng/µL) with two technical replicates on the QIAcuity dPCR system following manufacturer's instructions. Statistical analysis included unpaired t-tests.

Results: In regards to the E545K assay, the mean mutant fraction was 4.45% compared to 0.115% in control (p-value = 0.0125). There were a mean 217 positive partitions for the E54K mutant compared to 7 positive partitions in the control (p-value = 0.0047). For the H1047R assay, there was a mean mutant fraction of 69.52% compared to 0.085% in control (p-value < 0.0001). There was a mean of 5143 positive partitions in the mutant compared to a mean of 3 positive partitions in the control (p-value = 0.0003). Finally, in the H1047L mutation assay, there was a mean mutant fraction of 49.35% compared to 0.015% in control (p-value = 0.0002). There was a mean of 3494 positive partitions compared to a mean of 2 positive partitions in the control (p-value = 0.0005).

Conclusions: We were able to validate three Qiagen dPCR LNA mutation assays for assessment of the most common PI3K mutations found in anal carcinogenesis utilizing DNA with known mutations of interest. We plan to utilize these assays to evaluate patient samples across the spectrum of anal carcinogenesis for frequency of PI3K mutation at each stage.

The Application of the Topical Protease Inhibitor Saquinavir in a Transgenic Mouse Model

Evan Yao; Laura Gunder; Tyra Moyer; Hillary Johnson; Evie Carchman

Introduction: Anal dysplasia and cancer, though rare, are increasing in incidence in the United States. There is a significant need for methods of disease prevention. Protease inhibitors, such as Saquinavir (SQV), have shown success in the prevention of cervical cancer models *in vitro* and *in vivo*. This study aims to evaluate the effect of SQV on the expression of viral oncoproteins, E6 and E7, in a mouse model of anal disease.

Methods: *K14E6/E7* mice (n=90 females, n=64 males) express E6 and E7 oncogenes in their anal epithilium and develop high-grade anal dysplasia around 25 weeks of age. DMBA (7,12-dimethylbenz[a]anthracene) a topical carcinogen, was administered topically once a week to ensure anal cancer development. Mice were randomized into four groups at 25 weeks of age: mock tip, mock tip & DMBA, SQV only, SQV & DMBA. SQV (2.5%) was administered topically to the mice anuses, Monday through Friday, for the 20-week treatment period. Mice were then euthanized and anal tissue was harvested and fixed. Anal sections were immunohistochemical (IHC) stained for proteins E6 and E7. Images (200X) were reviewed using ImageJ and data analyzed via one-way ANOVAs with multiple comparison tests in Graphpad Prism 9.

Results: For female mice, SQV increased E7 expression between the mock tip and SQV only mice (p-value=0.0089). For male mice, SQV increased E6 expression between mock tip and SQV only (p-value=0.0345).

Conclusions: Topical SQV had significant effects on increasing E7 expression in female mice treated with SQV, and E6 expression in male mice treated with SQV.

Early Voice Deficits in the TgF344-AD Rat Model of Alzheimer's Disease

Denis Michael Rudisch; Charles Lenell; John A. Russell; Jared S. Cullen; Nadine P. Connor; Michelle R. Ciucci

Introduction: Alzheimer's disease (AD) is a progressive neurologic disease that is characterized by inflammation, abnormal levels of tau protein, and aggregation of β-amyloid. Deficits in communication also occur during disease progression, impacting health and quality of life. AD pathology is found in the central *and* peripheral nervous system, even in the prodromal and early stages. Because clinical diagnosis often occurs in mid-stage of the disease, studying the onset, progression, and specific neurobiology that results in communication dysfunction in prodromal and early AD in humans is challenging. As such, the aim of this study was to assay early vocal communication in a validated transgenic rat model (TgF344-AD) that manifests cognitive, behavioral, and neuropathological dysfunction akin to AD in humans. We tested the central hypothesis that vocal dysfunction manifests in the prodromal stage and progressively worsens in the TgF344-AD compared to wildtype (WT) controls.

Methods: Vocal communication (ultrasonic vocalizations) was analyzed in male TgF344-AD (n=6) and WT control rats (n=6) at 5 and 7 months of age. Dependent measures were: peak frequency (kHz), call complexity (number of complex calls), mean power (dB/kHz), call duration and type (simple, complex, harmonic). A 2x2 mixed-effects repeated measures model was used to analyze vocalizations with condition (TgF344-AD, WT) and age (5mo, 7mo) as independent variables. Pairwise comparisons were adjusted using Tukey's method. Significance was set at $p < 0.05$.

Results: For mean power, a significant interaction between condition and age was identified; pairwise comparisons revealed a reduction in mean power between 5 and 7 mo in AD rats ($p < 0.007$). For lower peak frequency, a significant interaction between condition and age was identified: lower peak frequency levels were observed in TgF344-AD rats at 7 mo compared to AD rats at 5 mo ($p < 0.005$).

Conclusions: Our preliminary findings demonstrated early and progressive vocal deficits in the TgF344-AD model. These findings suggest changes in vocalization in the early stages. Changes in vocal communication could be an important early biomarker to help early diagnosis and treatment in humans. Data collection and analyses for later timepoints (8 mo, 10 mo, 12 mo) is ongoing. Tissue harvest will occur at 12 mo. Pre- and post-synaptic neuromuscular junction morphological features will be analyzed using immunohistochemistry for thyroarytenoid, cricothyroid, and alar muscles. Future work will include PET scans and assay neuroinflammation markers in brain and peripheral tissues.

Visual System Prodromal Biomarkers in a Mouse Model of Parkinson Disease

**David GS Barnett; Freya M. Mowat; Michelle R. Ciucci**

Introduction: Parkinson disease (PD) is the second most prevalent neurodegenerative disorder and is primarily characterized by progressive motor dysfunction, which leads to diagnosis. At this clinical stage of PD, greater than half of substantia nigra dopaminergic neurons have died following years or decades of insidiously developing nervous system pathology. There is an urgent need to diagnose PD in the prodrome, prior to development of clinical motor signs. Germane to this work, non-motor PD signs, including visual changes, often develop in the prodromal phase of disease. Additionally, pathological alpha-synuclein protein aggregates, a primary etiological hallmark of PD, have been demonstrated in the retinas of post-mortem PD patients. This work aims to leverage the accessibility of the retina to evaluate the utility of functional and structural retinal deficits as potential prodromal biomarkers of PD by using noninvasive, relatively inexpensive, and widely available electroretinography (ERG) and optical coherence tomography (OCT). To investigate retinal changes in the PD prodrome, a mouse-model of PD was used and assayed over time via ERG and OCT while being screened for development of clinical motor PD deficits, which typically manifest after 8 months of age. We hypothesized that significant measurable deficits in retinal function via ERG and structure via OCT would be identifiable prior to the PD mice developing clinical motor signs.

Methods: M83 transgenic mice (n=8) expressing mutant human A53T alpha-synuclein under direction of the mouse prion protein promoter on a B6;C3H genetic background (M83) and B6C3F1 control mice (n=8) (WT) were received at 6 weeks of age. Every 2 months starting at 2 months of age, mice underwent ERG and OCT under isoflurane anesthesia. Pole and cylinder tests assayed motor function at each timepoint. The study remains in progress.

Results: Significant genotype effects were detected in retinal function via a-wave amplitude decreases in M83 mice at 4- (p=0.0343) and 6-months (p=0.0042) of age and b-wave amplitude decreases at 6-months (p<0.0001) of age using mixed model analyses (Figure 1). Total retinal thickness via OCT trended toward thinning among M83 vs. WT mice at 6 months but was not statistically significant (p=0.11). No significant motor deficits were detected at or before 6 months of age.

Conclusions: Non-invasive, *in vivo* assays of the retina identified significant quantifiable differences in retinal function in a mouse model of PD prior to development of clinical motor signs. These data suggest the retina is a useful biomarker of prodromal PD.
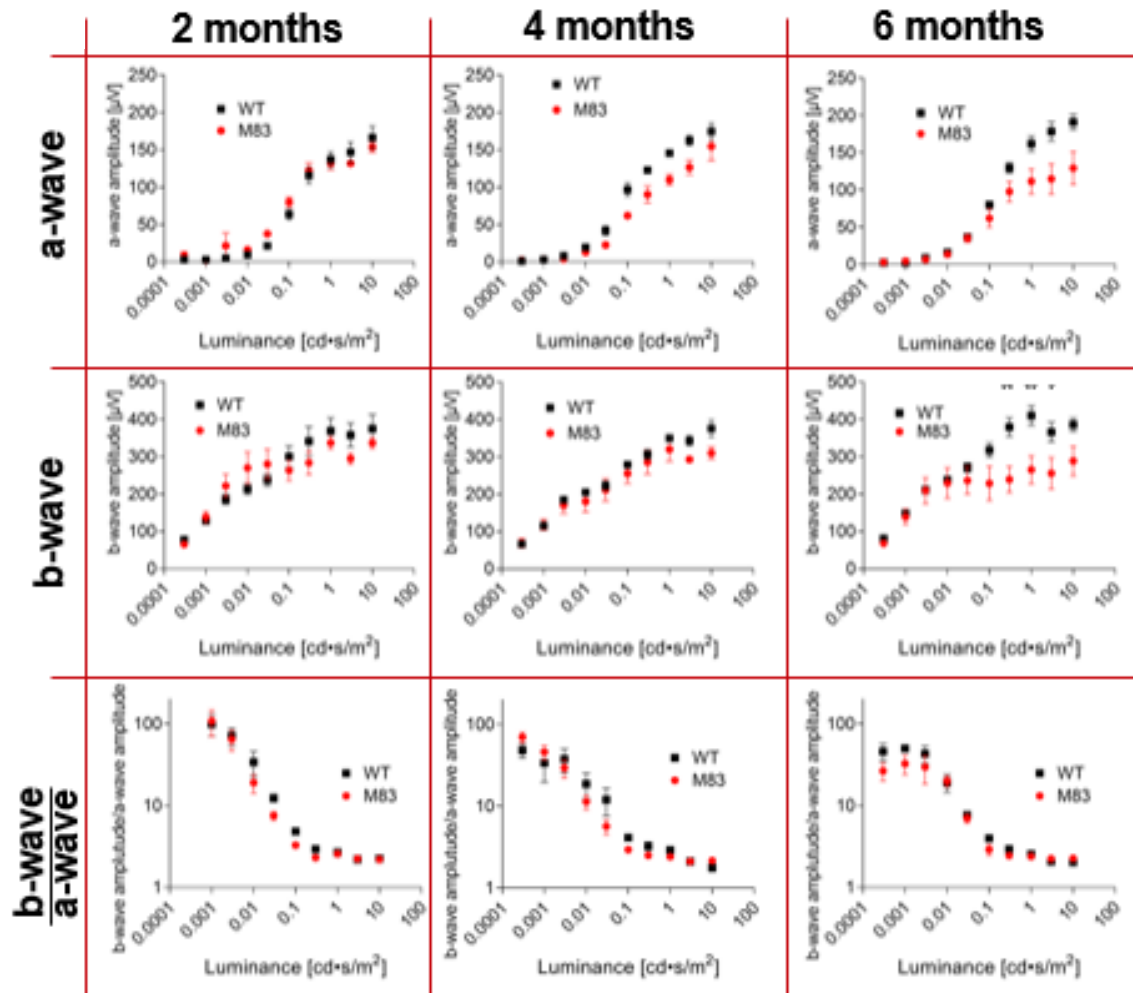
Figure 1. Scotopic full-field flash ERG. *a-wave* significant genotype effect at 4 months (*p*=0.0343) and 6 months (*p*=0.0042). *b-wave* significant genotype effect at 6 months (*p*<0.0001). *b-wave/a-wave* significant genotype effect at 6 months (*p*<0.0498). Multiple comparisons between genotype at each luminance not significant except *b-wave* 6 months at 0.3 (*p*<0.0023), 1 (*p*<0.0019), and 3 (*p*<0.0339) [cd·s/m^2].

SWIG Fluorescence Imaging Highlights Necrotic Burn Tissue Requiring Excision

Jocelyn C. Zajac; Aiping Liu; Adam Uselmann; Christie Lin; Sameeha E. Hassan; Lee Faucher; Lauren Nosanov; Angela L.F. Gibson

Introduction: Determining burn wound healing potential is challenging and significantly impacts surgical decision making. Indocyanine green angiography (ICGA) has promise to evaluate healing potential, but feasibility has limited the adoption to clinical practice. Delayed fluorescence imaging of high dose indocyanine green (ICG), a method called second-window ICG (SWIG), is a new technique being studied to identify necrosis and guide oncologic resection through inflammation. We have previously shown that SWIG identifies burn-injured tissue in mouse and human skin xenograft models. The objective of this study was to examine SWIG fluorescence *in vivo* in human burn wounds histologically, and identify potential mechanisms for ICG fluorescence in thermally injured cells using flow cytometry.

Methods: Adult patients scheduled for burn excision received high dose ICG the day before surgery. SWIG imaging was then performed intraoperatively before and after burn excision. Biopsies of the burn region of interest were obtained, fluorescently imaged *ex vivo,* and processed for histologic analyses. Macroscopic SWIG images were evaluated for the presence or absence of fluorescence and compared to clinical and histological assessments of burn depth. ICG fluorescence, inflammatory infiltrate, and non-viable tissue were co-localized using microscopic tissue sections. Flow cytometry using a Yo-Pro™-1 (necrosis) and propidium iodide (apoptosis) detection kit was performed on live, apoptotic, and necrotic fibroblast and keratinocyte cultured cells that were incubated with ICG after thermal injury. The ICG fluorescence intensity of each cell population was measured.

Results: SWIG fluorescence signal is present in burn tissue requiring excision, and may delineate burn tissue that will not heal. Histologically, near-infrared microscopy of biopsies from these areas demonstrate ICG retention. ICG travels from capillaries in viable tissue into non-viable tissue where it becomes sequestered. This phenomenon is not observed in desiccated eschar, which does not retain ICG. Flow cytometry revealed that necrotic fibroblasts and keratinocytes exhibit significantly higher ICG intensity than live or apoptotic cells.

Conclusions: SWIG fluorescence is associated with burns that were identified as necrotic requiring excision. Histological tissue analysis and flow cytometry data support the hypothesis that SWIG fluorescence thresholds defining necrotic burn tissue requiring excision can be established. Future work will include additional human subjects to define these thresholds, and translational animal studies to elucidate the interaction between inflammation and ICG.

# The Effect of Anatomic Location on Pig Models of Burn Injury and Wound Healing

Aiping Liu; Alex Cheong; Sameeha Hassan; Jen Meudt; Elizabeth Townsend; Dhanu Shanmuganayagam; Lindsay Kalan; Angela Gibson

Introduction: Pigs are frequently used for burn wound studies due to the structural and functional similarities of pig and human skin. However, factors including anatomic location, lack of standardized wound method, and pig breed can impact the interpretation of wound data, which may affect translation to patients. The objectives of this study are to examine the influence of anatomical locations on uniformity of burn creation and evaluate the location-dependent healing in pig burn wound models.

Methods: Burns were created on ventral and dorsal surfaces from *ex vivo* excised pig skin or *in situ* in a freshly euthanized pig, with a customized burn device set at 100 °C in contact with the skin for 5, 15, 30, or 60 seconds. To determine the location-dependent healing *in vivo,* burn wounds as well as excisional wounds of similar size and depth were created on the ventral and dorsal surfaces and at the cranial and caudal ends of two living pigs. Full thickness biopsies of wounds were obtained, processed, and stained for LDH and H&E for burn depth assessment (immediately after injury) and wound re-epithelization (14 days after injury). Burn depth and reepithelization were quantified by cell non-viability in LDH slides and the distance between the neo-epithelial tongues in H&E slides, respectively.

Results: Burn depth increased with longer contact time for both ventral and dorsal pig skin. However, at identical thermal conditions, burn depth on the ventral skin was significantly deeper than that of the dorsal skin. Compared to burns created *ex vivo*, burns created *in situ* immediately post-mortem were significantly deeper in the ventral location only. After 14 days, 2 out of 12 burn wounds were fully re-epithelialized in contrast to complete re-epithelization of all excisional wounds. Among the 12 burn wounds, no significant differences in re-epithelization was found between dorsal and ventral skin. However, burn wounds at the cranial-dorsal site exhibited faster healing than those at the caudal-dorsal site. The ventral skin exhibited large variations in healing rate regardless of site.

Conclusions: Dorsal and ventral pig skin have different contact time and burn depth relationships, indicating that anatomical location of porcine skin is an important consideration for the consistency of burn depth creation and healing. These data support location randomization of wound conditions in the pig model taking into consideration dorsal, ventral, cranial, and caudal sites to prevent misinterpretation of results, and increase the translatability of pig model findings to humans.
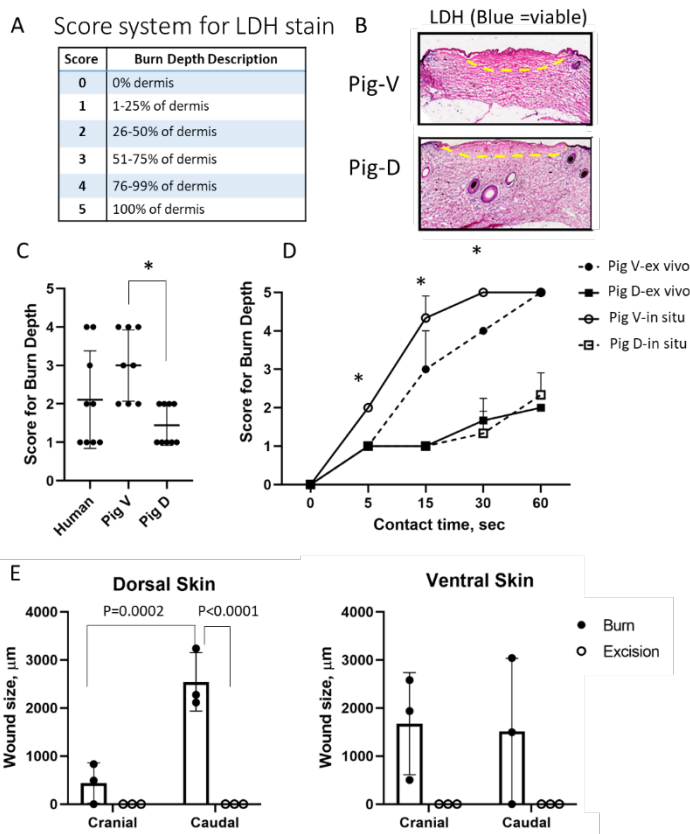
Figure. Burn wound depths and wound healing in porcine *ex vivo* and *in vivo* models. (A) Burn depth score system for lactate dehydrogenase (LDH) stain as seen in (B). (C) Comparison of burn depths created *ex vivo* on pig ventral and dorsal skins in comparison to that created *ex vivo* on human abdominal skin at 100ºC for 15 sec. (D) Comparison of burn depths at various contact time at 100ºC in *ex vivo* and *in situ* porcine burn models (n = 3 per condition). *indicates P<0.05 compared to burn depths created *ex vivo* in situ burns at comparable locations and thermal conditions. (E) Comparison of wound size (the distance between epithelial-tongues at two opposing wound edges) between cranial and caudal sides in dorsal and ventral skins (n = 3 per location per type of wounds). Two-way ANOVA followed with Turkey multi-comparisons was conducted to compare burn depths between ventral and dorsal skins, burn depths created between *ex vivo* and *in situ* burns at comparable locations and thermal conditions, wound size between cranial and caudal of burn wounds of comparable burn depths, wound sizes between burn and excisional wounds of comparable depths of injury at comparable locations.

Protein Restriction Augments Weight Loss and Glucose Improvements Following Sleeve Gastrectomy

Julia Illiano; Luiz Lopez; Oden Schaepkens; Dudley Lamming; David A. Harris

Introduction: Sleeve gastrectomy (SG) greatly improves obesity and Type 2 diabetes (T2D). The added therapeutic potential of post-operative dietary interventions on obesity and T2D are understudied. Following SG, patients typically consume increased dietary protein; however, protein restriction induces weight loss, improves metabolic health, and extends lifespan in both mice and humans. We hypothesized that reducing dietary protein intake following sleeve gastrectomy (SG) would improve post-operative weight loss, glucose tolerance, and metabolism.

Methods: Sixty-four, C57BL/6J mice were preconditioned with high-fat, western diet (WD) starting at 5 weeks of age. At 17 weeks, mice were weight matched and received SG or sham surgery. Following recovery, mice were placed into 1 of 4 dietary groups: high (36%), medium (21%), or low protein (7%), or WD. All protein diets were isocaloric. A separate control group of 16 mice were preconditioned on normal chow diet (NCD; 5% fat, 24% protein), received SG or sham, and maintained on NCD post-operatively. Weights and food intake were tracked longitudinally. Glucose tolerance and insulin sensitivity were assessed via oral glucose and insulin tolerance testing, respectively. Body composition was determined through MRI spectroscopy. Area under the curve analysis and/or one-way ANOVA with Dunnett corrections were used where appropriate.

Results: SG induced weight loss across all groups compared to their respective shams. SG animals on 7% protein had higher percent weight loss compared to other SG groups (Figure 1A) despite having increased daily food intake compared to SG animals on 36% protein (p=0.02) or WD (p=0.01). SG animals on 36% protein and NCD had the lowest fat mass (Figure 1B) and those on 36% protein had significantly elevated lean mass (Figure 1C) compared to the other SG groups. Of note, 7% SG animals had equivalent lean mass to both NCD and 21% protein SG animals. All SG animals had improved glucose tolerance compared to their respective shams (Figure 1D). However, SG mice on 7% protein had a trend toward improved glucose tolerance (compared to WD p=0.08, 36% protein p=0.066, 21% protein p=0.019) and significantly reduced fasting glucose compared to all other SG groups (Figure 1E). This occurred independent of changes in insulin sensitivity, which was similar across all groups (Figure 1F).

Conclusions: Protein restriction enhances weight loss and improves T2D control after SG. This occurs independent of changes in insulin sensitivity and has minimal effects upon overall lean mass. Controlling protein consumption may improve metabolic health outcomes for patients following SG.
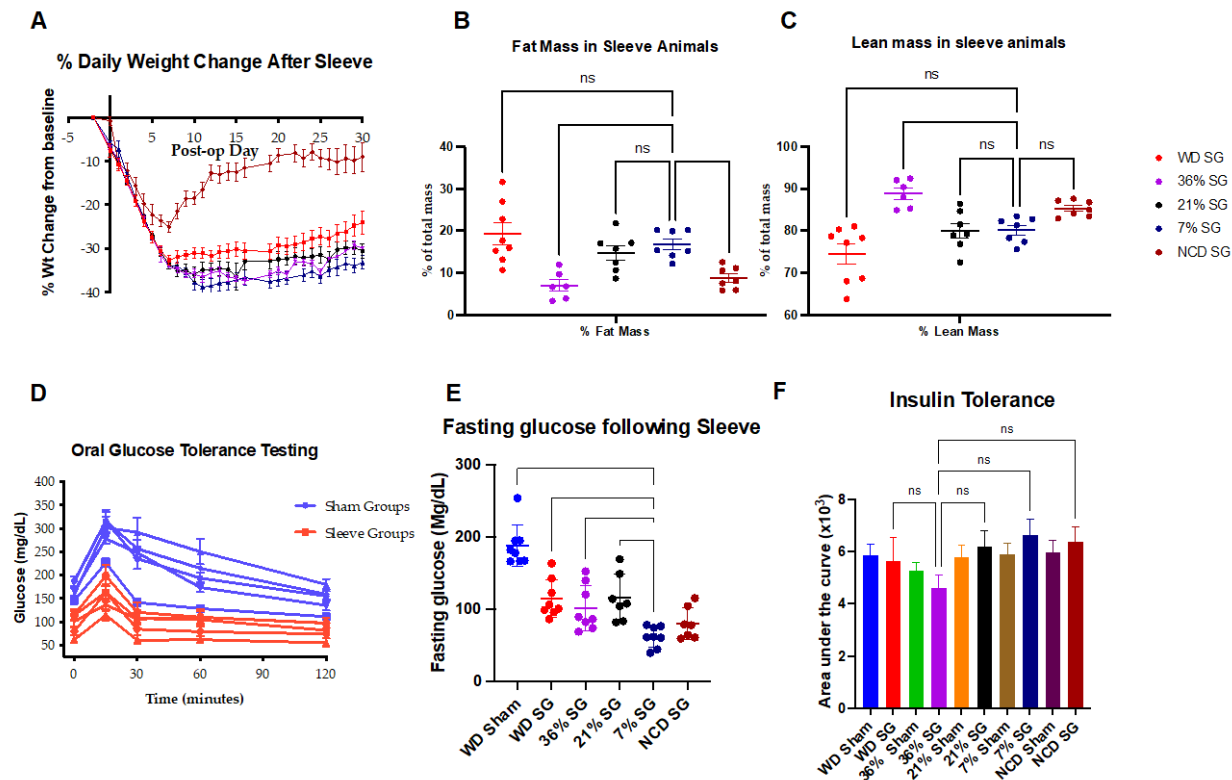
Figure 1: SG animals in all groups except post-operative NCD had persistently reduced weight following surgery. SG animals on 7% protein (blue) have reduced weight overall (A). Animals on 36% protein (pink) have reduced fat mass (B) and increased lean mass compared to other SG groups and specifically animals on 7% protein (C). All SG animals (red) have improved glucose tolerance compared to shams (blue). Those on 7% protein have reduced fasting glucose levels (E). These changes occur without changes in insulin sensitivity (F). western diet sham (n=8), WD SG (n=8), 36% protein sham (n=6), 36% SG (n=8), 21% sham (n=8), 21% SG (n=7), 7% sham (n=8), 7% SG (n=8), Normal chow diet sham (n=6), NCD SG (n=7). Comparisons represented: one-way ANOVA with Dunnett corrections (*p<0.05, **p<0.01, ***p<0.001).

Oral Administration of Resveratrol Alters Inflammatory Profiles in a Prodromal Model of Parkinson Disease

Sarah A. Lechner; Abby J. Haglin; Taylor A.R. Kaldenberg; Danielle R. Rosenblum; Peyton E. Vogt; Elizabeth Hoeppner; Amy Regenbaum; David G.S. Barnett; Stephen C. Gammie; Cynthia A. Kelm-Nelson

Introduction: Early-stage voice disorders in Parkinson disease (PD) are common and negatively impact an individual's quality of life, yet standard treatments do not consistently improve vocal dysfunction. Thus, the disconnect between current treatments and an understanding of the underlying early-stage pathology has resulted in a gap in knowledge that limits effective treatment. The *Pink1-/-* rat models early-stage PD as it demonstrates early disruption in ultrasonic vocalization and significant upregulation of inflammatory TNF-α and NF-κB signaling pathways in the larynx thyroarytenoid (TA) muscle. Previously, we created a TA-specific gene portrait and used a drug repurposing approach to identify therapeutic candidates that could reverse pathologic gene expression patterns. The top match, resveratrol, has anti-inflammatory, antioxidant, and anti-apoptotic properties and has demonstrated therapeutic effects for the treatment of PD signs in humans. We tested the hypothesis that resveratrol will ameliorate vocalization deficits and decrease inflammation-related transcription profiles in the whole blood of *Pink1-/-* rats.

Methods: Young (two-month-old) male *Pink1-/-* rats were randomly assigned into a control (saline; n=10) or drug (resveratrol; 20mg/kg dose; n=10) condition. Doses were administered orally, in a 4-gram cookie, daily for 8 weeks. Ultrasonic vocalization testing (duration [msec], bandwidth [kHz], intensity [dB], peak frequency [kHz]) was done at baseline, 4 weeks, and 8 weeks. The RT^2 Profiler PCR Array for NF-κB Signaling Targets (QIAGEN) was used to analyze whole blood gene expression changes after treatment.

Statistics: Repeated measures ANOVAs were used to analyze differences in vocalization variables between timepoints and drug condition. Fisher's Least Significant Difference test was used for post-hoc comparisons; level of significance was set *a priori* at 0.05. Triplicate C_T values were exported to the QIAGEN web portal, normalized to reference genes, and fold-change was reported using the formula $2^{(-\Delta\Delta C_T)}$. Fold-regulation threshold was set at ± 1.2 and *p*-values were calculated with t-test of $2^{\Delta C_T}$ replicates among drug and vehicle conditions.

Results: There were no significant interactions between timepoint and drug condition for any of the ultrasonic vocalization variables. Rats receiving resveratrol had significant transcription changes including downregulation of *Myd88* (microglial activation), *Bcl2a1* and *Irf1* (apoptosis), and upregulation of *Ifnb1* (anti-inflammatory) (**Figure 1**).

Conclusions: This is the first study to suggest that resveratrol acts to reduce systemic inflammation in the *Pink1-/-* rat. PCR sensitivity may detect changes in gene expression before observed vocal changes. Thus, our current challenge is investigating the effects resveratrol in older *Pink1-/-* rats, when vocal and limb motor deficits are pronounced and inflammation levels are significantly elevated.
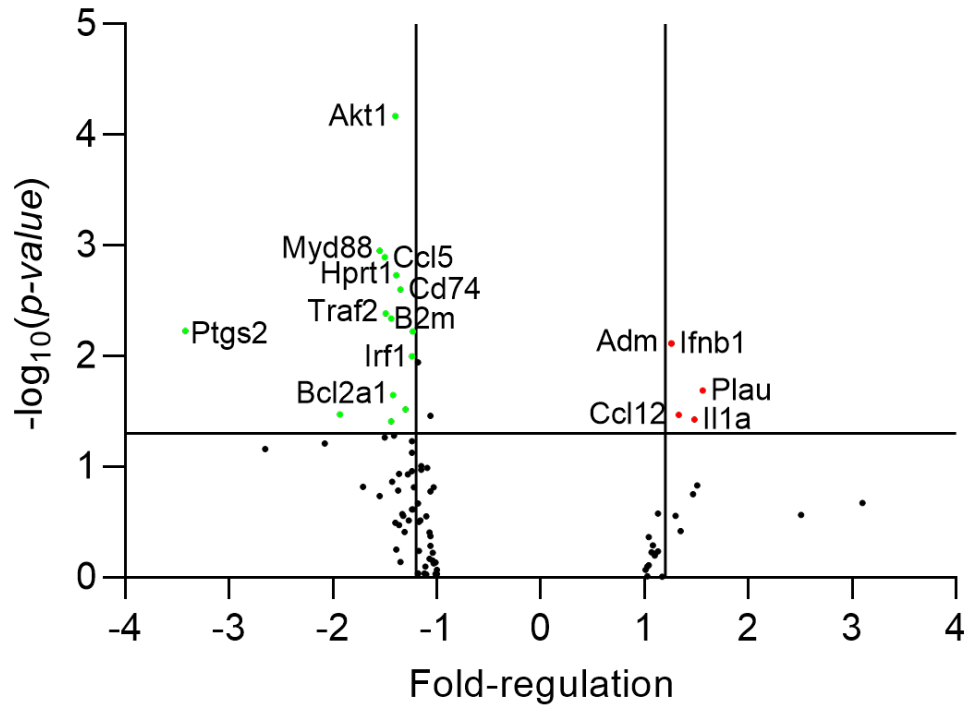
Figure 1: Transcriptional regulation changes in *Pink1-/-* rats treated with 8 weeks of oral resveratrol (20 mg/kg) vs. control. Above horizontal line represents $p<0.05$ and vertical lines represent fold-regulation cutoff of ±1.2. Fold-regulation < 1 represents downregulation vs. control and fold-regulation > 1 represents upregulation vs. control. *Adm*: Adrenomedullin; *Akt1*: V-akt murine thymoma viral oncogene homolog 1; *B2m*: Beta-2 microglobulin; *Bcl2a1*: B-cell leukemia/lymphoma 2 related protein A1d; *Ccl5*: Chemokine (C-C motif) ligand 5; *Ccl12*: Chemokine (C-C motif) ligand 12; *Cd74*: Cd74 molecule, major histocompatibility complex, class II invariant chain; *Hprt1*: Hypoxanthine phosphoribosyltransferase 1; *Ifnb1*: Interferon beta 1, fibroblast; *Il1a*: Interleukin 1 alpha; *Irf1*: Interferon regulatory factor 1; *Myd88*: Myeloid differentiation primary response gene 88; *Plau*: Plasminogen activator, urokinase; *Ptgs2*: Prostaglandin-endoperoxide synthase 2; *Traf2*: Tnf receptor-associated factor 2.

Female *Pink1*-/- Rats Have Down-Regulated Synaptic Signaling in the Vocal Fold Thyroarytenoid Muscle That May Influence Hypophonia

David G.S. Barnett; Sarah A. Lechner; Stephen C. Gammie; Cynthia A. Kelm-Nelson

Introduction: As the second most common neurodegenerative disease, Parkinson disease (PD) encompasses a wide range of progressive motor dysfunction. With an onset in the prodromal period, cranial vocal-motor deficits, including hypophonia, affect upwards of 90% of PD patients, progress and intensify throughout the disease, and are refractory to common PD treatments. Data from human studies suggest that the pathology of vocal deficits in PD may be related to alterations within the larynx. Rodent models of vocalization are validated research tools for studying mechanisms of vocal communication and for addressing hypotheses that are difficult or impossible to study in human subjects. Specifically, we use *Pink1*-/- rats to study the pathogenesis of communication in the context of early-stage PD mitochondrial dysfunction. Our prior work demonstrated that 8-month-old female *Pink1*-/- rats have reduced intensity of social 50-kilohertz (kHz) ultrasonic vocalizations, analogous to human hypophonia. The premise of this work was to generate a female-specific *Pink1*-/- thyroarytenoid (TA) muscle gene dataset to analyze differentially expressed genes implicated in vocalization intensity reduction. We hypothesized that gene expression, specifically genes that regulate muscle contraction and mitochondrial function, in the TA muscle of *Pink1*-/- rats would be significantly down-regulated compared to age-matched wildtype control rats.

Methods: Illumina® Total RNA-sequencing was used to determine TA muscle gene expression in adult (8-month-old) rats. Bioinformatic approaches of both differential gene expression and the ENRICHR gene analysis tool were used to compare the sequencing dataset to biological pathways and processes, disease relationships, and drug repurposing compounds.

Results: We identified a list of up- (200) and down- (246) regulated genes. Statistically significant up-regulated pathways included fatty acid oxidation, muscle contraction, synaptic transmission, and neuromuscular processes (*e.g., Chrna1, Myl4, Jsrp1*). Significant down-regulated pathways included anterograde trans-synaptic signaling, chemical synaptic transmission, neurotransmitter, and ion release (*e.g., Gabra2, Snap25, Gabra6, Gria2, Chrna3, Syt1, Gad2*). Several treatment candidates, including methylprednisolone, cetuximab, fluoxetine, and resveratrol, are hypothesized to reverse the observed aberrant gene transcription and should be considered in future studies.

Conclusions: Whole-genome expression studies are useful to the investigation of disease and may lead to the discovery of novel pathways or experimental biomarkers for future targeted treatments. The data presented identified biological pathways that may underlie the peripheral mechanisms of vocal-motor dysfunction, including neuromuscular synaptic transmission to the TA muscle. Moreover, these experimental biomarkers have potential to be targeted as sites for early-stage PD hypophonia treatment development.

Plasma Metagenomic Sequencing to Quantify Microbial DNA in Trauma Patients

Megan Nedden; Michelle Stephens; Clayton Marcinak; Sydney Thompson; Elise Dietmann; Caitlin Pepperell; Ben Zarzaur; David Andes; Bradon McDonald; Mehreen Kisat

Introduction: Approximately one in four trauma patients admitted to the Intensive Care Unit develop sepsis during their hospital course and 20% of these patients die. Injury causes systemic inflammatory response, which mimics the clinical presentation of sepsis. This makes it difficult to differentiate inflammatory response related to the initial tissue injury from sepsis. In preliminary studies, we have found that microbial DNA levels (mDNA) are higher in patients with sepsis compared to patients with no active infection. Whether injury in trauma patients causes an increase in background levels of mDNA above those expected in healthy individuals remains unknown. We hypothesized that the concentration of mDNA in trauma patients at the time of injury is similar to healthy controls.

Methods: We enrolled 41 trauma patients and collected plasma samples at the time of injury and presentation to the Emergency Department (ED). Plasma samples from 24 healthy controls were collected as part of a separate study. We performed metagenomic sequencing of plasma DNA and used computational classification of sequencing reads to detect and quantify total cell-free DNA and mDNA fraction. Differences in mDNA fractions between samples were evaluated using Mann-Whitney U test.

Results: Median total cell-free DNA (cfDNA) levels were not significantly different in trauma patients and healthy volunteers (5.46 ng/ml and 4.81 ng/ml, respectively, p=0.47). Median mDNA fraction was nearly 4 times lower in trauma patients as compared to healthy volunteers (2.78 x10^{-5} and 9.75x10^{-5} respectively, p < 0.001). As the cfDNA levels increase in trauma patients, the microbial fragment proportion decreases (Figure 1). Median pathogen-specific fraction was similar in trauma patients and water controls except for 4 genera: *Cutibacterium, Moraxella, Streptococcus and Staphylococcus*.

Conclusions: mDNA levels in plasma are lower in trauma patients at the time of injury and presentation to the ED, as compared to healthy volunteers. This observation is potentially driven by dilution of the mDNA proportion with higher human cell-free DNA levels released due to injury.

Figure 1: Plasma DNA concentration versus microbial fragment proportion in trauma patients
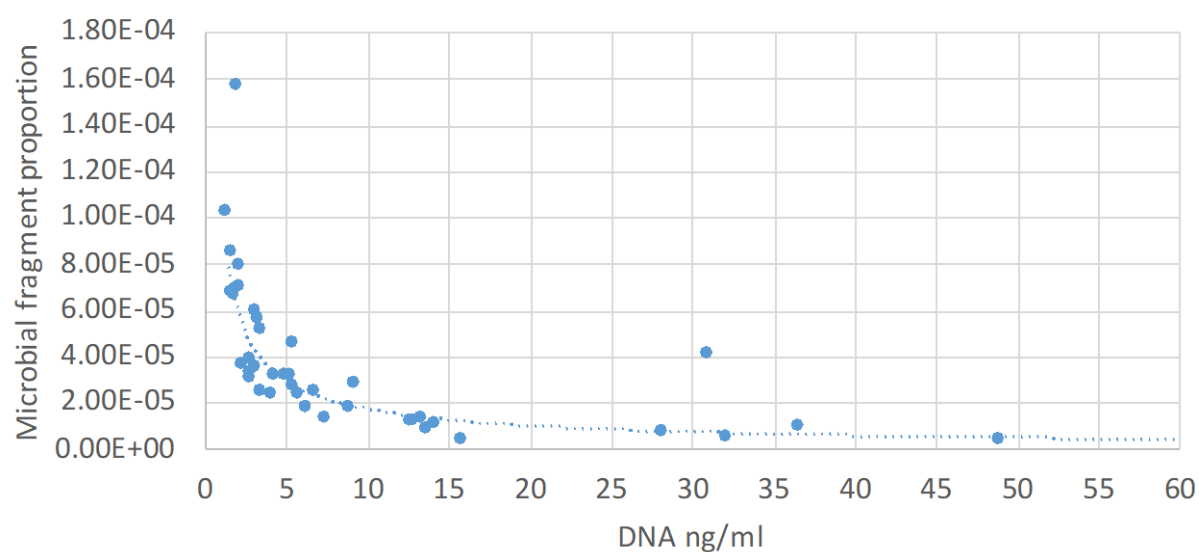
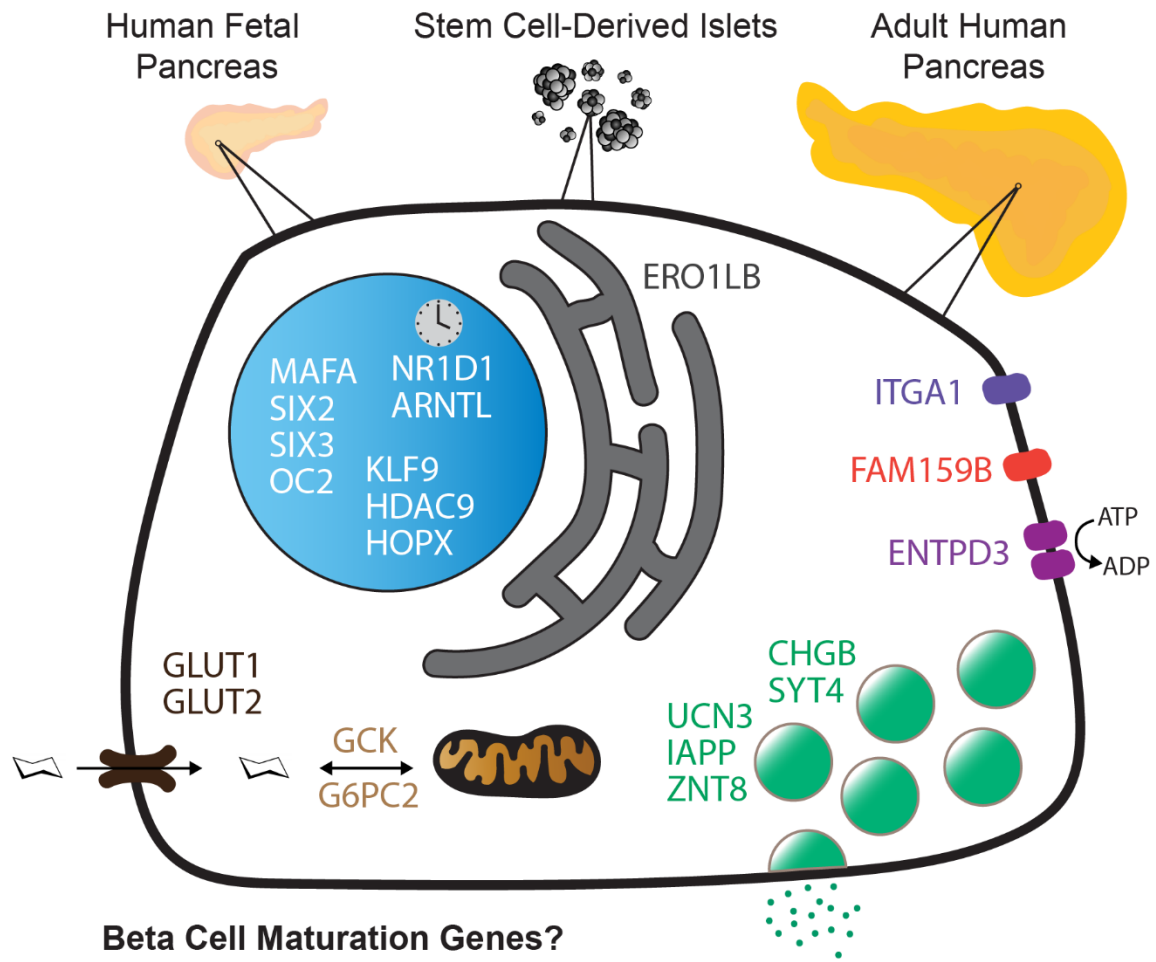# Evaluating Markers for Human β Cell Functional Maturation

Sakar Gupta; Daniel M. Tremmel; Anna E. Mikat; Jon S. Odorico; Sara D. Sackett

Introduction: Diabetes is characterized by the inappropriate regulation of blood sugar homeostasis due to impaired production of the hormone insulin by β cells in the pancreas. Human pluripotent stem cell differentiation protocols to generate insulin-producing stem cell-derived islets (SCDIs) use specific markers across β cell development as guides or checkpoints for differentiation at specific stages. To date, no published differentiation protocol has generated fully functionally mature β cells in vitro comparable to adult human islets (AHI). Identifying reliable markers of β cell maturity will help facilitate the characterization of the most effective differentiation protocols and further achieve consistent functional maturation of SCDIs in vitro and prior to transplantation. While several candidate β cell maturation markers have been identified, much of the supporting data comes from animal models or differentiated SCDIs. One such marker is Urocortin-3 (UCN3).

Methods: We utilized human islets, pancreas, and SCDIs and performed qPCR and IF staining to analyze the expression of UCN3 and other candidate genes as human β cell maturation markers. Expression of each marker was compared between human pancreas (fetal, adult) and SCDIs derived from two of our laboratory protocols (A, B). ImageJ was employed to quantify the protein expression of these markers in each tissue sample.

Results: IF staining indicates that human islets have high expression of UCN3 in α and β cells in fetal pancreata, well before the acquisition of functional maturation. No significant difference in UCN3 gene expression between fetal and AHI was found, bringing into question the utility of UCN3 as a distinguishing maturation marker. Furthermore, Protocol B expresses similar levels of UCN3 to AHI but shows no improvement of glucose-stimulated insulin secretion (GSIS) compared to Protocol A with very low UCN3 levels. Finally, we used the same methods to interrogate other candidate maturation markers that may better correlate with maturation. Multiple markers (CHGB, GLUT1, IAPP) exhibit significant differences in expression between fetal and AHI that suggest a correlation with maturation. In contrast, many markers did not have that increased expression and may not accurately correlate with maturation.

Conclusions: Understanding expression profiles of potential markers for mature human β cells is essential to finding affordable approaches to generating functional SCDIs. Our study establishes that UCN3 is not a reliable human β cell maturation marker. Furthermore, markers with significantly different adult and fetal β cell expression may help improve the identification of mature β cells and their roles in regulating GSIS.

Figure 1: Potential expression profiles of various genes in SC-islets and adult and fetal human beta cells.

University of Wisconsin Human Islet Core – A Crucial Resource in the Fight Against Diabetes

Peter Chlebeck; Sara D. Sackett; Samantha Mitchell; Ayesha P. Khan; Jon Odorico

Introduction: The University of Wisconsin Human Islet Core (UWHIC) began operation in 2002. Originally co-directed by Drs. Jon Odorico and Luis Fernandez, personnel perform clinical and research islet isolation procedures on human pancreatic tissue. Subcontracted by the Islet Cell Resources Program (ICR), which evolved into the International Islet Distribution Program (IIDP), and funded through the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) and National Institutes of Health (NIH), the UWHIC has performed hundreds of islet isolations and distributed millions of high quality viable human islets to researchers around the globe, including researchers here at the University of Wisconsin.

Methods: Relying on the technical expertise of UWHIC staff, the program has proven both highly successful and efficient in its mission to provide researchers with high value materials to foster beta cell biology and islet transplantation research in the field of diabetes. The Core performs research islet isolations at the Wisconsin Institutes of Medical Research, receiving donor pancreata primarily through the University of Wisconsin Organ and Tissue Donation Services (UWOTD), among the highest performing organ procurement organizations in the nation. Islets are purified through a modified Ricordi method with density gradient separation followed by short-term culture in specialized media, final quality assessment, and distribution to investigators.

Results: The UWHIC isolated and distributed islets via ICR from 2003–2010 and via IIDP from 2010–present. In 2010–2020, the UWHIC isolated 34.1 million islets from 126 isolations resulting in 20.8 million islets, with 1794 total shipments to investigators including 116 shipments overseas. Over 250 studies were supported by these islets, leading to high impact publications and advancement of diabetes research around the globe. Islet purity averaged 90% and viability averaged 98%, end-users judged the islet shipments as excellent or good in 92% of preparations. Looking closer at isolations and shipments performed 2018–2020, Figure 1 details UWHIC production and distribution as well as purity, viability, and functionality.

Conclusions: The UWHIC continues to provide high volumes of high quality human pancreatic islet tissue for islet research and looks forward to doing so for years to come.
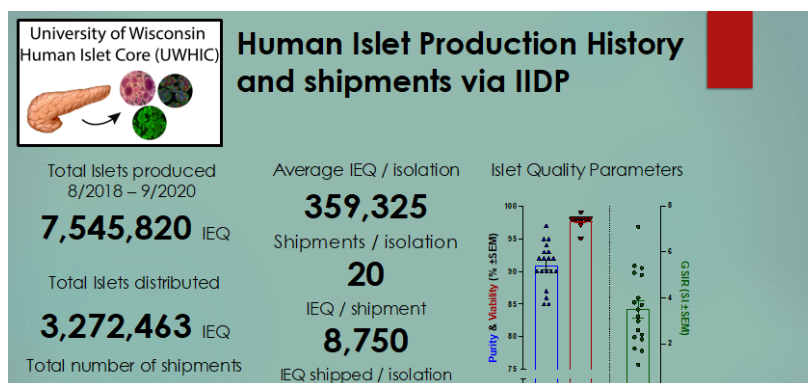
Figure 1: IIDP isolation production, distribution, and quality 2018-2020 by the Wisconsin Islet Isolation Center

Peripheral and Trigeminal Nerve Stimulation Improve Functional Outcomes of Nerve Recovery in a Rodent Forelimb Gap Repair Model

Peter J. Nicksic; D'Andrea T. Donnelly; Weifeng Zeng; Allison J. Seitz; Kip A. Ludwig; Samuel O. Poore; Aaron J. Suminski; Aaron M. Dingle

Purpose: Electrical stimulation (ES) has been shown to augment axonal regrowth when administered peripherally and evoke targeted neuroplasticity at the level of the cortex when administered to cranial nerves. The trigeminal nerve is a superficial somatosensory nerve that has not been explored for this indication. The aim of this study is to demonstrate that the trigeminal nerve can be used as a novel target for ES – and perform comparably to peripheral nerve stimulation (PNS) – to improve functional outcomes of peripheral nerve injury in a rat forelimb model.

Methods: After being trained to proficiency in a reach and grasp task, 45 adult male Lewis rats were randomized into four groups: (1) sham injury, (2) nerve injury with sham ES, (3) nerve injury with intraoperative PNS, and (4) nerve injury with trigeminal ES (TNS) during post injury rehabilitation. Median peak force, task success rates, and paw withdrawal thresholds were collected both preinjury and throughout rehabilitation. Repeated measures ANOVA was used to compare groups.

Results: The sham ES group did not recover their pre-injury median peak force (P-value = 0.0252), percent success (P-value = 0.0013), or paw withdrawal thresholds (P-value = 0.0092) by the final week of recovery. The PNS and TNS groups reached functional recovery for median peak force, percent success, and paw withdrawal thresholds (P-value > 0.05, all) by the final week of rehabilitation.

Conclusions: TNS and PNS are viable therapies to improve outcomes of nerve injury. Our group is currently studying these therapies in combination.
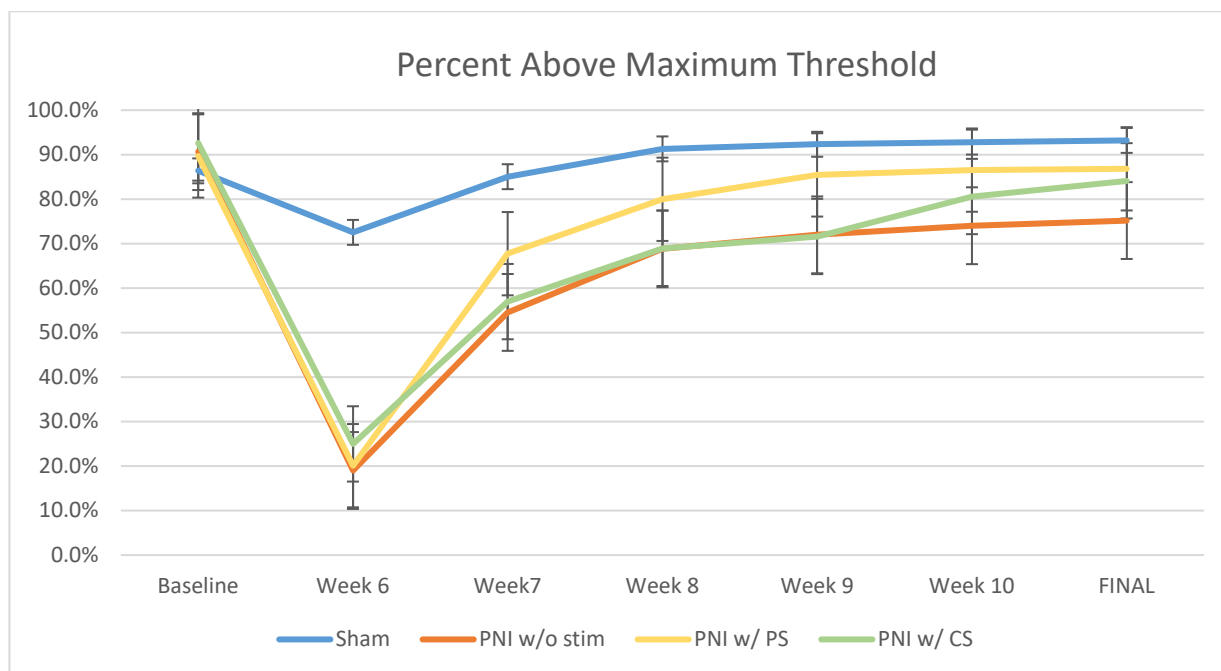
PRC-210 Extends Preservation Time of Vascularized Composite Allografts

Grant R. Seils; Weifeng Zeng; Ian Valerio; Samuel O. Poore; William E. Fahl; Aaron M. Dingle

Introduction: Surgeons performing vascularized composite allograft (VCA) transplantation face the challenge of limiting ischemic damage to the tissue. Ischemia begins as soon as the allograft is devascularized, with ischemic damage surging upon reperfusion, an event called ischemic reperfusion injury (IRI). Ischemia from both the required preservation time and IRI effects all parts of the transplantation process from procurement to rejection, and can result in negative clinical outcomes secondary to tissue necrosis and apoptosis. One mechanism mediating tissue death is the damage of genetic material by reactive oxygen species (ROS) generated by ischemia. In our study, we investigate the use of PRC-210, a novel ROS scavenging compound to combat limb ischemia and increase preservation time. The objective of this study is to optimize and validate the use of PRC-210 as an additive to UW organ preservation solution (UW solution) to increase limb preservation time in a rodent hindlimb model.

Methods: Initially, the optimal dose of PRC-210 was identified. Twenty hindlimbs of male Lewis rats were harvested and statically stored in UW preservation solution at 4°C in four groups containing 0, 10, 20, 30, or 40 mM of PRC-210 over 48h. Next, 16 additional hindlimbs received pump perfusion or drip perfusion with and without the optimal dose of PRC-210 for 48h. For all groups, punch biopsies were obtained at 0, 4, 8, 12, 24, and 48h post amputation. Biopsies were assessed quantitatively via caspase activity (apoptosis) assays, paired with qualitative histological analysis.

Results: The optimal dose of PrC-210 in cold static storage was found to be 30mM. At 8h post amputation, 30mM PrC-210 reduces caspase levels significantly (<0.0001) with minimal to no damage visible histologically. Furthermore, 30mM of PrC-210 also decreases caspase levels significantly at 48hs compared to controls (P=0.04). However, histological comparisons indicate that tissue damage is occurring between 8 and 48 hours, revealing 8 hours as the peak time for transplant under static cold storage conditions. Additionally, we found cold static storage conditions resulted in less caspase activation when compared to either pump or drip perfusion of the limb.

Conclusions: 30mM of PRC-210 has been shown to reduce cardiac and renal IRI. Our data provides evidence that 30mM of PrC-210 can also significantly extend limb preservation to 8 hours compared to controls. This is a significant finding that has the potential to extend the donor pool for transplantation and improve clinical outcomes. VCA transplants and data collection are currently underway utilizing the 30 mM dose of PRC-210 and cold static storage.

Combined Central and Peripheral Nerve Stimulation Improves Functional Recovery of Mixed Nerve Injury in a Rat Forelimb Peripheral Nerve Injury Model

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Introduction: Nerve reinnervation following peripheral nerve injury (PNI) is often a slow and incomplete process, resulting in significant morbidity and permanent loss of function of the injured extremity in many patients. Prior studies have shown the efficacy of intraoperative peripheral nerve electrical stimulation (PNS) to accelerate the growth of both motor and sensory neurons. Moreover, separate investigations have also shown the use of post-operative cranial nerve electrical stimulation to improve the neuroplasticity of the motor cortex, improving functional outcomes. However, no study has investigated the synergistic effects of both intraoperative PNS and cranial nerve electrical stimulation for functional improvement within a PNI model. This investigation quantifies the efficacy of both intraoperative PNS and cranial nerve electrical stimulation on sensory and motor functional recovery in a rat PNI model.

Methods: Sixteen Lewis rats were trained in a reach and pull task for a food reward using their right forelimb in the MotoTrak training system. Baseline sensory data was also retrieved using a von Frey monofilament test. The rats underwent surgical transection of their median and ulnar nerve of their right forelimb with 1 hour of intraoperative PNS (cathode-leading biphasic wave at 20Hz, 100µs pulse width). At 4 weeks post op, all rats will undergo a second surgery to receive an implanted headcap electrode for adjuvant trigeminal nerve electrical stimulation. Rehabilitation on the MotoTrak system will take place over a 4-week interval with motor and sensory data compared to rat cohorts that received either PNS or cranial nerve stimulation, as well as a positive control cohort (nerve transection with no electrical stimulation) and negative control (sham surgery).

Results: Rats within the synergistic cohort (PNS and cranial nerve stimulation) were trained to proficiency within the MotoTrak system with a median pull force of 158g (+/- 8.58g SD) at a 93.9% (+/- 3.21% SD) success rate, comparable to the previous studies. Baseline von Frey sensory data elicited 18.25g force threshold (+/-6.02g SD) for paw withdrawal at an average time of 1.85 seconds (+/-0.82s SD), comparable to previous studies. Experiments remain ongoing for data analysis during the rehabilitation period.

Conclusions: Peripheral nerve reinnervation following nerve injury continues to have inadequate clinical outcomes. The role of intraoperative PNS and adjuvant cranial nerve electrical stimulation may provide an avenue to elevate the functional recovery of PNI.

Embryonic Stem Cell Derived In Vitro Endothelialization of Interposition ePTFE Grafts in Rhesus Macaques

Weifeng Zeng; John P. Maufort; Sarah Lyon; Nicholas J. Albano; Jue Zhang; Dave Vereide; James A. Thomson; Samuel O. Poore

Introduction: Synthetic grafts, including ones made from expanded polytetrafluoroethylene (ePTFE), have performed well for high-flow, large-diameter vessels but generally fail for smaller diameter vessels (<6mm). The poor performance of small diameter ePTFE vascular grafts is largely due to early occlusion. Clinical evidence shows that lining synthetic grafts with autologous endothelial cells prior to implantation improves the patency of ePTFE grafts once implanted. Our study investigated whether lining small diameter ePTFE grafts with arterial endothelial cells (AECs) derived from embryonic stem (ES) cells could improve graft performance.

Materials and Methods: We developed a Rhesus Macaque model for lower extremity arterial bypass (femoral->femoral) grafts. Using this model, we assessed graft failure rates in naked (lacking an AEC lining) 3mm ePTFE grafts and two experienced groups, which cellularized with wild-type AECs or AECs engineered respectively. Interposition ePTFE grafts were placed in the superficial femoral artery (SFA) of seven Rhesus macaques each group. Patency was visualized by ultrasound and explanted at occlusion or at 6-month study endpoints.

Results: The control group revealed 43% patency of naked ePTFE grafts by study endpoints, with failure generally occurring by thrombosis within the first five weeks. The grafts that remained patent developed intimal hyperplasia by the study endpoint, with cells infiltrating only a few millimeters into the proximal and distal ends of the graft, while the middle portion remained free of cells. The Patency rates of the wild-type AECs group and the engineered AECs group were 100% and 50%. Assessment of immune responses of grafts containing either wild-type AECs or AECs engineered to elicit a minimal immune response are forthcoming.

Conclusion: Over 50% of naked ePTFE interposition grafts failed within the first five weeks of implantation in this novel Rhesus Macaque model. By cellularizing these grafts with a scalable, defined source of ESC-derived AECs, we aim to improve small diameter graft performance of readily available arterial grafts for cardiac and vascular surgery.

The Necessary Anatomy for an Osseointegrated Neural Interface Sheep Model

Lucas Sears; Alison Karczewski; Aaron Dingle; Samuel Poore

Introduction: Contemporary prosthetics aim to enhance amputees' relationships with their prosthetics by restoring functionality and sensation with bidirectional closed-loop peripheral nerve interfaces. Noninvasive approaches such as electromyography demonstrate proper stability but lack the necessary selectivity to be feasible. More invasive percutaneous methods employing implantable electrodes exhibit great selectivity but suffer the chronic instability of dynamic soft tissue environments. In conjunction with their inability to provide reliable sensory feedback, the current Peripheral Nerve Interfaces (PNIs) have failed to confront the seemingly contradictory need for chronic stability and selectivity demanded by neuroprosthetics. The osseointegrated neural interface (ONI) attempts to transcend this central paradox through the combination of osseointegration and nerve regeneration, intending to exploit the insulated and stem cell-rich environment provided by the medullary canal of long bones. To prove this concept's viability in clinical testing, the ONI must first be implemented in an ovine model. This study investigates the requirements and surgical approach necessary to establish an ovine ONI model.

Methods: For this anatomical study, six thoracic limbs were collected from mature, non-lactating female sheep. Microsurgical dissection, radiological screening, and histological analysis elucidated the location and circumference of major nerves, bone length, and intramedullary canal diameter, and epineurial thickness and number of fascicles, respectively.

Results: Microsurgical dissection of six ovine thoracic limbs unearthed one dorsal and three ventral nerves with average circumferences of 5.14 (±2.00) mm dorsally and 5.05 (±1.06) mm ventrally. The radiological screening revealed an average metacarpal length of 15.0 (±0.0) cm and an average intramedullary canal diameter was 12.91 (±3.69) mm. The histological analysis produced a mean of 9.58 fascicles per nerve with an average fascicle area of 283,108.35 μm^2.

Conclusion: The anatomical information obtained in this study will inform the future surgical integration of an ONI with a complementary endoprosthesis and amputation methodology in sheep. Measurements of nerve morphology and medullary cavity allow for prospective decision-making regarding electrode selection and placement within the intramedullary space. Knowledge of the available intramedullary canal space provides a structural roadmap for the complete osseointegration of an endoprosthetic abutment. These measurements will be vital in the creation of a clinical application of a closed-loop ONI implant in a large animal model, an instrumental step in providing the ONI with the foundation necessary to transcend the limitations of modern PNIs.

Microbial Gut-Larynx Axis and Laryngeal Immunity

Ran An; Christina Kendziorski; Federico E. Rey; Susan L. Thibeault

Introduction: The larynx is an important organ at the junction of the digestive and respiratory tracts, orchestrating swallowing, breathing, coughing, and voicing. It possesses unique microbial and immunological architecture. Our previous work has revealed the extensive role of laryngeal resident microbiota in shaping host immunity in the larynx. With the emergence of gut-lung microbiome axis concept, which is bi-directional microbial crosstalk between the gut and lungs, the impact of gut microbiota on the immune development of respiratory system has received increased attention. Despite the anatomical location of the larynx distal to the gut, we hypothesize the presence of the gut-larynx axis and that laryngeal immunity is not only dependent on laryngeal microbiota but also gut microbiota.

Methods: To address this, we compared wild type ConvR C57BL/6J mice (n=6 per group, 1:1 sex ratio) raised in specific-pathogen free facility with and without the treatment of an oral antibiotics regimen that is known to deplete gut microbiota only. Body weight, cecum size, and water consumption were monitored before and after antibiotics treatment; Total DNA per mg of cecum or fecal materials were evaluated and compared across animal groups. Microbial diversity and abundance were evaluated using 16S rRNA gene sequencing; laryngeal immune profile was characterized single cell RNA sequencing technique.

Results: No significant differences were observed in behavior and body weight between the two experimental groups (p<0.05). Enlarged cecum (4-fold increase) was observed in antibiotics treated mice; total DNA yields per mg of both cecal and fecal samples dramatically decreased in antibiotics treated mice (150 ng/ul) compared to the non-treated control mice (1.2 ng/ul), while no significant difference was observed in that of laryngeal samples (6 ng/ul) between the two groups. Data analysis will be completed by January.

Conclusions: Our preliminary data suggests antibiotic treatment can significantly decrease microbial DNA in mouse cecum and feces, but not in the larynx. More results will become available soon.

Contribution of Resident Commensal and Pathogenic Microbial Communities on Vocal Fold Mucosal Integrity and Function

Vlasta Lungova; Madhu Gouda; Susan L. Thibeault

Introduction: Existing dilated intercellular spaces between vocal fold (VF) epithelial cells have been documented in VF benign lesions. Mechanisms regarding the disruption of epithelial cell junctions are limited and do not address the contribution of resident microbial communities to this pathological phenomenon. Recent evidence suggests that the etiology and/or progression of VF benign diseases are likely associated with *Streptococcus* (S.) *pseudopneumoniae*, as a dominant bacterial pathogenic species present in every lesion sample at the expense of commensal species, namely *S. salivarius*. *S. pseudopneumoniae* colonizes the host via adhesins and metalloproteinases, such as HtrA, that cleaves cell adhesion molecule E-cadherin for epithelial invasion and/or microbial product penetration. In contrast, commensal bacteria have a probiotic effect, inhibiting the action of pathogens and stimulating the host's immune responses. The main aim of this study was to determine the contribution of resident commensal and pathogenic microbial communities on VF mucosal integrity and function. We hypothesize that the VF epithelial barrier will be compromised with exposure to pathogenic bacteria. These effects can be reversed in the presence of laryngeal commensals.

Methods: Engineered human VF mucosae were inoculated with 100☐l of bacterial suspensions of (1) *S.pseudopneumoniae* only, (2) *S. salivarius* only, (3) *S. pseudopneumoniae and S. salivarius* co-cultures and (4) plain culture medium for controls for 24 and 48 hours. We evaluated epithelial bacterial colonization using a Fluorescent In Situ Hybridization (FISH) 16S probe, expression of bacterial metalloproteinase HtrA, distribution and/or expression levels of the host-related genes - E-cadherin and inflammatory cytokines (IL6 and IL8).

Results: Our data show the progression in bacterial colonization of VF mucosae inoculated with *S. pseudopneumaniae* at 24 and 48h post-inoculation with the most prominent pathological changes observed 48h post-inoculation. At this time point, E-cadherin was cleaved in apical epithelial layers which correlated with apical detection of HtrA and bacterial invasion. The epithelial damage was rescued using *S. salivarius* that preferentially attached to the epithelium and likely prevented *S. pseudopneumoniae* from binding to the epithelial surface. *S. pseudopneumoniae* and *salivarius* co-cultures also stimulated the expression of IL6 and IL8 in VF mucosal cells.

Conclusions: *S. Pseudopneumoniae* likely contributes to pathological dilation of intercellular spaces between epithelial cells via HtrA-mediated E-cadherin cleavage. *S. salivarius* can reduce S. *pseudopneumoniae* adherence and epithelial damage. These findings extend our understanding of how pathogenic bacteria contribute to the VF benign disease etiology and progression and how probiotics may neutralize the effect of pathogens and/or prevent infection.

Clinical Science and Health Services Research Abstracts

Evaluation of the Ability of Lasers to Attract and Retain Patients in an Academic Cosmetic Surgery Center

Armin Edalatpour; Peter Wirth; Pradeep Attaluri; Lily Stalter; Ellen C. Shaffrey; Ahmed Afifi

Introduction: Lasers have become an integral part of cosmetic surgery centers in recent years. However, there is a paucity of data regarding the value of a laser in clinical practice, both in direct income and the ability to attract and retain patients. In this study, we sought to evaluate the commercial value of a laser to an academic multidisciplinary aesthetic surgery center.

Methods: We performed a retrospective review of all patients undergoing laser therapy at our cosmetic surgery center from November 2011 to March 2020. Patient demographics, including age, race, and gender, were collected. Patients were grouped by first encounter type, whether it was for laser treatment or otherwise. For each patient, the type of laser therapy and other surgical and non-surgical procedures were recorded. Revenue data was gathered from the total amount reimbursed to our healthcare system.

Results: A total of 1305 patients underwent 4201 laser treatments. Total revenue from laser therapy was $1,655,337.52. Nine hundred fifty-four (73.1%) patients underwent laser therapy at their first encounter, with the remaining patients being already established in our practice. Among those patients, 96% underwent additional laser treatments and 12.7% had additional non-laser procedures. For those undergoing additional procedures, there were a total of 661 additional procedures, of which there were 108 aesthetic surgeries and 553 Botox/filler injections. Total revenue from all additional procedures was $398,539.00.

Conclusion: Over nine years, our laser provided 4201 treatments with a significant gross revenue. Of those whose initial encounter was laser, 12.7% underwent additional procedures. The benefit of lasers to an aesthetic surgery center goes beyond its clinical results and the gross revenue, as lasers are important to complete the care of the aesthetic surgery patients and to attract new patients to the practice.

The Nuances of Abdominal Free Flap Harvest: Technical and Patient Factors Affecting Abdominal Donor Site Morbidity in Autologous Breast Reconstruction

Armin Edalatpour; Pradeep Attaluri; Ellen Shaffrey; Allison Seitz; Samuel O. Poore; Ahmed M. Afifi

Introduction: Abdominal donor site morbidity after autologous breast reconstruction is common and often underreported. The aim of this work is to compare prospectively collected technical details of the procedure and patient factors and their impact on the development of symptomatic and asymptomatic abdominal bulges (ASB and SB).

Methods: A review of patients undergoing abdominal based autologous breast reconstruction from May 2012 to October 2017 by two surgeons at a single institution was performed. Demographics, prior medical and surgical history, intraoperative data, and postoperative course were collected. Primary outcomes of interest were ASB or SB and wound healing complications.

Results: Overall, 196 free flaps in 117 patients were included. The average follow-up was 1.9 ± 1.7 years. Thirteen (11.1%) patients developed ASB and 13 (11.1%) patients developed SB. Patient with BMI≥30, bilateral ms-TRAM reconstruction, and onlay type of abdominal closure were 2x, 2.3x, 8.1x more likely to develop a bulge, respectively ($p=0.017$, $p=0.010$, $p=0.049$). Every one-point increase in BMI above 30 increased the odds of developing a bulge by 10.8%. Prior abdominal surgery increased the risk of SB by 7 times ($p=0.017$). Size of the harvested muscle, use of mesh, or nerve preservation did not affect the rate of bulge development.

Conclusion: High BMI, bilateral ms-TRAM, onlay type of abdominal closure, and prior abdominal surgery increases the risk of ASB and SB development to variable degrees, while several other operative variables did not seem to make a difference. This information can aid in preoperative counseling of breast reconstruction patients as well as intraoperative decision-making.

Use of CT Metrics to Predict Pancreas Transplant Outcomes

Colin Snook; David Aufhauser

Introduction: Simultaneous pancreas-kidney (SPK) transplantation delivers excellent outcomes for patients with end-stage kidney disease caused by diabetes. Visceral adiposity has long been associated with insulin resistance and diabetes, but the impact of it in pancreatic transplant patients is not established. The objective of this study was to determine whether central adiposity, sarcopenia, and bone density were predictive of pancreas transplant outcomes.

Methods: This single-center retrospective cohort study examined n=204 pancreas transplant recipients at UW Hospital between the years 2012-2020. Volumetric software was used to determine the cross-sectional area (cm2) and density (HU) of adipose and skeletal muscle tissue at the L4 level. Skin-to-iliac distance at the L3 level as well as L1 vertebral body bone density was also recorded. These metrics were used to calculate Psoas Index (cm2 / m2), skeletal muscle index (cm2 / m2), and the ratio of visceral-to-subcutaneous adipose tissue. Primary outcomes of interest were patient and graft survival and post-transplant diabetes mellitus. Statistical analysis was conducted using Cox regression analysis and multivariable regression analysis.

Results: Visceral adiposity was not associated with pancreatic graft failure. Increased skeletal muscle area (p = 0.478; HR 0.992, 95% CI [0.984,1.00]) skeletal muscle index (HR 0.984, 95% CI [0.969, 0.999], p = 0.0357), and psoas index (HR 0.941, 95% CI [0.875, 1.011], p = 0.0966) were all associated with improved pancreatic graft survival.

Conclusions: Sarcopenia but not visceral adiposity is associated with pancreas graft loss. This finding should inform patient selection for transplant. In particular, current BMI restrictions may be too restrictive and may exclude patients who may benefit from this therapy. These findings are of particular relevance to patients with Type 2 diabetes where visceral adiposity is relatively common and who currently have diminished access to pancreas transplantation.

Table 1: Study Demographics

	T1DM (n= 146)	T2DM (n= 55)	Other (n=3)	All (n=204)
Age	46.7 ± 10.3	50.6 ± 8.4	36.2 ± 12.9	47.6 ± 10.1
Male (n, %)	83 (56.9%)	47 (85.5%)	1 (33.3%)	131 (64.2%)
Race (n, %):				
American or Alaska Native	1 (0.7%)	3 (5.5%)	-	4 (1.96%)
Asian	2 (1.4%)	6 (10.9%)	1 (33.3%)	9 (4.41%)
Back or African American	10 (6.9%)	14 (25.5%)	-	24 (11.76%)
White	113 (91.1 %)	32 (58.2%)	2 (66.7%)	167 (81.86%)

Values reported are mean ± standards deviation or percent.

How Can We Objectively Evaluate the Effectiveness of Protocol-Driven Calcium and Calcitriol Supplementation After Thyroidectomy?

Rebecca Williams; Alexander Chiu; Nicole Lunardi; Elisa Marten; Dawn Elfenbein; Simon Holoubek; Kristin Long; Erin Mackinney; David F Schneider; Rebecca Sippel; Courtney Balentine

Introduction: Determining the effects of calcium and calcitriol supplementation after thyroidectomy is difficult because observational studies are biased by unmeasured confounding variables that differ between patients who are treated versus those who are untreated. A regression discontinuity design, a relatively new and novel analytic technique, can address this problem by balancing measured and unmeasured confounding to generate an unbiased estimate of how treatments affect outcomes. The purpose of this study was to evaluate the effects of calcium supplementation following thyroidectomy using a regression discontinuity design.

Methods: Our institution follows a protocol after total or completion thyroidectomy: patients with postoperative PTH between 10-20pg/ml receive calcium carbonate, while those with PTH <10 pg/ml receive calcium and calcitriol. We used a regression discontinuity design to determine protocol effects on (1) transient hypocalcemia, (2) 2-week postoperative calcium, and (3) readmission or emergency room visits for 2,294 consecutive patients who underwent total or completion thyroidectomy from 2010-2022.

Results: The mean age for the cohort was 50 ± 15 years and 78% were women. Fifty-seven percent of operations were for benign disease, including 2,054 total thyroidectomies and 240 completion lobectomies. For patients with postoperative PTH <10, supplementation with calcium and calcitriol did not eliminate symptomatic hypocalcemia (p<0.001) but did lead to normalization of calcium at two weeks after surgery and effectively prevented emergency room visits or readmissions. For patients with postoperative PTH <20 but >10, calcium supplementation was associated with improved rates of symptomatic hypocalcemia and reduced risk of emergency room visits or readmissions. Calcium supplementation was also associated with normalization of two-week postoperative calcium: 9.24 mg/dl for untreated versus 9.07 mg/dl for patients treated with calcium (p for difference <0.15).

Conclusions: Selective supplementation with calcium and/or calcitriol after thyroidectomy is associated with improved postoperative outcomes, even after accounting for both known and unknown differences in confounding variables. Unlike standard techniques for measuring treatment effects using observational data, our novel use of a regression discontinuity design allowed for an unbiased estimate of how our protocol improves patient outcomes after thyroidectomy.

Heterogeneity of Patients with Primary Hyperparathyroidism: Implications for Interpretation of Intraoperative PTH

Rebecca Williams-Karnesky; Alexander Chiu; Nicole Lunardi; Elisa Marten; Dawn Elfenbein; Simon A. Holoubek; Kristin Long; Erin MacKinney; David F. Schneider; Rebecca Sippel; Courtney J. Balentine

Background: Assessing intraoperative cure of hyperparathyroidism based on predefined rules (such as 50% drop in PTH or 50% drop + normalization) assumes that intraoperative PTH dynamics are uniform for all patients. We used a novel finite mixture model to determine whether patient characteristics could cause heterogeneity in the relationship between changes in intraoperative PTH and long-term outcomes of parathyroidectomy, making it difficult to apply universal criteria to define intraoperative cure.

Methods: We analyzed 2,526 patients aged 18+ years who underwent parathyroidectomy for hypercalcemic primary hyperparathyroidism at our institution from 2001-2022. We used finite mixture models with up to four latent classes to identify unique subgroups of patients and to analyze the relationship between intraoperative PTH dynamics and normalization of postoperative calcium.

Results: The mean patient age was 62±13 years, 76% were women, mean preoperative calcium was 11±0.7 mg/dl, and mean PTH was 124±85 mg/dl. Intraoperative PTH levels were measured at baseline and 5, 10, and 15 minutes post-resection. We identified four subgroups of patients with unique intraoperative PTH dynamics. Each of these groups was associated with unique demographic characteristics, pre-operative biochemical profiles, and cure rates (p<0.03): (1) Early responders had the largest drop in PTH at 5 minutes, were most likely to attain a 50% drop in PTH (88%), but surprisingly had the lowest cure rate (91%, p=0.017). (2) Intermediate responders had the largest drop in PTH between 5-10 minutes, were most likely to have hyperplasia (25%, p<0.001), and had the highest cure rate (96%, p=0.017). (3) Steady responders had similar changes in PTH at each PTH assessment, and had baseline Ca/PTH levels between those of Early and Intermediate responders. (4) Late responders had the largest drop in PTH at 15 minutes, were more often men (43%, p<0.001), and had the highest preoperative calcium.

Conclusion: We found considerable heterogeneity in how intraoperative PTH changes during parathyroidectomy. We also found that patterns of patient heterogeneity affects long-term outcomes of parathyroidectomy. The complexity and heterogeneity of patients with hyperparathyroidism suggests that the judgement of expert surgeons should not be replaced by any universal criteria to define intraoperative cure.

Exploring Benefits and Barriers to Perioperative Comprehensive Geriatric Assessment: A Qualitative Analysis

Julia R. Berian; Randi S. Cartmill; Esra Alagoz

Introduction: The Perioperative Optimization of Senior Health (POSH) clinic performs comprehensive geriatric assessment for complex elderly UW surgical patients. Despite national guidelines and improvement in morbidity and mortality, the service remains under-utilized. We explore the perceived benefits of and potential barriers to POSH utilization among UW providers.

Methods: We performed semi-structured interviews with POSH providers (n=9) and purposeful sampling of surgeons and surgical advanced practice providers (n=6) who refer to POSH. All interviews were audio-recorded, transcribed, and coded using directed content analysis based on the CFIR framework. Higher-level analysis explored barriers and benefits to POSH use.

Results: All healthcare professionals expressed that the POSH clinic provides a more detailed risk-assessment for elderly surgical patients with regard to morbidity and mortality. However, there was an added benefit in increasing patient-centeredness for this population. This benefit took two forms: (1) the act of having the conversation had inherent value to patients and providers, and (2) it provided 'patient empowerment' by generating concrete 'action items' for patients, preserving a sense of control over their health.

Conclusions: Preoperative geriatric assessments as performed by the UW POSH clinic improve surgeons' risk-assessment and provide an additional subjective increase in patient-centeredness.

Reducing the Relative Radiation Risk from Diagnostic Computed Tomography for Craniosynostosis

Daniel Y. Cho; Catharine Garland; Nastassja L. Peterman; Liana Cheung; Scott P. Bartlett; Jesse A. Taylor; Arastoo Vossough; Jordan W. Swanson

Introduction: Computed tomography (CT) is the gold standard for the diagnosis of craniosynostosis. However, there has been debate on the use of CT imaging in pediatric patients due to concerns regarding potential radiation risk. To mitigate this risk, many pediatric centers have developed low-dose CT protocols to reduce the total radiation dose patients are exposed to with these scans. This study quantifies the efficacy in radiation reduction over the last decade at a major tertiary craniofacial center and contextualizes this risk using known environmental and occupational exposure risks to help guide implementation radiation reduction strategies at American Family Children's Hospital.

Methods: Radiation effective dose was calculated for pre-operative CT data from two-year timeframes (2007-2008 and 2018-2019) before and after the implementation of a low-dose CT protocol at the Children's Hospital of Philadelphia. Mean effective dose of the historical protocol was compared to the new low-dose protocol and data were compared using the non-parametric Mann-Whitney U-test to assess efficacy of radiation reduction strategies. Common environmental and occupational radiation risks were collated from publicly available sources.

Results: New scanner technology accounted for a 336% dose reduction ($p < 0.0001$), optimizing scan length led to an additional 14% reduction ($p < 0.0001$), and the craniosynostosis-specific protocol further reduced radiation by 22% ($p < 0.0001$). Cumulative mean effective dose was 6.85 mSv in the historical low dose protocol and decreased to 1.84 mSv with the new low dose protocol ($p < 0.0001$), for a total reduction of 372%. Contextualizing this radiation risk, the mean effective dose of 1.84mSv for the low-dose CT protocol is similar to 4 months of the annual background radiation in the US and 3 months in the state of Wisconsin, significantly less than the annual occupational exposure of airline crew members and vascular surgeons, and well within the international occupational radiation annual exposure limit of 20mSv.

Conclusions: Technological improvements in radiation safety over the last decade have provided a 3.7-fold decrease in CT radiation risk, with effective dose risk comparing favorably with known environmental and occupational radiation risks. Given the efficacy of recent radiation safety improvements, we advocate for the continued use of confirmatory CT scans for craniosynostosis, along with routine quality and institutional radiation safety reviews. Using the results of this study, we plan to continue to enhance our radiation reduction strategies at American Family Children's Hospital to reduce the radiation risk for our patients with craniosynostosis.

Healthy Adults Demonstrate Pressure and Timing Differences Between Volitional and Spontaneous Swallows: A Pharyngeal High-Resolution Manometry Study.

Maryann N. Krasko; Sarah Ladin; Nicole E. Schaen-Heacock; Suzan Abdelhalim; Corinne A. Jones; Michelle R. Ciucci; Timothy M. McCulloch

Introduction: Swallowing is a complex process, requiring precise neuromuscular coordination for the safe and efficient transfer of materials from mouth to esophagus. Swallowing physiology varies among individuals and, importantly, can vary within individuals due to a number of factors, including bolus size, bolus mass, and sex. However, there is still a paucity of objective and quantitative data supplementing the current understanding of swallow variability in humans. Voluntary and spontaneous (involuntary, saliva) swallowing have distinct patterns as they are controlled differently by the central nervous system. This study aimed to quantify differences between voluntary and spontaneous swallows in healthy adults. We hypothesized that voluntary swallows would yield greater pressures and durations compared to spontaneous swallows. Secondary analyses included consideration of sex and size of the pharynx.

Methods: Voluntary (2cc water) and spontaneous (saliva) swallow pressures and durations from 50 healthy adults (male n=25; age range=21-87) were measured using pharyngeal high-resolution manometry (pHRM). Maximum and cumulative pressures were measured in the velopharynx, tongue base, and hypopharynx; maximum pressures were measured in the pre-opening upper esophageal sphincter (UES) and post-closure UES; minimal pressures were measured in the UES. Velopharyngeal, tongue base, hypopharyngeal, and nadir UES durations were also measured. Paired t-tests were used to assess differences between volitional and spontaneous swallows for each pressure and duration parameter. Unpaired t-tests were calculated to assess differences between males and females for each pHRM parameter, as well as C2-C4 size. Pearson's correlation coefficient assessed associations between size and swallowing parameters. Level of significance was set at alpha = 0.05.

Results: Volitional swallows yielded greater pressures compared to spontaneous swallows in the velopharynx (maximum, p<0.0001), tongue base (maximum, p=0.0452; cumulative, p=0.0004), and post-UES (p=0.0058). Of timing measures, only nadir UES duration was significant (p=0.0003), with longer durations for voluntary than spontaneous swallows. Sex was not significant for any pHRM measure. Males were found to have larger cervical sizes than females (p<0.0001); however, Pearson's correlation coefficient revealed that there were no meaningful associations between size and any of the swallow differences (r<0.1).

Conclusions: This study revealed important differences between voluntary and spontaneous swallows. Neither sex nor size was a significant factor in pressure or timing events. These findings increase our understanding of how volitional and spontaneous swallows differ and may serve as foundational to refining clinical evaluations, taking these differences into account.

National Analysis of Short-Term Outcomes Following Valve Replacement for Radiation Heart Disease

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Objective: To describe short-term outcomes and volume-outcome relationships for patients undergoing valve replacement for radiation-induced heart disease.

Methods: Patients ≥18 years old in the National Inpatient Sample with histories of chest radiation who underwent aortic valve replacement (AVR), mitral valve replacement (MVR), or combined aortic and mitral valve replacement (AMVR) between 2005-2015 were identified. Demographics, preoperative factors, hospital characteristics, in-hospital outcomes, and volume-outcome relationships were described. Continuous variables were compared using T-tests and maximum likelihood estimation. Categorical variables were compared using Chi-squared tests. Predictors of short-term mortality were evaluated with logistic regression.

Results: 1,336 patients underwent AVR, 699 patients underwent MVR, and 189 patients underwent AMVR. The majority of patients were female (AVR 1147 [86%], MVR 622 [89%], AMVR 147 [78%]) and relatively young (AVR 70.5 years, MVR 67.2 years, AMVR 67.4 years). Comorbidities were common, with 1/5th of patients having existing chronic lung disease (AVR 306 [23%], MVR 157 [22%], AMVR 33 [18%]); 38% of AMVR patients had pre-existing coagulopathy. The majority of operations were performed at urban teaching hospitals (AVR 970 [73%], MVR 526 [75%], AMVR 144 [76%]) with considerable yearly total valve-surgical volume (Table 1). In-hospital mortality was highest for AMVR patients (15 [8%]) and complications were common (AVR 1010 [76%], MVR 631 [90%], AMVR 174 [92%]). Prosthesis-related, bleeding, arrhythmia, and pulmonary complications were most observed (Table 1); 39 AMVR patients (21%) required permanent pacemakers. Non-white patients were more likely to die following MVR (OR 2.72, p<0.0001) and the need for intra-aortic balloon counter-pulsation was predictive of mortality (AVR OR 64.3, p=0.0001, MVR OR 25.8 p=0.05, AMVR OR 5.6 p=0.018). A mortality benefit was observed for patients undergoing MVR at urban hospitals.

Conclusions: Valve replacement surgery for radiation-induced heart disease is associated with considerable short-term morbidity and mortality and should be reserved for high-volume centers.

Table 1: Summary of Patient Demographics, Hospital Characteristics, and Short–Term Outcomes Following Valve Replacement for Radiation Heart Disease.

	AVR (n = 271 unweighted; 1336 weighted)	MVR (n = 142 unweighted; 699 weighted)	AMVR (n = 39 unweighted; 189 weighted)
Demographics			
Median age, years	70.5 (95% CI: 68.9, 72.1)	67.2 (95% CI: 65.5, 69.7)	67.4 (95% CI: 60.0, 74.7)
Sex			
Male	189 (14.1%)	77 (11.1%)	43 (22.5%)
Female	1147 (85.9%)	622 (88.9%)	146 (77.5%)
Comorbidities			
Stroke/TIA	46 (3.4%)	24 (3.4%)	25 (13.0%)
Chronic Pulmonary Disease	306 (22.9%)	157 (22.4%)	33 (17.5%)
Peripheral Vascular Disease	266 (19.9%)	68 (9.8%)	19 (10.27%)

Chronic Renal Insufficiency/Failure	119 (8.9%)	74 (10.6%)	10 (5.3%)
Anemia	199 (14.9%)	121 (17.3%)	34 (18.0%)
Coagulopathy	343 (25.7%)	153 (21.9%)	71 (37.7%)
Hospital Characteristics			
Bed Size			
Small	69 (5.2%)	23 (3.4%)	none
Medium	275 (20.6%)	161 (23%)	48 (25.4%)
Large	992 (74.3%)	515 (73.6%)	141 (74.6%)
Setting			
Rural	34 (2.5%)	14 (2.0%)	none
Urban Non-Teaching	331 (24.8%)	159 (22.8%)	45 (24.0%)
Urban Teaching	970 (72.6%)	526 (75.2%)	144 (76.0%)
Median Annual Valve Cases/Hospital	76.16 (95% CI: 68, 84)	82 (95% CI: 71, 92)	88 (95% CI: 61, 114)
Distribution of Cases Across Hospitals			
Minimum	4	4	12
25th percentile	33 (95% CI: 29, 37)	32 (95% CI: 21, 42)	37 (95% CI: 29,44)
75th percentile	188 (95% CI: 167, 209)	190 (95% CI:120, 260)	181 (95% CI: 147, 215)
Maximum	1704	1704	553
Short-Term Outcomes			
Mortality	24 (1.8%)	8 (1.2%)	15 (7.9%)
Any Complication	1010 (75.6%)	631 (90.1%)	174 (91.8%)
Procedural			
Valve/Device Complication	28.3 (2.1%)	49.2 (7.0%)	19.7 (10.4%)
Bleeding Complicating Procedure	48 (3.6%)	13 (1.8%)	20 (10.3%)
Cardiovascular			
Supraventricular Arrhythmia	577 (43.2%)	439 (62.7%)	112 (59.2%)
Atrioventricular Block	117 (8.8%)	77 (11.1%)	49 (25.9%)
Pacemaker Insertion	63 (4.7%)	69 (9.8%)	39 (20.6%)
Pulmonary			
Pulmonary Collapse	170 (12.7%)	132 (18.9%)	44 (23.5%)
Pneumonia	9 (0.7%)	24 (3.5%)	14.7 (7.8%)
Noninvasive Ventilation	35 (2.6%)	33.9 (4.8%)	5 (2.7%)
Mechanical Ventilation	73 (5.5%)	48.7 (7.0%)	20 (10.6%)

Predictors of Short-Term Mortality	OR	P-Value	OR	P-Value	OR	P-Value
Demographics						
White	N/A		Ref.		Ref.	
Non-White	N/A		2.723	<0.0001	2.044	0.123
Hospital Setting						
Rural	N/A		Ref.		N/A	
Urban Teaching	N/A		0.092	<0.001	N/A	
Urban Non-Teaching	N/A		0.001	<0.001	N/A	
Procedural						
IABP	64.301	0.0001	25.784	0.05	5.620	0.018

Patient and Provider Perceptions about Communication after Bariatric Surgery: A Qualitative Analysis

Chloe S. Lam; Dawda Jawara; Esra Alagoz; Jacqueline A. Murtha; Corrine I. Voils; Luke M. Funk

Introduction: Communication between bariatric surgery patients and providers can strongly influence a patient's weight-related behavior after surgery. Little is known about this communication following bariatric surgery. The objective of this study was to assess patient and provider perceptions of how communication affected weight-related behaviors after bariatric surgery.

Methods: Semi-structured interviews with bariatric surgery patients and providers were conducted from April-November 2020. Patients who had undergone bariatric surgery and had at least one-year of follow-up were eligible for inclusion. Patients who had Medicaid within three years of surgery were defined as socioeconomically disadvantaged. A hybrid of Andersen's Behavioral Model of Health Services and Torain's Framework for Surgical Disparities was utilized for the interview guide construction and analysis. Participants were asked to describe post-operative experiences within three domains: adherence to diet, physical activity, and follow-up care. Five study team members developed a codebook to analyze the data. Directed content analysis identified themes pertaining to patient-provider communication.

Results: Forty-five participants were interviewed, including 24 patients (83% female; 79% white; mean age 50.6 ±10.7 years) and 21 providers (6 primary care providers, 4 health psychologists, 5 registered dietitians, 6 bariatric surgeons). Table 1 displays the four themes within which patient-provider communication was perceived to have influenced patient behavior after surgery. From the patient's perspective, decisions to follow-up were negatively influenced by shame or fear of communicating to providers about weight re-gain. Patients felt that rapport-building communication enhanced their trust in the care team but did not lead to better patient adherence to provider recommendations. Provider perceptions aligned with these themes. Providers stated that socioeconomically disadvantaged patients were less likely to trust the healthcare system. Personalized communication strengthened these patients' trust in providers. Providers emphasized communicating about access to healthy foods, alternative forms of physical activity, and nutritional education to patients who were disadvantaged socioeconomically. However, patients felt that provider recommendations often did not fit their lifestyles.

Conclusions: Optimal patient and provider communication after bariatric surgery is essential, but perceptions about the quality of communication differ between patients and providers. Reassuring patients who have attained less weight loss than expected and focusing on establishing trust with socioeconomically vulnerable patients could strengthen care after bariatric surgery.

Table 1. Patient-provider communication themes with representative quotes.

Themes	Patient	Provider
Motivation to follow-up	"It was about a year and half I started gaining weight back, I felt like a failure, and I didn't want to meet with [the providers]." (Medicaid Patient)	"[Patients] don't want to come to the provider and admit, 'I didn't do it.' They know they're not doing everything, and they feel guilty and ashamed, and they don't want to tell us." (HP)
Trust	"I trust [the bariatric team] wholeheartedly. I'm a people's person, I feel people, and if I meet you and something about you is not right, I don't deal with you." (Medicaid Patient)	"[Medicaid] patients don't present for primary care because they fear stigma. You've come in ten times with knee pain and your knee still hurts. My patients don't have an experience of trust and good outcomes in healthcare settings." (PCP)
***Personalized communication**	"I knew that she wasn't there to try to help me work through my issues. For her, it was black and white that you just need to do this." (Non-Medicaid Patient)	"We try to coach them into what may be healthy options at a gas station versus a full-blown grocery store." (RD)
***Understanding treatment plans**	"Everything was explained in a way that I can understand. I don't remember feeling intimidated or overwhelmed. They spoke to me like I was a person." (Non-Medicaid Patient)	"You're talking to [patients] and you can tell that they don't understand anything you're saying, and I try to be as simple and use the most plain language possible." (Surgeon)

HP=health psychologist; PCP=primary care physician; RD=registered dietitian
*Indicates misaligned views between patients and providers.

Racial Disparities in Nutrient Deficiencies among Bariatric Surgery Patients: A Systematic Review

Dawda Jawara; Jacqueline A. Murtha; Daniel M. Ufearo; Bryan M. Gannon; Luke M. Funk

Introduction: Bariatric surgery increases the risk of micronutrient deficiencies, along with secondary hyperparathyroidism, bone loss, and anemia. Prospective cohort studies have found a higher prevalence of nutrition-related complications among racial and ethnic minorities including African Americans and Hispanics compared to White bariatric surgery patients. The objective of this systematic review is to determine if racial and ethnic minorities have disparate nutritional outcomes after bariatric surgery.

Methods: Pubmed, CINAHL, PsychINFO, and Cochrane databases were searched for manuscripts published between January 1, 2002, and February 1, 2022. Manuscripts were included if they reported data describing micronutrient outcomes or pathology resulting from micronutrient deficiencies following bariatric surgery.

Results: 886 manuscripts were identified in the initial search, and 18 were included for full-text review. Ten manuscripts met the criteria for inclusion in our analysis. As shown in Table 1, among the seven studies that evaluated vitamin D as an outcome, six reported an increased risk of vitamin D deficiency in racial and ethnic minorities compared to White patients. Thiamine deficiency was reported to be disproportionately higher in racial and ethnic minorities in the two studies that evaluated it as an outcome. Hyperparathyroidism was found to be also disproportionately increased in racial and ethnic minority patients in three out of the five studies that evaluated this condition. Additionally, two studies found increased bone resorption and fracture risk in racial and ethnic minority patients.

Conclusions: Racial and ethnic minority patients experienced an increased risk of nutrient deficiencies, hyperparathyroidism, and fracture risk following bariatric surgery. Qualitative studies including patients and providers would help to provide insight into the disproportionate nutritional deficiencies in racial and ethnic minorities compared to white patients after bariatric surgery.

Table 1: Incidence of reported nutrient deficiencies in racial and ethnic minorities

Incidence	Nutrient deficiency or related pathology
6/7	Vitamin D deficiency
2/2	Thiamine deficiency
3/5	Hyperparathyroidism
1/1	Vitamin A
1/1	Vitamin B2/6/12 deficiency
2/2	Excessive bone loss/fracture

Socioeconomic Disparities and Bariatric Surgery Outcomes: A Qualitative Analysis

Jacqueline A. Murtha; Esra Alagoz; Dawda Jawara; Catherine R. Breuer; Lindsey Eierman; Chloe S. Lam; Dorothy Farrar-Edwards; Corrine I. Voils; Luke M. Funk

Background: Disparities in socioeconomic status have been associated with less weight loss after bariatric surgery. Reasons for these disparities are unknown. Our objective was to identify socioeconomic barriers to weight loss after bariatric surgery.

Methods: We performed semi-structured interviews with bariatric surgery patients and providers from April-November 2020 asking them to describe the postoperative experience within three clinical areas: dietary habits, physical activity, and follow-up care. Low SES patients were defined as having Medicaid within three years of surgery. To allow for comparison of barriers, patients were purposefully sampled to be evenly split into "low" and "high" SES groups. Interview data were coded by team members using Directed Content Analysis based on the domains in Andersen's Behavioral Model of Health Services Use and Torain's Surgical Disparities Model.

Results: Twenty-four patients (median of 4.1 years postoperatively; mean age 50.6 (±10.7) years; 83% female) and 21 providers (6 bariatric surgeons, 5 registered dietitians, 4 health psychologists, and 6 primary care providers) were interviewed. For lower SES patients, barriers to weight loss related to five areas (Table 1): 1) limited health literacy; 2) challenging employment environments; 3) limited income; 4) unreliable transportation; and 5) unsafe/inconvenient neighborhoods. Higher SES patients noted fewer barriers: 1) occupation that is sedentary or requires frequent travel; and 2) longer travel-time to gym or follow-up care.

Conclusion: Patients from lower socioeconomic strata face unique barriers to weight loss after bariatric surgery. Interventions that target these barriers are needed to support this vulnerable patient population.

Table 1. Barriers to weight loss after bariatric surgery among low socioeconomic status patients

1. Limited health literacy	Patients with lower education often needed more training/teaching regarding recommendations for diet, physical activity, and post-op care.
2. Challenging employment environments	Patients who had physically demanding jobs or multiple jobs struggled to follow dietary, physical activity, and follow-up care recommendations.
3. Limited income	Low-income patients: a) had a difficult time affording supplements and vitamins; b) skipped meals or relied on cheaper convenience food options/unhealthy options at food pantry; c) did not have access to affordable fitness centers; d) did not have reliable internet access for virtual follow-up meetings; e) struggled with gas money and co-pays, which prevented their attendance to follow-up meetings.
4. Unreliable transportation	Patients who did not have reliable transportation were restricted to bus routes to get their healthy foods. Public transportation or insurance-provided transportation (e.g., scheduled service driver) was often unreliable.
5. Unsafe/inconvenient neighborhoods	Grocery stores in disadvantaged neighborhoods did not carry healthy options. Patients could not have groceries delivered to their homes because of fear of theft. Neighborhoods were unsafe for exercising or did not have sidewalks.

Weight Change Trends: A Quantitative Analysis of an NIH-Partnered Dataset

Dawda Jawara; Jacqueline A. Murtha; Manasa Venkatesh; Craig Krebsbach; Jen Birstler; Lily Stalter; Bret M. Hanlon; Luke M. Funk

Introductions: Obesity and its related comorbidities, including hypertension, type 2 diabetes, and certain cancers, have been increasing in prevalence in the U.S. for the past 30 years. Several studies have reported that losing as little as 5% total body weight (TBW) can improve health. National datasets that are used for weight trajectory estimates for the U.S. population, such as National Health and Nutrition Examination Survey (NHAHES), are limited by very small sample sizes and a lack of longitudinal data for patients. Our objective in this study was to analyze the National Institutes of Health All of Us Research Program (AoU) dataset to evaluate weight trends in U.S. adults.

Methods: We identified patients age 18-70 years old who had at least two height and weight measurements recorded within a 5-year period between January 2008 and January 2022. We excluded all underweight participants (BMI ≤18.5 kg/m^2), cancer patients, pregnant patients, and bariatric surgery patients. We categorized patients by BMI class: normal (18.5-24.9 kg/m^2), overweight (25.0-29.9), class 1 (30.0-34.9), class 2 (35.0-39.9), and class 3 (≥40.0) obesity, and we evaluated weight trends during the study period. TBW loss was calculated for each patient from the baseline BMI measurement and most recent BMI measurement within the 5-year period.

Results: Nearly 31,000 participants met our study inclusion criteria. Table 1 highlights weight loss changes of the participants over the 5-year period. Nearly half of the population met criteria for obesity (BMI ≥30 kg/m^2). 15.2% of patients who were overweight at baseline had a normal weight on their most recent BMI measurement. Furthermore, 21.2%, 24.7%, and 19.2% of class 1, 2, and 3 obesity patients, respectively, lost enough weight to drop one BMI class. Nearly a third of patients with class 2 and 3 obesity lost ≥5% of their TBW, while a third of patients in the normal and overweight categories gained ≥5% of their TBW. Additionally, 23.2% of patients with class 1 obesity lost weight to become non-obese, while 1.2% with class 3 obesity lost weight to become non-obese at the end of the 5-year window.

Conclusion: Nearly one in three adults with obesity in an NIH-partnered nationally representative dataset lost a clinically meaningful amount of weight during the study period. This suggests that evidence-based obesity treatments, including behavioral weight management, medications, and bariatric surgery, are not having a significant impact on population-level weight trends in the U.S. Increased dissemination and implementation of these therapies and effective obesity prevention strategies are needed.

Table 1: Weight Change Trends Over a 5-Year Period

Initial BMI Class	Normal (18.5-24.9 kg/m^2) n=8,199 (%)	Overweight (25.0-29.9 kg/m^2) n=9,338 (%)	Class 1 obesity (30.0-34.9 kg/m^2) n=6,711 (%)	Class 2 obesity (35.0-39.9 kg/m^2) n=3,609 (%)	Class 3 obesity (≥ 40 kg/m^2) n=3,005 (%)	All participants n=30,862 (%)
Lost any weight	2,977 (36.3)	3,964 (42.5)	3,185 (47.5)	1,857 (51.5)	1,781 (59.3)	13,764 (44.6)
Decreased 1 BMI category	297 (3.6)	1,416 (15.2)	1,420 (21.2)	893 (24.7)	576 (19.2)	4,602 (14.9)
Lost ≥ 5% TBW	1,303 (15.9)	2,066 (22.1)	1,729 (25.8)	1,133 (31.4)	1,116 (37.1)	7,347 (23.8)
Gained ≥ 5% TBW	3,100 (37.8)	3,086 (33.0)	1,947 (29.0)	998 (27.7)	641 (21.3)	9772 (31.7)
Ending BMI < 30 kg/m^2			1,557 (23.2)	191 (5.3)	35 (1.2)	1783 (5.8)

Mandibular Distraction Osteogenesis in Pierre Robin Infants: A Literature Review and Retrospective Analysis on Feeding and Growth Outcomes

Allison J. Seitz; Armin Edalatpour; Vik Patel; Lisa Block; Katherine Rose; Delora Mount; Catherine B. Garland

Introduction: Feeding and growth outcomes following mandibular distraction osteogenesis (MDO) in infants with Pierre Robin Sequence (PRS) are variable within the literature. The majority of prior studies consist of small case series or retrospective cohorts examining short-term outcomes. In this study, we aim to comprehensively review the literature to evaluate both short and long-term feeding and growth outcomes in infants with PRS following MDO and compare these outcomes to infants with PRS undergoing MDO at our institution.

Methods: A literature review was performed using PubMed. Full-text articles reporting feeding and/or growth outcomes following MDO in infants with PRS were included. We additionally performed a retrospective chart review of infants with PRS who underwent MDO from 2002-2020 by two surgeons at a single institution. Variables of interest included patient demographics, intraoperative data, and preoperative and postoperative feeding and growth outcomes.

Results: Of the 600 articles identified, 15 studies were included with 391 infants with PRS who underwent MDO. Twelve studies (n=328) reported feeding outcomes. The majority of patients (67.4%) required tube feeds preoperatively. Following MDO, 49.5% of infants were discharged on oral feeds. Within one year after the operation, most patients were feeding orally (76.8%), and only 22.4% required tube feeds. Overall, 10 studies (n=161) examined growth outcomes. Three of these studies (n=47) reported long-term weight measurements (kg), while seven studies (n=109) reported weight percentiles. On average, patients' weight increased over a duration of 12 months postoperatively. Regarding weight percentiles, four articles reported an average decline in percentiles from birth to MDO or discharge (n=85). Following MDO, five studies reported long-term weight percentiles at 12-36 months. Of these studies, the majority of patients (88.6%) had an average increase in weight percentiles from MDO or discharge to their most recent follow-up. At our institution, 44 patients underwent MDO. Average weight percentiles decreased significantly from birth to MDO (42.7 vs. 17.9, $p<0.001$) but increased from MDO to the two-year follow-up (17.9 vs. 29.5, $p<0.001$). Fifteen patients had full oral feeds preoperatively (34.1%), while 13 patients (29.5%) had partial oral feeds preoperatively. Following MDO, most patients achieved full oral feeds by 12 months (n=31, 70.5%), while the rest of the patients required tube feeds (n=13, 29.5%).

Conclusions: Despite heterogenous data, MDO is effective at improving feeding and growth outcomes in infants with PRS. The majority of infants with PRS who undergo MDO progress to oral feeding within one year following the operation. Although birth weight percentiles may decline initially, patients overall have improvement in long-term weight percentiles.

Postoperative Outcomes Following Periareolar versus Double Incision Gender-Affirming Mastectomies

Armin Edalatpour; Allison J. Seitz; Aleah M. Warden; Kirsten Gunderson; Peter J Wirth; Katherine Rose; Katherine Gast

Introduction: Chest masculinization is one of the most frequently performed gender-affirming operations. Two commonly described techniques to gender affirming mastectomy include the periareolar approach or a double-incision (DI) mastectomy with free nipple grafting. Research comparing complications and revision rates following these two operative techniques have been conflicting within the literature. The specific aim of this paper is to compare postoperative outcomes between periareolar and double-incision gender-affirming mastectomies at our institution.

Materials and Methods: Following approval from the University of Wisconsin Institutional Review Board, a retrospective chart review was performed on all transgender patients undergoing gender-affirming mastectomies from August 2018 to December 2021 by a single surgeon (KG) at our institution. Variables of interest included patient demographics, operative data, and postoperative outcomes. Postoperative complications and revisions were examined by breast. Statistical analyses included independent sample t-tests and chi-square tests to compare double-incision (DI) and periareolar groups.

Results: A total of 212 patients met inclusion criteria. Sixteen of these patients (7.5%) underwent periareolar mastectomies while 196 patients (92.5%) underwent DI mastectomies. Patients who underwent DI mastectomies were significantly older and had a higher BMI compared to patients who underwent periareolar mastectomies (26.4 ± 8.1 vs. 22.1 ± 5.1 years, p=0.040 and 29.9 ± 8.1 vs. 21.3 ± 3.2 kg/m2, p<0.001, respectively). There was no difference in operative time (mean 1:29 ± 0:41 DI vs. mean 1:47 ± 0:25 peri) or blood loss. Time to drain removal was shorter in the periareolar group (p=0.048). Overall, the 90-day complication rate was low, 7.9% in the DI group vs. 14.3% in the periareolar group (p=0.322). Hematoma, seroma, delayed wound healing, and SSI rates were similar between the two groups (p>0.05 for all). Periareolar patients had a significantly higher rate of revisionary procedures compared to DI breasts (28.6% vs. 4.6%, p<0.001).

Conclusions: Postoperative complication rates are similar following periareolar and DI gender-affirming mastectomies. However, mastectomies utilizing a periareolar incision result in a significantly higher rate of revisions. Patients undergoing gender-affirming periareolar mastectomies should be counseled on the increased likelihood of requiring secondary revision procedures.

Zero-Depth vs. Penile Inversion Vaginoplasty: A Comparison of Surgical Techniques and Postoperative Outcomes

Armin Edalatpour; Allison J. Seitz; Kirsten Gunderson; Peter Wirth; Katherine Rose; Katherine M. Gast

Purpose: Zero-depth vaginoplasty (ZDV) and penile inversion vaginoplasty (PIV) are two surgical options for patients undergoing feminizing gender-affirming surgery. The primary purpose of this study is to compare surgical technique, complication rate, and need for revisionary surgery in PIV vs. ZDV.

Methods: A retrospective chart review was performed on patients undergoing vaginoplasty from 2018-2021 by the senior author (KG) at the University of Wisconsin Hospitals and Clinics. Variables of interest included patient demographics, intraoperative data, and postoperative outcomes. Variables were compared between ZDV and PIV cohorts using independent samples t-test for continuous variables and chi-square or fisher's exact test for categorical variables.

Results: Of the 114 patients who underwent vaginoplasty, 84 patients (73.6%) underwent PIV and 30 patients (26.3%) underwent ZDV. ZDV is a vulvoplasty only with no vagina, while PIV includes dissection of a vaginal canal that is lined with a full thickness skin graft. Patients who underwent PIV were significantly younger (M=38.8) compared to ZDV patients (M=52.3, p<0.001). PIV operations were significantly longer than ZDVs (4:06 vs. 2:30, p<0.001), resulted in higher estimated blood loss (303.7 vs. 211.3mL, p<0.001), and required more intraoperative fluids (2359 vs. 1381mL, p<0.001). PIV patients had significantly longer hospital stays than ZDV patients (5.7 vs. 2.6 days, p<0.001); however, duration of follow-up was similar among the cohorts (139.8 vs. 183.5 days, p=0.28). Following vaginoplasty, PIV patients required catheterization for significantly longer than ZDV patients (5.7 vs. 2.8 days, p<0.001) while the vaginal pack was in place, with extended activity restrictions. PIV patients developed significantly more wound healing complications (p<0.001) and pelvic floor spasm with vaginal dilation (p=0.02), requiring higher rates of postoperative pelvic floor therapy (p=0.04). Rates of hematoma, prolonged pain, surgical site infection, and granulation tissue were the same in both groups. A minority of patients required revisionary surgery (19% PIV vs. 10% ZDV, p=0.4).

Conclusion: PIV, with reconstruction of a vaginal canal in addition to vulvoplasty, is a more extensive operation with longer hospital stay and higher rates of postoperative delayed wound healing and pelvic floor spasm. Preoperative counseling regarding need for lifelong vaginal dilation and patient interest in postoperative penetrative vaginal intercourse must be taken into consideration when determining surgical approach.

Communication Challenges and Opportunities for Improvement during Interhospital Transfers of Emergency General Surgery Patients: The Physician Perspective

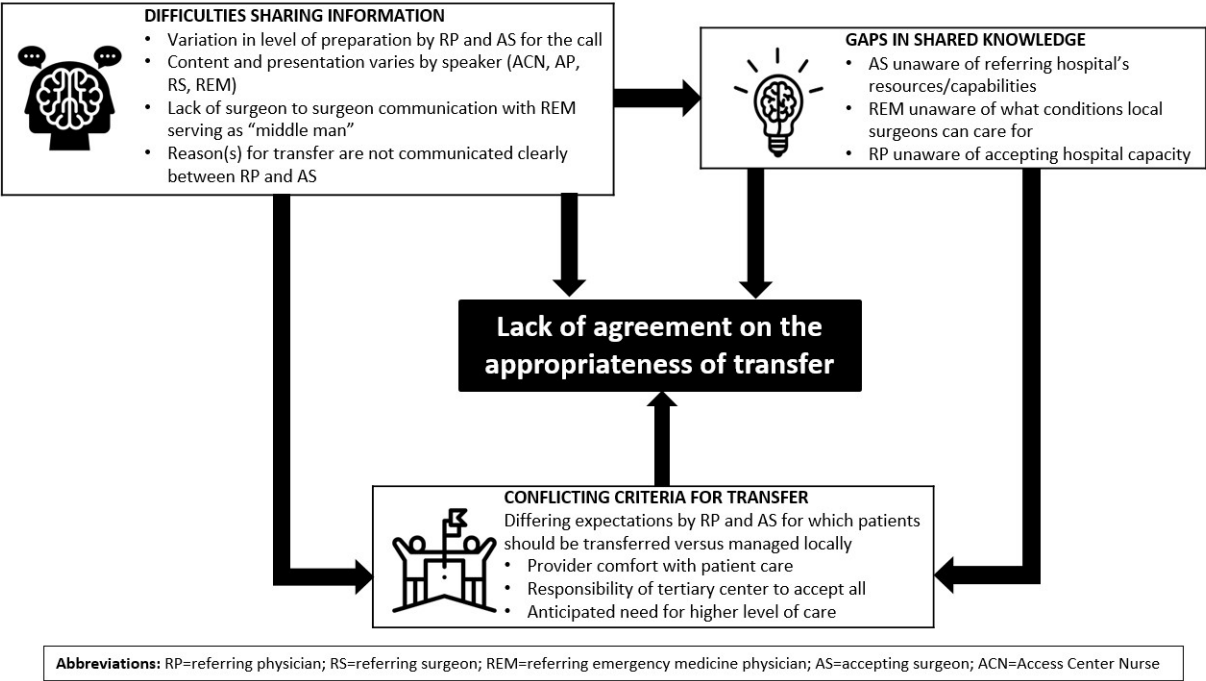Diana Gutierrez-Meza; Megan Saucke; Esra Alagoz; Angela Ingraham

Introduction: Research on interhospital transfers of emergency general surgery (EGS) patients typically centers on delineating risk factors for transfer and evaluating resulting outcomes. To improve the quality of care delivered, in-depth assessments of transfer processes are needed. We sought to characterize challenges and opportunities for improving communication regarding interhospital transfers of EGS patients as described by physicians.

Methods: We interviewed seven referring emergency medicine physicians, six referring surgeons, and seven accepting surgeons regarding their experiences during calls about transferring EGS patients between acute care hospitals. We asked participants to describe communication challenges (including impacts on transfer processes), techniques for overcoming challenges, and factors that promote successful calls. Interviews were conducted over Webex, recorded, transcribed, and managed in NVivo. We developed a codebook based on the Relational Coordination Framework and created new codes to capture emergent themes. Four researchers co-coded each transcript and met regularly to build consensus, discuss themes, and resolve differences. We completed thematic summaries of codes to identify patterns and arrive at higher-level concepts.

Results: Referring and accepting physicians described one overarching challenge - a lack of agreement on the appropriateness of transfers (Figure). Several interrelated challenges, including difficulties sharing information, gaps in shared knowledge, and conflicting criteria for transfer, contributed to this challenge. These challenges further contributed to a perceived lack of respect, trust, and empathy, which impeded a sense of collaboration. Opportunities to improve communication centered around four themes: (1) standardizing the content and organization of information presented, (2) enhancing how physicians share patient information, (3) supporting physicians in preparing for calls, and (4) building mutual understanding and respect. Physicians suggested standardizing communication by including information critical to the call in an order expected by accepting surgeons. Physicians recommended having direct surgeon-to-surgeon communication to improve information sharing. Physicians proposed ways to improve preparedness for calls, including reviewing images when able and being aware of referring hospital's capabilities and accepting hospital's capacity. Finally, physicians provided approaches to build mutual understanding and collaboration (e.g., conferences to discuss challenging cases, virtual or in-person visits to partnering hospitals).

Conclusions: Although referring and accepting physicians described numerous communication challenges, they also proposed feasible strategies to improve transfer calls. We are conducting stakeholder engagement sessions with physicians and Access Center nurses to prioritize these challenges and develop interventions to improve interhospital transfers. We anticipate these efforts will equip providers with the knowledge and tools needed to optimize discussions and decisions surrounding transfers.

Figure. Challenges described by referring physicians and accepting surgeons regarding interhospital transfers of emergency general surgery patients

DIFFICULTIES SHARING INFORMATION
- Variation in level of preparation by RP and AS for the call
- Content and presentation varies by speaker (ACN, AP, RS, REM)
- Lack of surgeon to surgeon communication with REM serving as "middle man"
- Reason(s) for transfer are not communicated clearly between RP and AS

GAPS IN SHARED KNOWLEDGE
- AS unaware of referring hospital's resources/capabilities
- REM unaware of what conditions local surgeons can care for
- RP unaware of accepting hospital capacity

Lack of agreement on the appropriateness of transfer

CONFLICTING CRITERIA FOR TRANSFER
Differing expectations by RP and AS for which patients should be transferred versus managed locally
- Provider comfort with patient care
- Responsibility of tertiary center to accept all
- Anticipated need for higher level of care

Abbreviations: RP=referring physician; RS=referring surgeon; REM=referring emergency medicine physician; AS=accepting surgeon; ACN=Access Center Nurse

Do the Nonlinear Dynamic Acoustic Measurements, Nonlinear Energy Difference Ratio, and Spectrum Convergence Ratio Correlate with Perceptual Evaluation of Esophageal Voice Speakers?

Fan Zhang; Duy Duong Nguyen; Catherine Madill; Yi Zhang; Sebastian Kiehn; Jiachen Sun; Nicole Haderlein; Sara Haines; Logan Klein; Cai Li; Jack J. Jiang

Introduction: The acoustic assessment of phonation after total laryngectomy is challenged by signal aperiodicity, which makes frequency-based acoustic measures less reliable. This is important for patients who use esophageal voice since voice samples mostly include type 3 (highly aperiodic) and type 4 (chaotic) signals. As such, using non-linear measures that are better suited for aperiodic phonation may be useful to investigate the relationship between acoustic signal characteristics and perception of esophageal voice quality. This study aimed to investigate whether nonlinear dynamic acoustic methods, nonlinear energy difference Ratio (NEDR), and spectrum convergence ratio (SCR) were correlated with perceptual measures in subjects who used esophageal phonation.

Methods: Thirty-one subjects who had undergone total laryngectomy and use esophageal voice as a rehabilitation method were included in this study. Expert and non-expert raters listened to the esophageal voice samples from the subjects and rated vowels and connected speech samples on a scale from 1 to 7 on dysphonia severity and intelligibility. In addition, non-linear acoustic analysis was performed to calculate NEDR and SCR. Analysis from the raters was compared to the non-linear acoustic analysis to find the correlation between the variables.

Results: There were no significant correlations between any of the non-linear acoustic measures NEDR and SCR and the perceptual ratings at the significance level of 0.05. Correlations were calculated for each acoustic measure among the expert raters and among the non-expert raters in both connected speech samples and sustained vowel fragments.

Conclusions: We hypothesized that nonlinear dynamic acoustic analysis would be correlated with perceptual ratings. We were unable to find any significant correlations between perceptual ratings and nonlinear dynamic acoustic measures NEDR and SCR. The lack of statistically significant results could be due to only having esophageal voices for data analysis. In the future, we would like to have a broader range of voices in the hopes of having more variation in data. There is also a potential in obtaining Voice Type Component Profiles and using intrinsic dimension estimation to obtain results that correlate more with perceptual analysis measures.

Table: Spearman's Rho Correlation Coefficients (r_s) Between Two Non-linear Measures (of Connected Speech) and Accuracy of Transcription (n = 31)

Spearman's rho		NEDR	SCR
Number transcription	r_s, nonexpert	.318	−.151
	p	.081	.417
	r_s, expert	.260	−.169
	p	.158	.362
Phrase transcription	r_s, nonexpert	−.031	.147
	p	.867	.429
	r_s, expert	−.037	.143
	p	.845	.444

Colonoscopy Access and Quality Measurement in Rural Wisconsin

Jessica Schumacher; Jennifer Weiss; Jeremy Levin; Matt Gigot; Elise Lawson

Introduction: Despite the critical role of colonoscopy in reducing the burden of colorectal cancer, people living in rural areas have reduced access in their communities due to provider shortages. The Surgical Collaborative of Wisconsin's (SCW) Rural Task Force, which is comprised of surgeons practicing in rural settings, identified colonoscopy as a high priority area because it is a high-volume procedure and there is a lack of access to quality measures, which are necessary for assessing performance and driving improvement. Colonoscopy is known to be a cornerstone of many rural surgical practices, representing the second most performed procedure among general surgeons. Improving access to high quality colonoscopy may reduce the burden of colorectal cancer in rural areas that currently face higher incidence and lower screening rates. Our objective was to assess the infrastructure and capacity for colonoscopy quality measurement and improvement in rural hospitals across Wisconsin.

Methods: In 2019-2020, SCW, the Rural Wisconsin Health Cooperative (RWHC), and the Wisconsin Collaborative for Healthcare Quality collaborated to survey RWHC hospitals (n=26) to understand colonoscopy provider availability, procedural volume and capacity, and informatics and quality measurement infrastructure. A web-based survey was sent to RWHC hospital administrative contacts and reminder emails were sent over four weeks (60% response rate). Survey items were summarized with descriptive statistics.

Results: The majority of colonoscopy providers in RWHC hospitals were general surgeons (66%) followed by family/internal medicine (20%) and gastroenterologists (14%). The average hospital volume/month was 80 colonoscopies (SD=53) and hospitals reported operating at 80% capacity for these procedures. Most selected 'seldom,' 'never,' or 'unknown' regarding the frequency of measuring evidence-based quality measures, including adenoma detection rate (58%), cecal intubation (69%), withdrawal time (53%), and prep quality (58%). About a third of hospitals (36%) utilized procedure-reporting software. Most hospitals (72%) did not have onsite pathology.

Conclusions: Approximately two-thirds of rural colonoscopy providers are general surgeons, a finding unique to rural hospitals. Hospitals report operating at 80% capacity, suggesting there may be opportunities to increase access to colorectal cancer screening for patients living in these areas. The lack of access to colonoscopy quality measures suggests the opportunity to develop a flexible measurement approach that takes into consideration availability of reporting software and electronic medical record differences. Improving access to quality measures along with access to education and training opportunities that do not require travel has the potential to improve access to colonoscopy for patients in rural Wisconsin.

Indications, Resource Allocation, and Outcomes Associated with EXIT Procedures – A North American Fetal Therapy Network (NAFTNet) Survey

Devashish Joshi; Michael Stellon; Kathleen Antony; Michael Beninati; Francois L. Luks; Michael Puricelli; Inna N. Lobeck

Introduction: Neonates with cardiorespiratory compromise at delivery are at substantial risk of hypoxic neurologic injury and death. Though mitigation strategies such as ex-utero intrapartum treatment (EXIT) exist, the competing interests of neonatal benefice, maternal non-maleficence, and just distribution of resources require consideration. Due to the rarity of these entities, there are few systematic data to guide evidence-based standards. This multi-institutional, interdisciplinary approach aims to elucidate the current scope of diagnoses that might be considered for such treatments and examine if treatment allocation and/or outcomes could be improved.

Methods: After IRB approval, a survey investigating diagnoses appropriate for EXIT consultation and procedure, variables within each diagnosis, occurrence of maternal and neonatal adverse outcomes, and instances of suboptimal resource allocation in the last decade was sent to all NAFTNet center representatives. One response was recorded per center.

Results: We received a 91% response rate, and all but one center offered EXIT. Most centers (34/40, 85%) performed 1-5 EXIT consultations per year and 17/40 (42.5%) centers performed 1-5 EXIT procedures in the last 10 years. The diagnoses with the highest degree of agreement between centers surveyed to justify consultation for EXIT are head and neck mass (100%), congenital high airway obstruction (90%), and craniofacial skeletal conditions (82.5%). Maternal adverse outcomes were noted in 7.5% of centers while neonatal adverse outcomes were noted in 27.5%. A large percentage of centers reported cases of suboptimal selection for risk mitigation procedures and several centers experienced adverse neonatal and maternal outcomes.

Conclusions: This study captures the scope of EXIT indications and is the first to demonstrate the mismatch in resource allocation for this population. Further, it reports on attributable adverse outcomes. Given suboptimal allocation and adverse outcomes, further examination of indications, outcomes, and resource use is justified to drive evidence-based protocols.

Consequences of Anastomotic Leaks after Minimally Invasive Esophagectomy: A Single-Center Experience

Grigor S. Simitian; David J. Hall; Glen Leverson; Entela Lushaj; Erik E. Lewis; Kelsey A. Musgrove; Daniel P. McCarthy; James D. Maloney

Introduction: Anastomotic leak (AL) after minimally invasive esophagectomy (MIE) is a well-described source of morbidity for patients undergoing surgical treatment of esophageal neoplasm. With improved early recognition and endoscopic management techniques, the long-term impact remains unclear.

Methods: A retrospective review was conducted of patients who underwent MIE for esophageal neoplasm between January 2015 and June 2021 at a single institution. Cohorts were stratified by development of AL and subsequent management. Baseline demographics, perioperative data, and post-operative outcomes were examined.

Results: During this period, 172 MIEs were performed, with 35 of 172 (20.3%) complicated by an AL. Perioperative factors independently associated with AL were post-operative blood transfusion (leak rate 52.9% vs. 16.8%; p=0.0017), incompleteness of anastomotic rings (75.0% vs. 19.1%; p=0.027), and receiving neoadjuvant therapy (18.5% vs. 30.8%; p<0.0001). Inferior short-term outcomes associated with AL included number of esophageal dilations in the first post-operative year (1.40 vs. 0.46, p=0.0397), discharge disposition to a location other than home (22.9% vs. 8.8%, p=0.012), length of hospital stay (17.7d vs. 9.6d; p=0.002), and time until jejunostomy tube removal (134d vs. 79d; p=0.0023). There was no significant difference in overall survival between patients with or without an AL at 1 year (79% vs. 83%) or 5 years (50% vs. 47%) (overall log rank p=0.758).

Conclusions: In this large single-center series of MIEs, AL was associated with inferior short-term outcomes including hospital length of stay, discharge disposition other than to home, and need for additional endoscopic procedures, without an accompanying impact on 1-year or 5-year survival.

Initial Efforts to Establish a Surgical Remote Telepresence Mentoring Program in Kigali, Rwanda

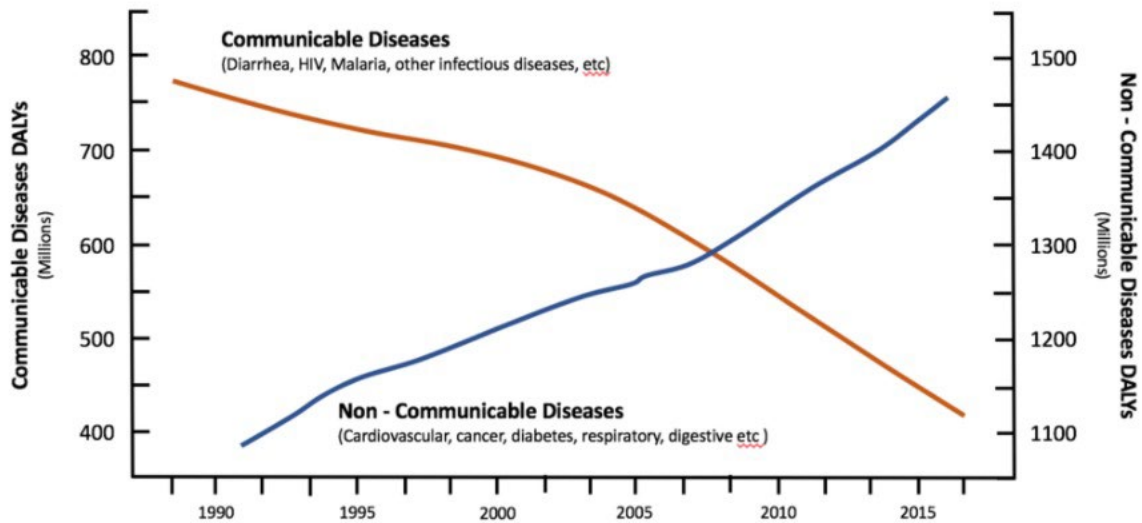**Y. Ejigu; Maurice Musoni; S. Adera; D. Wood; G. Maloney; James Maloney; Girma Tefera**

Background: The causation of disease around the globe is changing, most profoundly in developing nations. As the volume and complexity of surgical needs increase, the global surgical community must develop strategies to support surgeons, hospitals, and programs as they take on new challenges. Mentorship is the foundation of surgical practice, from surgeon to trainee or senior to junior Consultant. We describe our initial efforts to establish a remote telepresence mentoring at King Faisal Hospital in Kigali, Rwanda.

Methodology: Rods and Cones Visor OR-V-MIS kit was used for digital remote telepresence mentoring (Rods and Cones LLC, USA) supplied by funding from the University of Wisconsin School of Medicine and Public Health. The System provides direct live communication with a remote expert, surgeon's view of the operation, and other video input as determined by the surgeon and remote expert. Remote expert sessions were first conducted with a VATS Simulation model, then transitioned to operating theatre to demonstrate feasibility.

Results: The system was successfully used in simulation and live OR sessions in different areas of the hospital. Direct surgeon view, remote expert controlled live camera feed, and direct MIS tower input were achieved and transmitted to a remote expert. There was some difficulty in establishing and maintaining internet connectivity, which was overcome by boosting the Wi-Fi signal as internet upload/download requirements are 24 and 7 Mbps, respectively.
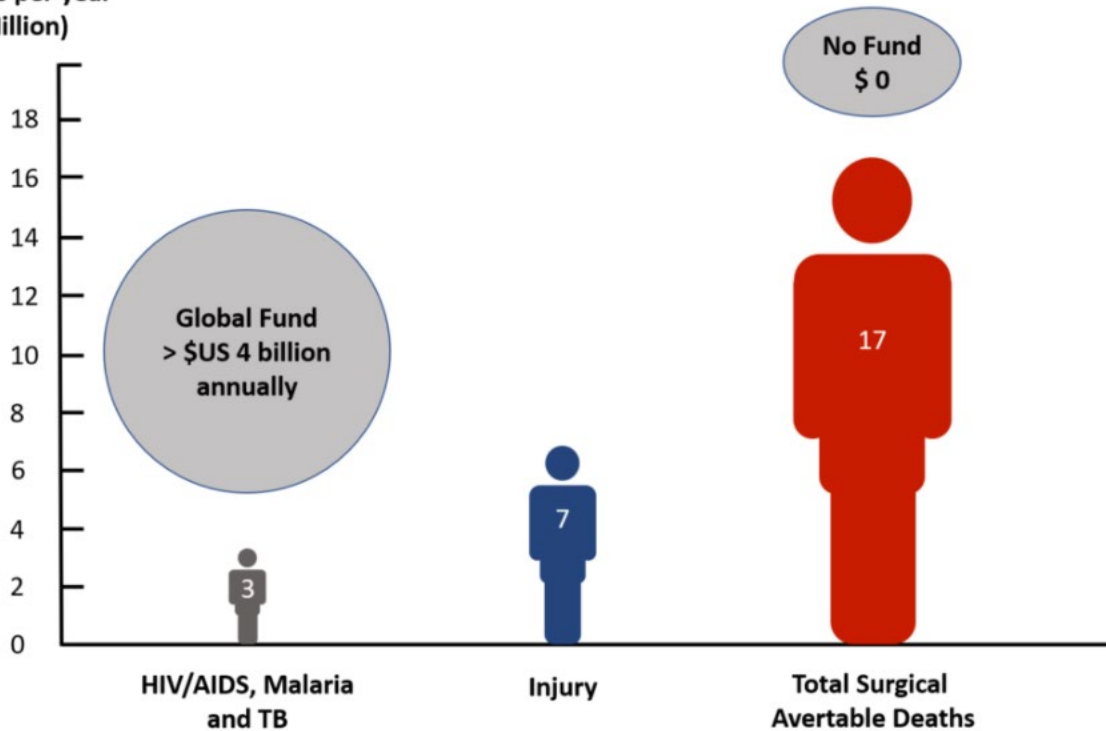
Conclusion: Remote mentoring has the potential to enhance surgical care by providing teams the support they need when developing or advancing surgical programs. A portable system has intrinsic advantages over systems embedded in a specific OR room, which limits use to specific sites, and cost. We successfully connected to a remote expert from multiple sites in King Faisal Hospital. This technology requires satisfactory Wi-Fi and internet access to be effective. Institutional support of the program, especially from IT and digital officers, is required for success.

Changes in Global Burden of Disease
(Disability Adjusted Life Years)

Communicable Diseases
(Diarrhea, HIV, Malaria, other infectious diseases, etc)

Non - Communicable Diseases
(Cardiovascular, cancer, diabetes, respiratory, digestive etc)

Communicable Diseases DALYs (Millions): 800, 700, 600, 500, 400

Non - Communicable Diseases DALYs (Millions): 1500, 1400, 1300, 1200, 1100

1990, 1995, 2000, 2005, 2010, 2015

Source: IHME Global Burden of Disease

Deaths per year (Million)

18, 16, 14, 12, 10, 8, 6, 4, 2, 0

Global Fund > $US 4 billion annually

3 — HIV/AIDS, Malaria and TB

7 — Injury

17 — Total Surgical Avertable Deaths

No Fund $ 0

Body Mass Index does not Impact Long-term Survival of Patients with Idiopathic Pulmonary Fibrosis Undergoing Lung Transplantation

Entela B. Lushaj; Malcolm DeCamp; James Maloney; Glen Leverson; Nilto De Oliveira; Daniel McCarthy

Objective: We investigated the impact of body mass index (BMI) on post-operative outcomes and survival of patients with interstitial pulmonary fibrosis (IPF) undergoing lung transplantation.

Methods: We retrospectively reviewed 222 patients with IPF that underwent lung transplant (LT) at our institution from 2005-2019. Recipients were divided in four groups: group-1 consisted of underweight patients (BMI≤18.5kg/m^2), group-2 of normal weight patients (BMI 18.5-25kg/m^2), group-3 of over-weight patients (BMI 25-29.9kg/m^2), and group-4 of obese patients (BMI ≥30kg/m^2).

Results: Group-1 consisted of 13 (6%) patients, group-2 of 67 (30%) patients, group-3 of 79 (36%) patients, and group-4 of 63 (28%) patients. Median BMI for group-1 was 17 (interquartile range [IQR]: 17, 18), for group-2 was 23 (22, 24), for group-3 was 29 (28, 29.5), and group-4 was 32 (31, 33). Patients in group-1 were significantly younger (p<0.01). Single LT comprised the majority of operation type in group-2 to group-4 and it was significantly higher than group-1 (p<0.01). Median follow-up time was 39 months (13-76). A total of 79 (35.5%) patients died by the end of study. Overall, five deaths occurred in group-1, 17 in group-2, 33 in group-3, and 24 in group-4. Mortality was not statistically significant between the groups (p=0.24). BMI did not impact patient survival even when considered as a continuous variable (p=0.59; HR: 0.97, CI [0.89-1.06]). Overall reasons for death included graft failure (24%), infection (23%), respiratory failure (14%), and malignancy (13%).

Conclusions: BMI does not impact long-term survival of patients with IPF undergoing lung transplantation.
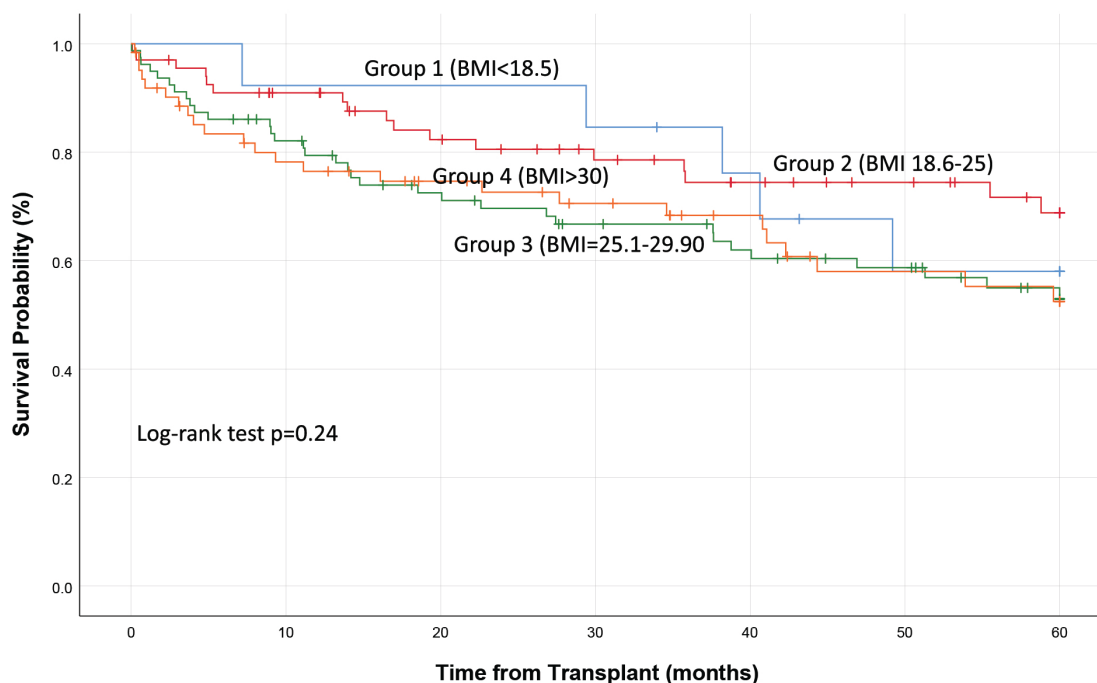
Predictors of Hand Therapy Non-Compliance Following Flexor Tendon Repair: A Retrospective Cohort Study

Armin Edalatpour; Matthew T. McLaughlin; Allison J. Seitz; Steven P. Moura; Brett F. Michelotti

Introduction: Following surgical repair of injuries to the flexor tendons, hand therapist-directed early mobilization of the affected digits promotes faster tendon healing, improves post-recovery range of motion, and helps prevent secondary tendon ruptures. Despite the demonstrated importance, many patients are non-compliant with postoperative hand therapy protocols, and the patient factors that predict compliance are unknown. This study aims to assess the factors that influence patient adherence to hand therapy following flexor tendon repair surgery.

Materials and Methods: In this retrospective cohort study, we reviewed electronic health records of consecutive patients (N=153) over a 5-year period who underwent acute flexor tendon repair surgery at a tertiary care medical center. Patients were stratified by insurance coverage (No Insurance, Medicaid, Medicare, Private, or Workmen's Compensation) and other demographic variables. Outcomes included no-shows to occupational therapy (OT) appointments, duration of OT follow-up, and postoperative emergency department visits.

Results: Patient factors significantly associated with no-shows to OT appointments were having no insurance (p=0.026) or Medicaid coverage (p=0.001), Black or African American race (p=0.014), and current tobacco use (p=0.047). Uninsured patients attended 73.84% of their OT visits and those with Medicaid attended 71.95% of their OT visits, which were significantly lower attendance rates than those of patients with private insurance 90.73% (p=0.026 and p=0.001, respectively). Patients with Medicaid were 8 times more likely to no-show to an OT visit or to have a postoperative emergency department visit than patients with private insurance (p=0.001 and p=0.002, respectively). Patients with no insurance or Medicaid averaged 3.67 and 8.86 total OT visits, respectively, which was significantly less than patients with workmen's compensation coverage, who averaged 22.79 visits (p<0.001 and p=0.007, respectively).

Conclusions: We identified statistically significant disparities in attendance to hand therapy appointments following flexor tendon repair surgery. This observed non-compliance to OT may lead to worse surgical outcomes and patient morbidity. These data can assist hospitals, providers, and social workers identify at-risk patients and aid in the development of strategies to increase OT utilization.

A 4-arm Randomized Trial of Topical Pain Control for Breast Cancer Sentinel Node Radiotracer Injections

Alyssa A. Wiener; Jessica R. Schumacher; Scott B. Perlman; Lee G. Wilke; Meeghan A. Lautner; Laura M. Bozzuto; Bret M. Hanlon; Heather B. Neuman

Introduction: To identify sentinel nodes for breast cancer staging, a radioactive tracer is injected into the breast prior to surgery. This injection can be painful. The optimal method to mitigate this pain is unknown. In this randomized trial, we compared four approaches to topical pain control for breast radiotracer injections.

Methods: From April 9, 2021-May 8, 2022, 167 breast cancer patients scheduled to undergo technetium99 sulfur colloid injection for sentinel node mapping were consented and randomized to receive the institutional standard of ice on the breast prior to injection (n=44) or one of three treatments: ice plus a vibrating distraction device (Buzzy®) (n=39), 4% lidocaine patch (n=44), or 4% lidocaine patch plus ice plus Buzzy® (n=40). Patients completed a survey immediately following injection, including the Wong-Baker FACES® pain score (primary outcome) and a satisfaction with pain control received scale (secondary). Nuclear medicine technologists (n=8) also completed a survey immediately following each injection rating their perception of patient pain and ease of administration. At study conclusion, technologists completed a final survey rank-ordering ease of use and perceived pain control for each treatment. Data was analyzed as intention-to-treat. Wilcoxon rank-sum tests were used to compare post-injection pain scores of the control arm versus pooled treatment arms (primary) and then control arm to each treatment arm individually (secondary). A similar approach was taken for the secondary outcomes. (ClinicalTrials.gov NCT04822597).

Results: Median age for the 160/167 evaluable patients was 61 years (range 33-87). There were no differences in patient-reported pain scores in the control and treatment groups, both pooled and individually (Figure 1). 85% of patients were "satisfied/very satisfied" with treatment received, with no differences between groups. No differences in providers' perceptions of patients' pain were observed on immediate post-injection survey. However, providers reported that treatments involving Buzzy® were more difficult to administer (p<0.001). At study conclusion, 7/8 providers identified the lidocaine patch as the easiest to use, with ice being second. The majority of providers (5/8) also felt that lidocaine patch provided the least pain control, with no providers rating it as best.

Conclusions: In this randomized trial, no differences in patient or provider reported pain for the standard of ice compared with other topical treatments was observed. While patients were generally satisfied with the pain treatment they received, providers found treatments using Buzzy® more difficult to administer. Ice is a reasonable standard treatment given reported patient satisfaction and ease of administration.

Figure. Wong-Baker FACES[®] pain score distributions of ice versus pooled intervention arms (left) and ice versus individual intervention arms (right). P-values from Wilcoxon rank sum testing are reported.
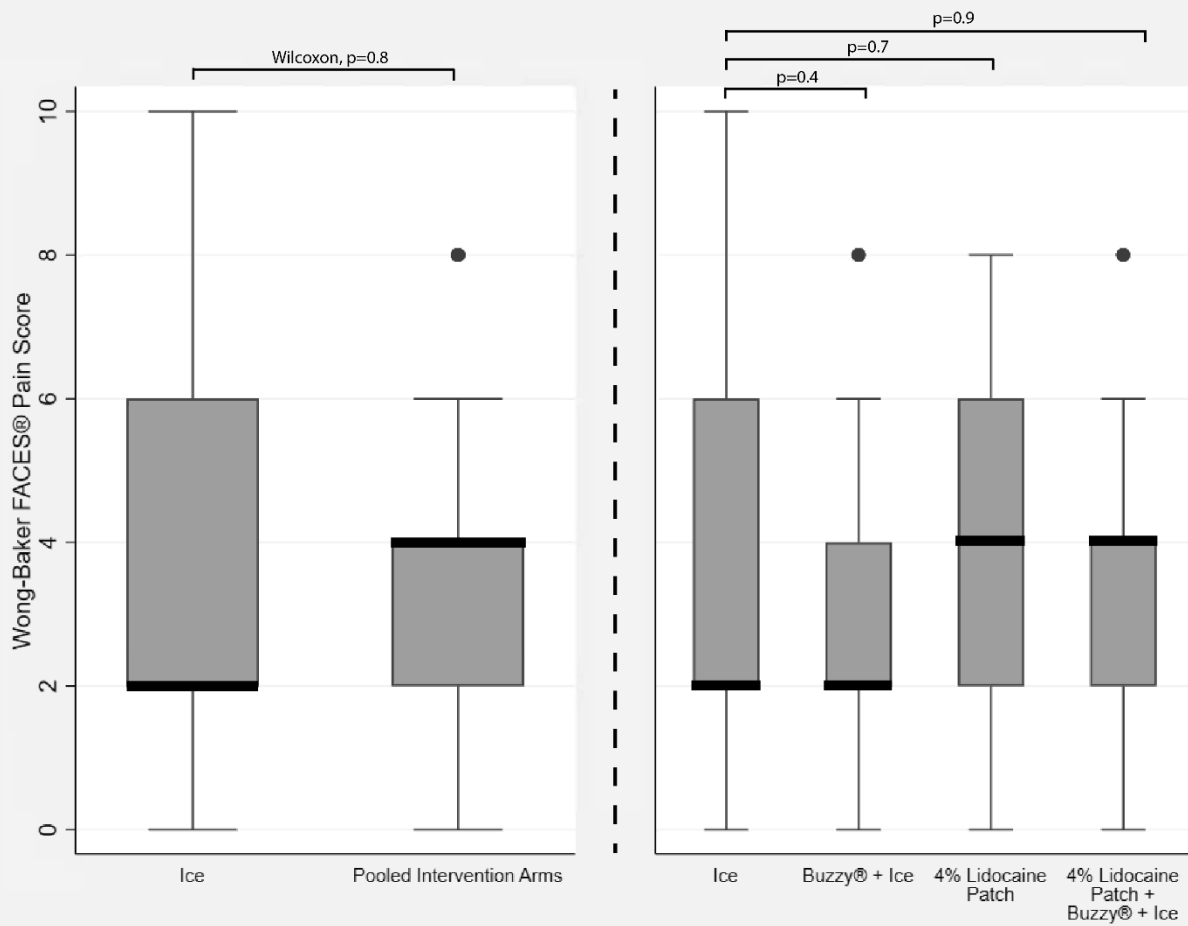
Note: Medians are indicated in bold. Interquartile ranges are indicated by solid rectangles. Whiskers represent one and a half the interquartile range. Dots represent outside values.

Re-examining Time from Breast Cancer Diagnosis to Primary Surgery

Alyssa A. Wiener; Bret Hanlon; Jessica R. Schumacher; Kara A. Vande Walle; Lee G. Wilke; Heather B. Neuman

Introduction: Although longer times from breast cancer diagnosis to primary surgery have been associated with worse survival outcomes, the specific time point after which it is disadvantageous to have surgery is unknown. Understanding this timeframe is critical because breast cancer requires highly individualized multidisciplinary care, and some patients benefit from extensive pre-operative workup and consultation that can result in longer times to surgery. Identifying an acceptable time to surgery would help inform patients, providers, and the healthcare system. Our objective was to examine the association between time from diagnosis to surgery (weeks) and overall survival and to describe factors associated with surgical delay. We tested the hypothesis that there was an association between time-to-surgery and overall survival.

Methods: We conducted an observational cohort study using the National Cancer Database (NCDB) from 2010-2014 (5-year follow-up to 2019). We studied adult (≥ 18 years) females with stage I-III ductal or lobular breast cancer who underwent surgery as the first course of treatment. Patients with prior breast cancer, missing receptor information, neoadjuvant or experimental therapy, or who were diagnosed with breast cancer on the date of their primary surgery were excluded. The primary outcome measure was overall survival. Multivariable Cox regression was used to evaluate factors associated with overall survival. Patients were censored at death or last follow up. Covariates included age and tumor characteristics. We also performed multinomial regression to identify factors associated with longer time-to-surgery, using surgery ≤30 days from diagnosis as the reference group.

Results: The final cohort included 373,334 patients with a median age of 61 (interquartile range 51-70). On multivariable Cox regression analysis, time-to-surgery greater than 8 weeks (57 days or greater) was associated with worse overall survival (hazard ratio 1.15, 95% confidence interval 1.08-1.23, p<0.001) compared to surgery between 0-4 weeks (1-28 days). Multinomial regression demonstrated that younger age and sociodemographic factors, such as uninsured/Medicaid status and lower neighborhood household income, were associated with longer times-to-surgery.

Conclusions: Our findings support using 8 weeks or less as a quality metric for time-to-surgery. Time-to-surgery of greater than 8 weeks may partly be related to disadvantageous social determinants of health.

Barriers and Facilitators to the Implementation of a Web-Based Decision Aid in Surgery Clinics (Alliance A231701CD)

Jennifer L. Tucholka; Jessica R. Schumacher; Patricia McNamara; Angelina Tan; David Zahrieh; Selina Chow; Catherine R. Breuer; Grace McKinney; Heather B. Neuman

Introduction: Although substantial evidence supports the effectiveness of decision aids to support decisions for breast cancer surgery, few patients ever receive one due to barriers to implementation. As part of a multisite trial, we implemented a web-based decision aid in ten surgery clinics. The objective of this study is to describe barriers and facilitators to implementation.

Methods: The multisite trial is occurring in ten clinics participating in the NCI Community Oncology Research Program within the Alliance for Clinical Trials in Oncology Research Base (first enrollment June 5, 2019). Site visits were conducted to support decision aid implementation. Two researchers recorded field notes regarding observed barriers and facilitators, and categorized these into the Consolidated Framework for Implementation Research (CFIR) constructs. The researchers independently rated each construct based on importance to implementation (barriers rated as -2, -1, 0; facilitators rated as 0, +1, +2). The NCI Central IRB approved this study. (ClinicalTrials.gov NCT03766009e).

Results: The ten clinics are geographically dispersed across the United States. Sites annually care for a median 252 new breast cancer patients, a median 37% of whom have private insurance and 9% Medicaid. Clinics include a median 11 (range 2-32) clinical staff. Barriers were observed in 26/39 and facilitators in 35/39 CFIR constructs. Barrier constructs reported by the majority of clinics included: 1) perceived "relative advantage" of the web-based decision aid, 2) whether it met "patients' needs", and 3) "compatibility" of the approach within clinic workflow (Table). The most important facilitators were perceived to be "opinion leaders" within the clinic and having a dedicated surgeon "champion". Other notable facilitators included 1) "belief" that implementing the decision aid was beneficial, 2) perceived "low complexity" of implementation with "adaptability", 3) robust "communication" within clinical teams, and 4) strong "self-efficacy" that they would be able to implement this.

Conclusion: In this multisite trial, local champions and opinion leaders were perceived to be the most important factors influencing implementation. Working with local champions to communicate potential benefits of decision aid and engaging opinion leaders to plan needed adaptations to implementation within their clinical setting are critical to overcoming implementation barriers.

Table: Barriers and Facilitators Observed in the Majority of Clinics		
	Perceived importance of barrier	Perceived importance of facilitator
Intervention characteristics		
Relative Advantage	-2	+1
Adaptability	0	+1
Complexity		+1
Outer Setting		
Patient needs and resources	-1	+1
Inner Setting		
Network and communications		+1
Implementation climate		+1
Compatibility	-2	+1
Structural characteristics	-1	
Leadership engagement		+1
Characteristics of individuals		
Knowledge and beliefs about interventions		+1
Self-efficacy		+1
Process		
Planning		+1
Engaging		+1
Opinion leaders		+2
Champions		+2
External change agents		+1
Reflecting and evaluating		+1

Receipt of Preventive Care and Health Promotion Counseling in Early Stage Breast Cancer Survivors

Laura K. Krecko; Jessica R. Schumacher; James E. Haine; Amye J. Tevaarwerk; Kristine L. Kwekkeboom; Trista J. Stankowski-Drengler; Catherine R. Breuer; Jennifer L. Tucholka; Courtney Maxcy; Heather B. Neuman

Introduction: Despite the known importance of comprehensive cancer survivorship care, studies suggest breast cancer survivors are less likely to receive preventive care (e.g., vaccinations and screening tests) than non-cancer patients. It remains unclear to what extent breast cancer survivors receive health promotion guidance from their providers such as counseling on nutrition and physical activity, which is critical to maintaining a healthy lifestyle. We sought to determine the extent of receipt of preventive care and health promotion in a modern cohort of early-stage breast cancer survivors within a single breast program.

Methods: We enrolled patients with stage I-II ER+ or PR+, HER2/neu- breast cancer diagnosed within the past five years from a single program (January-March 2020). Receipt of preventive care was assessed via electronic health record abstraction. Perceived receipt of health promotion counseling was evaluated via survey.

Results: Our final cohort (n=94) was mostly white females (95%) with stage I disease (73%) who were a mean of 2.5 years from diagnosis (SD=1.3). Of 58 survivors with a primary care provider within the participating health system, the majority received preventive care services such as colorectal cancer screening (76%), pneumococcal (92%) and flu (76%) vaccinations, and mammograms (100%). Many survivors in the overall cohort did not perceive recent discussions with their healthcare providers about specific health promotion topics such as: "How much or what kind of exercise you get" (41%) and "How much or what kinds of food you eat" (18%).

Conclusions: In this cohort of early-stage breast cancer survivors, documented receipt of preventive care was high (>75%). However, survivors perceived limited discussions with providers about specific health promotion topics. Our findings support the need to measure, standardize, and incentivize health promotion for breast cancer survivors to improve survivor longevity and quality of life.

Risk Modeling of Errors in the Surgical Instrument Cycle, Insights to Solutions for an Expensive and Persistent Problem

Peter Nichol; Mark Saari

Introduction: We have previously observed that surgical instrument errors occur with a frequency of 1.65 to 2.72 errors/OR/elective day of surgery resulting in somewhere between 39,000 to 66,000 minutes of lost OR time and $6-10 million in lost capacities per year within American Family Children's Hospital and University Hospital. Furthermore, 95% of observable errors relate to failed visualization or identification. To better understand where the process of sterilizing instruments breaks down and the points of greatest risks for error, we mapped the instrument workflow cycle (instrument leaves a surgeon's hand, is reprocessed, and returned to the surgeon).

Methods: Observations were conducted in the following spaces: OR, sterile processing dirty side, sterile processing clean side, sterilization, and storage. The total number of steps for simple (non-laparoscopic/non-endoscopic) instruments were identified, recorded, and totaled. The stress level of each space was determined by assessing each of the following parameters in that space: physical (temperature/noise/light/humidity), organizational (layout), workforce health (full FTE complement), employee experience (percent fully trained), and circumstantial (time pressures). Each parameter was scored from 0 to 1 and a total score greater than 2.0 for any space was considered high stress. Each step was assigned a risk of error score (RES) based on Smith's textbook *Reliability, Maintainability and Risk* (7th ed.) for human errors: simplest possible (RES 0.0001-0.0005), routine simple (RES 0.001-0.005), routine with care (RES 0.01-0.06), and complicated non-routine (RES 0.1-0.25). Tasks in low stress spaces were assigned the lowest possible RES and those in high stress environments were assigned the highest RES. The total RES for a simple instrument was then calculated by adding up the RES of each step.

Results: A total of 140 hours was spent in all spaces mapping the workflow of the instrument cycle. There were 105 steps in the simple instrument cycle, and each of these steps was performed by a human. Of these, 66 occurred in sterile processing. The stress score of the OR and storage was 0.4. The stress score of sterile processing was 3.3. The total aggregate RES was 5.2 errors per instrument. The majority (4.9) occurred in sterile processing. All complex steps (7) involved visualization or inspection and occurred in sterile processing. The aggregate RES for these steps was 1.75.

Conclusions: Risk modeling indicates that the steps with the highest risk for error in the reprocessing of surgical instruments involve visualization. This corresponds with our previous observational studies of surgical instrument errors in which 95% of errors involve failures in visualization/inspection/identification. The highest risk environment for errors is sterile processing, which also has the highest stress score. Based on this modeling and our previous work, solutions or technologies that minimize visualization errors by humans (e.g., advanced cameras paired with AI identification) would significantly reduce the risk of instrument errors in the OR. Furthermore, optimization of the SPD environment to eliminate stress would further reduce the risk for surgical instrument errors in the OR.

Management of Symptomatic Neuromas: A Narrative Review of the Most Common Surgical Treatment Modalities in Amputees

Sahand C. Eftekari; Peter J. Nicksic; Allison J. Seitz; D'Andrea T. Donnelly; Aaron M. Dingle; Samuel O. Poore

Introduction: Symptomatic neuromas are an all-too-common complication following limb amputation or extremity trauma, leading to chronic and debilitating pain for patients. Surgical resection of symptomatic neuromas has proven to be the superior method of intervention, but traditional methods of neuroma resection do not address the underlying pathophysiology leading to the formation of a future symptomatic neuroma and lead to high reoperation rates. Novel approaches employ the physiology of peripheral nerve injury to harness the regeneration of nerves to their advantage.

Methods: This review explores the underlying pathophysiology of neuroma formation and centralization of pain signaling. It compares the traditional surgical approach for symptomatic neuroma resection and describes three novel surgical strategies that harness this pathophysiology of neuroma formation to their advantage.

Results: The traditional resection of symptomatic neuromas is currently the standard of care for amputation patients, but new techniques including the regenerative peripheral nerve interface, targeted muscle reinnervation, and intraosseous transposition have shown promise in improving patient pain outcomes for postamputation pain and residual limb pain.

Conclusions: Symptomatic neuromas are a chronic and debilitating complication following amputation procedures and trauma, and the current standard of care does not address the underlying pathophysiology leading to the formation of the neuroma. New techniques are under development that may provide improved patient pain outcomes and a higher level of care for symptomatic neuroma resection.

Assessment of Racial Disparities in Reconstructive Breast Surgery Receipt and Outcomes in Wisconsin

Zeeda H. Nkana; Kasey Leigh Wood; Kirsten A. Gunderson; Rachel Weber; Erin L. Doren; Aaron M. Dingle; Samuel O. Poore

Introduction: Post-mastectomy breast reconstruction remains a critical component of the management of breast cancer patients, prompting physical and psychological benefits. Despite these benefits, non-White patients are less likely to undergo breast reconstruction than their White counterparts. Racial disparities in access to care, insurance coverage, as well as physician- and patient-associated preferences and biases are often cited as explanations. However, little is known about the impact these factors have on the receipt and outcomes of reconstructive breast surgery. Thus, this study aims to evaluate the presence of racial disparities and impact of systemic racism on receipt and postoperative outcomes of breast reconstruction in Wisconsin.

Methods: An IRB-exempt retrospective study was performed using the University of Wisconsin Hospitals and Clinics and the Medical College of Wisconsin National Surgical Quality Improvement Program Registries to identify patients who underwent reconstructive breast surgery following mastectomy from July 2009 to June 2022. Demographics and perioperative covariates were recorded. Patients who underwent mastectomy without reconstruction, were of unknown or unreported race, or non-female were excluded. Statistical analyses were performed to evaluate the receipt of reconstruction and postoperative complications in relation to self-reported race.

Results: Preliminarily, a total of 1,933 patients met the inclusion criteria, comprised of 1,845 White patients and 88 non-White patients. Non-White patients demonstrated a higher incidence of bleeding disorders (0.4% White vs. 2.3% non-White, p=0.019) as well as differences in insurance status (p<0.001), with an increased proportion of non-White patients with public health insurance (8.0% White vs. 20.5% non-White) compared to private insurance (42.3% White vs. 37.5% non-White).

Conclusions: The present study compares receipt and postoperative complications of White versus non-White patients undergoing reconstructive breast surgery in Wisconsin. Evaluation of the influence of self-reported race, demographic variables, and associated risk factors on complication rates will aid the elucidation of racial disparities and the impacts of systemic racism on breast reconstruction patients in Wisconsin.

Understanding Prosthetic Embodiment and Assessing its Value to Amputee Patients

Sahand C. Eftekari; Lucas Sears; Steven Moura; Sydney Garelick; Ellen C. Shaffrey; Samuel O. Poore

Introduction: The term embodiment within the world of prosthetics has been used to describe the efficacy and acceptance of a prosthesis to replace a user's missing limb. Current prosthesis research has no consensus on the exact definition of embodiment, with various studies defining it vaguely or only implicitly referring to this concept. This study aims to review the current literature focused on prosthetic embodiment and provides an up-to-date account of how embodiment is currently analyzed. Moreover, it provides an understanding of the two fundamental mechanisms that drive embodiment and the deeper domains that influence these two mechanisms.

Methods: We utilized the PubMed database to search for ways embodiment is quantified and analyzed in amputee patients within the current literature. Initial search terms included: "embodiment AND prosthesis" and "embodiment AND prosthetic," which yielded 242 articles. All articles were obtained and compiled into an Excel spreadsheet for abstracts to be reviewed. Inclusion criteria were articles with a focus on embodiment that attempted to quantify the concept in any capacity. Only articles in English were considered. Prosthetic inclusion criteria was restricted to upper or lower limb prostheses in limb amputation patients of any cause. Sixty-seven articles met inclusion criteria and were read in full to be used for analysis. Each article was then categorized into one of four domains of embodiment, with the majority of articles falling into multiple domains.

Results: Embodiment describes the degree of perception, action, and self-awareness a user develops with their prosthesis and is a central theme in prosthesis research. Ownership and agency are the two mechanisms that drive embodiment, each of which are influenced by four deeper domains of embodiment: sensory, motor, postural, and psychosocial domains.

Conclusions: Embodiment is a central theme to prosthetics research and describes the efficacy and acceptance of a prosthesis to replace a user's limb. However, there is no consensus on the exact definition of this term. Current literature indicates that embodiment is dictated by two mechanisms, ownership and agency, which are influenced by four underlying domains of embodiment.

From Tip of Brush to Tip of Knife: Aesthetics of Post-Mastectomy Breast Reconstruction and the Fine Arts

Kasey Leigh Wood; Zeeda H. Nkana; Allison J. Seitz; Armin Edalatpor; Ashish Y. Mahajan; Samuel O. Poore

Background: Breast surgery and post-mastectomy breast reconstruction are highly complicated operations, requiring simultaneous navigation of not only clinical and operative realities, but of patient expectations as well. The authors sought to identify historical art pieces that exhibit breast asymmetries and deformities for comparison with photos of breast reconstruction patients seen at the clinic of the senior author to demonstrate that achievement of perfect breast cosmesis is challenging in both breast reconstruction as well as in the fine arts.

Methods: Open access libraries and Creative Commons images were reviewed to identify historical works of art depicting breast asymmetries and deformities. Special attention placed on collecting non-satirical, non-comical works of art from various time periods and geographic locations. Following artwork selection, photos of breast reconstruction patients seen at the senior author's clinic were reviewed and paired with selected artworks exhibiting cosmetically similar breasts.

Results: A total of 12 pieces of selected historic art were found to have at least one matching patient photo, with 15 correlative patient photos ultimately identified. The works of art originated from nine different countries, dating from circa 38,000 BCE to 1932 CE. Common breast asymmetries and deformities identified included ptosis, asymmetric chest wall placement, asymmetric nipple placement, and absence of the nipple.

Conclusion: The present review identified historical pieces of art of varying styles spanning vast expanses of both geography and time. That these diverse artworks exhibit breast deformities and asymmetries commonly encountered in contemporary breast reconstruction underscores that creating the cosmetically ideal breast is a difficult task both in the operating room and the art studio. Importantly, the authors emphasize that the arts frequently celebrate that which is considered beautiful, but to the trained eye of a plastic surgeon that which is considered beautiful is often classified as dysmorphic or asymmetric.
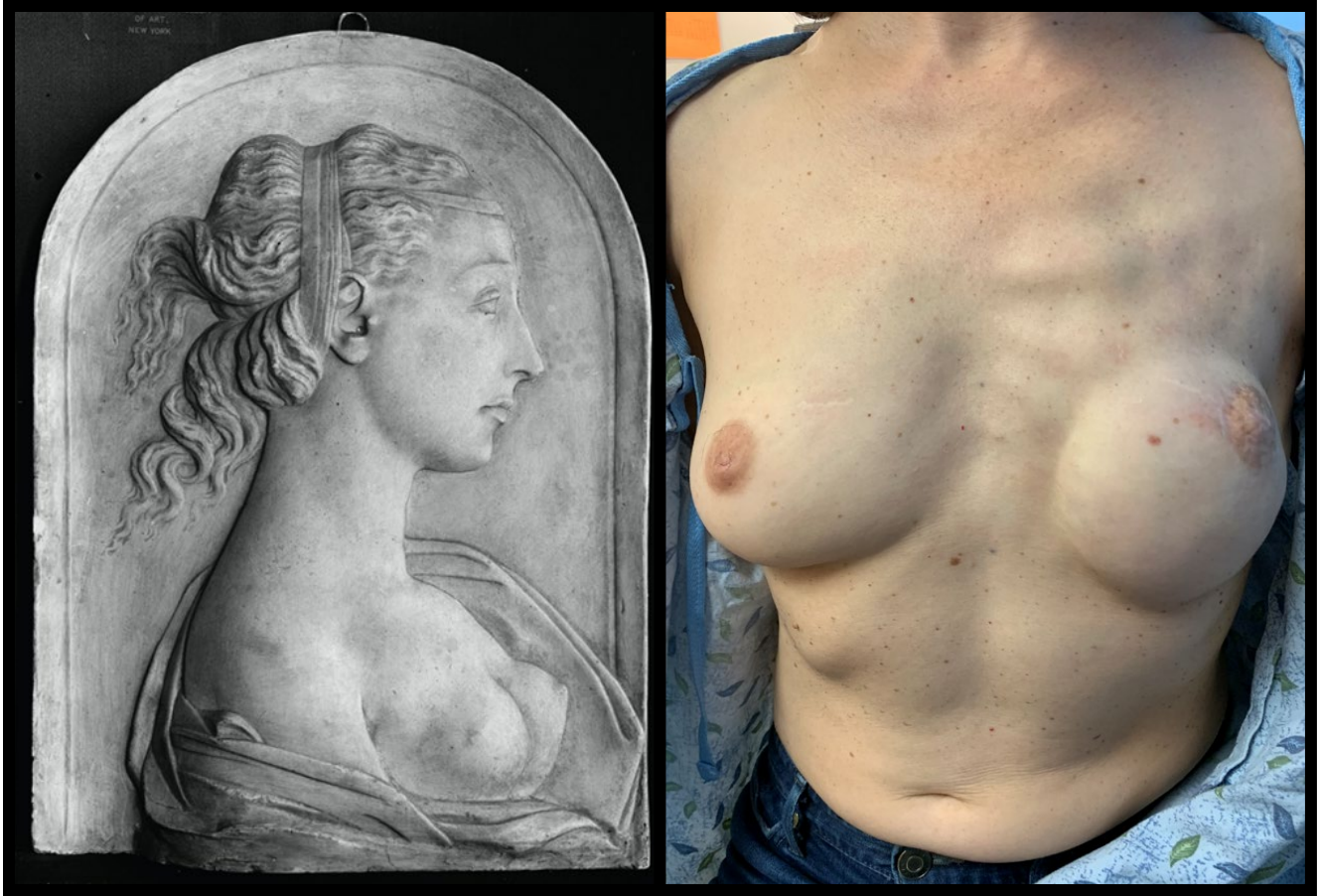
Figure 1. *Portrait of a girl*, marble, 45.7 x 34.3 cm, 15th century, Italy, The Met (open access). The subject of this piece exhibits dramatic pseudo-ptosis of the left breast and lateral displacement of the right nipple. The corresponding patient image shows a breast reconstruction patient desiring revision due to concern for her asymmetry.

Surgical Management of Adult Acquired Buried Penis Syndrome: A Systematic Review of Postoperative Outcomes

Armin Edalatpour; Allison J. Seitz; Jacqueline S. Israel; Samuel O. Poore

Introduction: Adult acquired buried penis syndrome (AABP) is a chronic and disabling condition that often necessitates surgical intervention. Postoperative outcomes following surgical repair of AABP have been highly variable within the literature. The primary aim of this study was to perform a systematic review of outcomes following AABP repair, including postoperative symptoms, complications, and patient satisfaction.

Methods: Standard PRISMA guidelines were utilized to perform this systematic review. The Medline database was queried for "buried penis" from 1954-2021. Studies discussing the surgical management of AABP and postoperative outcomes in the English language were included. Non-full text articles, case reports, editorials, commentaries, and articles examining only patients with congenital buried penis etiologies were excluded. Outcomes of interest included patient demographics, intraoperative data, symptoms attributed to AABP, postoperative complications, and patient satisfaction.

Results: Nineteen unique articles met inclusion criteria. A total of 440 patients underwent surgical repair of AABP. Average duration of follow-up in the studies ranged from 6-39.4 months, while age ranged from 22.4-61.5 years and BMI ranged from 26.0-55.0kg/m2. The most common reported etiology of AABP was obesity (n=110). Nine studies (n=237) examined patient-reported symptoms. The most frequently cited presenting symptoms were sexual dysfunction (n=159), with reported rates of 26-100%, and urinary difficulties (n=129), with rates of 40-80%. Other preoperative symptoms included unsatisfactory aesthetic appearance (n=3), recurrent infections (n=20), hygiene concerns (n=44), and pain (n=21). Following surgical management, 95 patients reported ongoing sexual dysfunction in the studies, with rates of 0-83%, while 12 patients had ongoing urinary difficulties, with rates of 0-19%. Rates of complications among the studies varied from 0-75%. Postoperative complications were reported in 144 (32.7%) patients. Of these, 17 (4.3%) required operative intervention. Reburying of the penis was reported in 16 (3.0%) patients. The majority of studies assessing patient satisfaction (6/8 studies) reported satisfaction rates above 75%. Nine articles reported improvement in patient-reported outcomes following the surgery, but the questionnaires utilized were highly variable among the studies.

Conclusion: Operative management of AABP is complex, but the rates of reoperation and reburying of the penis remain relatively low. Though sexual dysfunction may persist following surgical repair, many pre-existing symptoms associated with AABP improve following the operation. Nevertheless, postoperative complication rates following AABP surgery are highly variable in the literature. Furthermore, there is currently no validated patient-reported outcome measure for assessing patient satisfaction following the operation. These findings highlight the need for a standardized classification system to guide management of AABP through a multidisciplinary approach.

Surgical Management of Adult Acquired Buried Penis Syndrome: A Review of the Wisconsin Classification System and Postoperative Outcomes

Allison J. Seitz; Armin Edalatpour; Jacqueline S. Israel; Matthew D. Grimes; Daniel H. Williams; Samuel O. Poore

Background: Adult acquired buried penis syndrome (AABP) is a debilitating condition that can significantly impair a patient's quality of life. Our institution previously proposed the Wisconsin Classification System, which uses preoperative examination findings to categorize patients with AABP in order to guide the operative decision-making process. The purpose of this study is to evaluate the success of the Wisconsin Classification System in AABP. Additionally, we aim to examine patient and surgical factors that influence postoperative outcomes.

Methods: A retrospective chart review was performed on all patients who underwent surgical repair of AABP from 2015-2021 by the senior author (SOP) at the University of Wisconsin Hospitals and Clinics. Variables of interest included patient demographics, classification data, intraoperative data, and postoperative outcomes. Linear regression analyses were performed to determine which factors influenced postoperative outcomes.

Results: Fifty-two patients with an average age of 56.5 ± 14.8 years and an average BMI of 46.2 ± 11.9 kg/m^2 underwent AABP repair. Using the Wisconsin Classification System intraoperatively, 6 patients (11.5%) were classified as type 1 AABP, 13 patients (25.0%) had type 2 AABP, 30 patients (57.7%) had type 3 AABP, and 3 patients (5.8%) had type 4 AABP. Of these patients, 36 (67.0%) were classified in the preoperative visit. Preoperative classification was consistent with intraoperative findings in the majority of these patients (86.1%) and successfully guided the surgical approach. Overall, 26 patients (50.0%) developed postoperative complications. The most common complications were wound healing (n=11, 21.2%), infection (n=8, 15.4%), and penile reburying (n=8, 15.4%). Increased preoperative BMI (OR 1.09, 95% CI 1.03-1.16, p=0.01), severe obesity (OR 4.40 95% CI 1.56–26.23, p=0.01), and diabetes (OR 4.55, 95% CI 1.37-15.08, p=0.01) significantly increased the risk for developing postoperative complications. Conversely, prior circumcision reduced the risk for complications (OR 0.17, 95% CI 0.04–0.77, p=0.02). Fourteen patients (26.9%) reported persistent symptoms, the most common being ongoing urinary difficulties (n=11, 21.2%). The development of postoperative complications significantly predicted persistent symptoms following AABP repair (OR 3.90, 95% CI 1.07–14.16, p=0.03).

Conclusion: The Wisconsin Classification System allows for an individualized approach to categorizing patients with AABP and helps to guide the surgical decision-making process. High BMI and patient comorbidities may result in higher rates of postoperative complications. Further, these postoperative complications may lead to persistent symptoms following AABP repair.

Perinatal Airway Obstruction: A Quantitative Analysis of Fetal Goiter

Maya N. Matabele; Christie Cheng; Manasa Venkatesh; Inna Lobeck; Michael Puricelli

Introduction: Fetal goiter is a rare congenital disorder that can present with life-threatening neonatal airway obstruction. Lifesaving and function-preserving airway management strategies are available, but routine delivery presents a limited window for intervention. Accordingly, fetal goiter is among the most common indications for ex-utero intrapartum treatment (EXIT). While EXIT prolongs the window for airway intervention to benefit the neonate, it elevates the risk to the mother and requires extensive resources; therefore, data to guide ideal treatment selection are essential. The objective of this study is to compare the necessity and type of perinatal airway interventions between the general population and individuals with fetal goiter.

Methods: Birth hospitalizations among individuals with and without fetal goiter were identified in the Healthcare Cost and Utilization Project (HCUP) Kids' Inpatient Database from 2000 to 2016. The frequency of airway interventions on day of life 0 or 1 and complications were compared between the groups using the Rao-Scott chi-square test. Additionally, birthweight, length of stay, and charges were examined for the goiter cohort.

Results: One hundred sixty-six weighed cases of fetal goiter were identified in the study period. The population was 60% male, median birthweight 3.3 kg, median length of stay 3.4 days, and average total charges was $42,332. Airway intervention on neonatal day of life 0 or 1 was required in 15.1% of individuals with fetal goiter compared to 1.74% in neonates without fetal goiter (p<0.001). Required airway interventions were endotracheal intubation in 14.4% of cases and laryngoscopy/bronchoscopy in 4.23% of cases. No patients required a surgical airway, extracorporeal membrane oxygenation cannulation, or cardiopulmonary resuscitation. There were no cases of perinatal airway-attributable hypoxic encephalopathy. 83.02% of fetal goiter patients underwent routine discharge, while 9.63% underwent transfer to a short-term hospital. The remaining patients were transferred to a lower acuity care facility (4.27%) or home health care (3.08%).

Conclusion: Individuals with fetal goiter require significantly higher rates of perinatal airway intervention. However, endoscopic interventions alone were sufficient to avoid neurologic complications of airway obstruction. This data supports more precise risk-benefit assessment for pregnant individuals and selection of values-based treatment.

Medical Malpractice Lawsuits Involving Cosmetic Surgeries and Minimally Invasive Procedures Not Performed by Plastic Surgeons

Steven Moura; Ellen C. Shaffrey; Chloe Lam; Peter J. Wirth; Pradeep K. Attaluri; Venkat K. Rao

Introduction: The increasing patient demand for cosmetic surgeries and minimally invasive procedures has enabled physicians without aesthetic training accredited by the American Board of Medical Specialties to provide these services. This systematic review aims to determine the rate of out-of-scope practice in medical malpractice lawsuits involving cosmetic surgery or minimally invasive procedures not performed by plastic surgeons.

Methods: Our systematic review of the Westlaw legal database from 1979 to 2022 included 65 malpractice cases. Inclusion criteria were cosmetic surgeries or minimally invasive procedures in medical malpractice lawsuits not involving board-certified plastic surgeons. Out-of-scope was defined using the procedural competencies established by the American Council for Graduate Medical Education, the Commission on Dental Accreditation, and the Council of Podiatric Medical Education. Data on legal proceedings, provider credentials and board certification(s), surgical interventions, and outcomes were collected.

Results: The majority of malpractice cases involving cosmetic surgeries or minimally invasive procedures occurred when providers were practicing out of scope (N = 32, 56.14%). The verdict was ruled in favor of the plaintiff (patient) in 33.85% of cases. The specialties with the highest rates and frequencies of out-of-scope practice were Family/Internal Medicine and Obstetrics/Gynecology. The most common allegation was permanent injury or disfigurement (N = 21, 21.43%). Plastic surgeons provided expert testimony 43.14% of the time.

Conclusions: Our review of the Westlaw legal database demonstrates that non-plastic surgeon cosmetic malpractice cases are most likely to arise when providers practice out-of-scope.

Impact of a Probiotic Intervention on Oral Microbial Profiles in Older Patients with Dysphagia at Risk for Aspiration Pneumonia

Celia Deckelman; Ashley Kates; Jonah Dixon; Colleen Riley; Nasia Safdar; Susan Thibeault; Nicole Rogus-Pulia

Introduction: Dysphagia is a common issue among older adults, and those with dysphagia are at greater risk for poor oral health. The combination of impaired swallowing and altered oral microbial profiles increases risk for aspiration pneumonia. Probiotic interventions have been shown to be a simple, cost-effective intervention to increase oral microbial diversity with positive effects on oral health. The goal of this pilot study was to determine whether probiotic use can enhance diversity of the oral microbiota for older adults with dysphagia.

Methods: Nine patients with dysphagia were recruited from an academic medical center in Wisconsin into a 4-week longitudinal study in which they were prescribed a probiotic powder dissolved in liquid to swish and swallow daily. Stimulated and unstimulated saliva samples were collected at baseline, week 2, and week 4. DNA was extracted from samples and 16S rRNA sequencing was carried out on the Illumina MiSeq using 2x250 paired-end reads. A linear mixed effects model was constructed to assess differences in alpha microbial diversity across weeks. A relative abundance analysis was performed to determine which phyla were most abundant. For beta diversity, the Bray-Curtis Dissimilarity matrix was plotted using nonmetric multidimensional scaling.

Results: Six of the nine participants completed all three timepoints. All participants reported greater than 90% adherence to the intervention. Across all timepoints for both saliva types, firmicutes were the most dominant phyla, with Bacilli, Clostridia, and Actinobacter being the most dominant classes and Lactobacillales the most dominant order. Alpha diversity significantly increased over the four weeks in the unstimulated samples (Shannon diversity, p=0.01). For the stimulated saliva samples, alpha diversity increased over time but this change did not reach significance (p=0.56). Saliva collected under both conditions showed similar beta diversity with no significant differences by collection condition at each timepoint.

Conclusions: Results support feasibility of a probiotic intervention in older patients with dysphagia at risk for aspiration pneumonia and show that probiotic use increased oral microbial diversity over a 4-week trial in these patients. Future larger studies are warranted to assess the impact of probiotics on oral health and pneumonia risk in older patients with dysphagia.

Clinical Momentum Associated with Overtreatment at the End-of-Life

Sarah I Zaza; Kyle J Bushaw; Anne Buffington; Karlie Haug; Taylor Bradley; Elle L Kalbfell; Margaret L Schwarze

Introduction: In the final six months of life, older adults with serious illness often receive invasive treatments despite their own preferences to avoid burdensome interventions with limited efficacy. Although strategies to reduce such overtreatment have focused on shared decision-making between patients and physicians, surgeons have endorsed factors beyond their control that promote intervention and contribute to non-beneficial surgery. We call this phenomenon clinical momentum, a latent systemic property of clinical care with multiple components (Table). We sought to evaluate the empirical fit and optimize this theoretical model of clinical momentum by examining an event with clear guidelines against intervention: patients with advanced dementia who receive a feeding tube.

Methods: We screened three hospitals in the upper Midwest and identified patients 65 years and older with advanced dementia whose hospital stay included feeding tube placement. We performed semi-structured interviews with family members and clinicians, including physicians, nurses, speech-language pathologists, and dieticians. Five independent coders with varying backgrounds used NVivo software to code individually and then met to explore dissent and achieve consensus about coded items. We characterized system-level factors that arose during the course of care and their relationships to feeding tube placement. We used higher level, confirmatory analysis to interrogate how events confirmed or rejected the model of clinical momentum.

Results: We enrolled 4 patients and interviewed 26 clinicians and family members. We found the model accurately reflected respondents' reports. Elements of the model – including recognition-primed decision-making, "fix-it," and sunk costs – contributed to placement of a feeding tube, revealing this process is set in motion long before a conversation related to goals of care takes place. For example, the patient received placement of a nasogastric tube for medicines or other oral supplementation and the need for "a tube" was reinforced by identification of inadequate nutritional intake. Family members wanted the patient to leave the hospital, yet rigid post-acute care rules about tubes, nutrition, or end-of-life care pressed them to choose an "all-in" intervention pathway (Table).

Conclusions: Routine events that occur before a decision-making conversation about feeding tube placement make a non-interventional pathway difficult to pursue and likely contribute to guideline-discordant care for patients with advanced dementia. The model of clinical momentum expands our understanding of overtreatment at the end-of-life and may reveal opportunities to reduce other non-beneficial surgical interventions.

Table. How the components of Clinical Momentum (CM) contribute to guideline discordant feeding tube placement

Components of CM model	Description	Representative Quotes
Recognition-primed decision making *Reflexively treating new problems based on known patterns*	Placement of NGT to help with medication administration after a patient is made NPO	"[The NGT] was just automatically in there when he came back from surgery." (Family member) "Let's place a [DHT] and treat them for the acute stuff" (Dietician) "It's like standard care." (Neurologist)
"Fix-it" model *Correcting deviations from normal in isolation*	When standards of nutrition, such as measured caloric intake, are not met, clinicians and families are pushed to "fix-it" Placement of a G-tube is described as a simple procedure with a quick recovery and minimal complications	"A patient isn't eating, and so you want do something to help alleviate that quote, unquote problem." (Neurosurgeon) "[The team] talked to me…they said…it's like a colonoscopy. He won't be completely out…he still will be awake." (Family member) "It's really easy to put a tube in somebody, right? Like everyone has a stomach. You just put it in…tube is in. They're ready for discharge." (Interventional radiology PA)
Patterns of usual care *Routine practice; what is usually done*	Rigid post-acute care rules that promote meeting specific requirements for nutrition Applying the same standards of care to all patients	"Most nursing homes won't take a patient with an…NG tube...the nursing homes wanted PEG-tubes put in." (Nurse) "This person can't get into a nursing home without a PEG-tube, so let's put a PEG-tube in…it seemed like a very knee jerk reaction." (Nurse) "It's just like the natural progression that this is the next thing that's done for this patient to try to move them through the system and…get them out of the hospital." (Neurosurgeon)
Cascade effects *An inciting event triggering subsequent events automatically*	Multiple teams treating an isolated problem related to their expertise without considering alternative pathways	"The informed [consent] process…was totally based on the risk and the procedure itself…there was never any mention of why are we putting this tube in this person" (Nurse) "A lot of this was like an isolated feeding issue." (Palliative care physician)
Sunk costs effects *Continuing an activity due to irretrievable investment*	After a prolonged hospitalization that includes interventions, families feel pressure to continue an "all-in" life-prolonging pathway	"Either he would eat [by] himself…or he had to have a PEG. And the family was like, the wife was at her wit's end." (Palliative care physician) "He can't come home without a feeding tube unless it's comfort-focused care…[it was] just like placement driving decision-making." (Physician)

NGT = nasogastric tube
DHT = dobhoff tube
PEG tube = percutaneous endoscopic gastrostomy tube

Training Nephrologists to Use Best Case/Worst Case for Dialysis Decisions for a Multisite Randomized Clinical Trial with Older Adults with Kidney Failure

Karlie L. Haug; Amy Zelenski; Anne Buffington; Kyle J. Bushaw; Taylor Bradley; Lily Stalter; Toby C. Campbell; Margaret L. Schwarze

Introduction: We adapted the Best Case/Worst Case (BC/WC) tool to fit outpatient clinic conversations between nephrologists and older adults. This new tool uses scenario planning and a graphic aid for dialysis decisions. Our research question is, "Can we train nephrologists to use BC/WC?"

Methods: As part of a multisite randomized clinical trial, we randomized nephrologists at 10 study sites to intervention or control. We trained nephrologists in the intervention group with a 2-hour one-on-one session including two simulated patient encounters. We used a competency checklist upon completion, and required 14/19 elements for competency. We collected the BC/WC graphic aid used with study-enrolled patients to evaluate performance of the intervention in vivo. We measured performance, scored by two raters, using a separate rubric scaled from "Not Done" to "Exceptional."

Results: We enrolled 62 nephrologists from 10 sites, with 31 nephrologists randomized to the intervention arm. For this in-progress study, there are a median of three patients enrolled per nephrologist (IQR 1-5), and 16 nephrologists have not had a study patient enrolled. We successfully trained 28 of the 31 nephrologists in the intervention arm to competence (2 withdrew, 1 is pending training), with an average training score of 18.6/19 and no need for remediation. We have received 112 graphic aids related to 150 patients on study for a return rate of 75%. For the 59 patients in the intervention, we have received 44 graphic aids for an intervention arm return rate of 75%. Of the scored graphic aids, the average score for performance was 18 out of 28, where 15 indicated "most elements done." Inter-rater reliability for this assessment was high, ICC=.926 (95% CI=.859-.961).

Conclusion: Best Case/Worst Case, a tool pioneered in acute care surgery, can be taught to clinicians in other settings within the context of a clinical trial with support for intervention adherence. The intervention has potential to improve communication regarding upstream decisions that influence surgical care.

Factors Affecting Time to Re-Injection for the Treatment of Presbyphonia-Induced Glottal Insufficiency.

Anumitha Venkatraman; David Francis; Susan Thibeault

Introduction: In the field of laryngology, injection laryngoplasty is a common treatment of glottal insufficiency. Glottal insufficiency is characterized by a lack of vocal fold closure, which leads to a continuous escape of air during voicing. For voice production, the modulation of airflow by the vocal folds can influence voice quality. Thus, glottal insufficiency is commonly associated with a breathy, hoarse, and soft voice quality. Glottal insufficiency can also affect coughing and swallowing abilities. Glottal insufficiency can be the result of neurological etiology or age-related vocal fold muscle atrophy (also known as presbyphonia**)**. During injection laryngoplasty, a filling agent is used to bulk vocal fold muscle mass to achieve sufficient vocal fold closure. These injections usually provide temporary relief of voice symptomology (2-3 months), with patients then requiring re-injections. Thus, there is a critical need to understand factors that may prolong the time to re-injection. This study will focus on the time to re-injection in treatment of presbyphonia-induced glottal insufficiency with injection laryngoplasty.

Methods: This retrospective review of medical records at the UW Madison Voice and Swallow clinic included patients with a diagnosis of presbyphonia who underwent at least one injection laryngoplasty between 2008 and 2017 (N=35). Exclusion criteria included patients with neurological comorbidities influencing glottal closure (paralysis, Parkinson's disease) and a minimum follow-up of 60 days post-injection. As used in similar research investigating time to re-injection in vocal fold paralysis, Kaplan Meier statistics were completed to determine factors affecting time to re-injection in presbyphonia-induced glottal insufficiency. Time to re-injection was defined as the duration between the injection and the last follow-up. No significant differences in voice outcomes and time to re-injection was observed between first injection and subsequent re-injections; thus, these were combined in statistical analysis (N=60).

Results: The type of injectable material and completion of voice therapy influenced time to re-injection in patients with presbyphonia-induced glottal insufficiency. However, only 72% patients reported an improvement in voice-related quality of life. Regarding injection materials, Juvederm Ultra Plus lasted longer than Radiesse. Completion of voice therapy positively influenced time to re-injection across materials. No improvements were observed in acoustic voice measures.

Conclusions: In patients with presbyphonia-induced glottal insufficiency, injectable material and completion of voice therapy affected time to re-injection. Future studies are needed to determine whether these findings are replicated in neurological comorbidities such as Parkinson's disease.
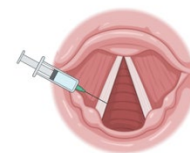
Injection Larygoplasty

*Created with BioRender

Support Needs for Living Kidney Donor Candidates: Results from a Multicenter, Mixed-Methods Study

Amelia Daley; Arhat Dwa; Esra Alagoz; Jackie Gannon; Sienna Li; Danielle Dobosz; Kristie Kennedy; Daniel Gray; Adam Mussell; Peter Reese; Elisa Gordon; Sanjay Kulkarni; Carrie Thiessen

Introduction: Only one-half of people being evaluated for living kidney donation are approved to donate their kidney and even fewer follow through with donation. Research on living kidney donation has focused on informed consent, understanding of medical risk, and financial burdens. This study evaluates living kidney donor candidates' perceptions of support received by their transplant teams.

Methods: Participants were English-speaking adults undergoing in-person living kidney donor evaluation at three US transplant centers. They completed semi-structured interviews at the time of evaluation. They were asked about the quality of support they received from the transplant center. The interviews were transcribed and analyzed using NVivo. A summative content analysis was used to identify major and minor themes regarding participants' reasons for feeling supported or unsupported by the transplant team. Using SAS, we evaluated univariate correlations between participant characteristics and support needs.

Results: Of the 266 participants, 59% were female, 84% were Caucasian, 86% were employed, 70% had a college education or higher, and 15% were being evaluated to donate via an exchange program. Fifty-five percent felt supported, 36% felt supported but still had one or more unmet support needs, and 9% felt unsupported. Highly educated potential donors were more likely to identify unmet support needs (graduate education 60%, some college 43%, high school 36%, p=0.02). The most common reasons for feeling supported and unsupported are listed in Table 1.

Conclusions: After their initial evaluation, many participants still identified unmet needs for support despite meeting with independent living donor advocates and social workers. The main reasons for feeling supported and unsupported give insight into what potential donors value during their evaluation process. Our results suggest that transplant centers can improve education about the evaluation process and resources available to donors, facilitate communication with potential donors, and streamline evaluation scheduling. Further research needs to be done to assess how living kidney donors' support needs change over the donation process and if their final donation status impacts the type of support needed.

Table 1: Reported reasons for feeling supported and unsupported

Reasons for Feeling Supported	Percent	Reasons for Feeling Unsupported	Percent
Education from center	38%	Not informed of evaluation process	30%
Friendliness/ politeness of staff	34%	Unable to reach center easily via phone/email	22%
Given financial resources	31%	Concerned about finances regarding donation	13%
Believed their information would remain confidential	28%	Had problems with scheduling evaluation	12%
Felt team focus was on them	26%	Inefficiency of evaluation process	11%

Normothermic Regional Perfusion in Donation after Circulatory Death Heart Donors May Not Have a Detrimental Effect on Lung Transplant Outcomes

Yu Xia; Samuel T. Kim; Erin Lowery; James Maloney; Malcolm DeCamp; Daniel McCarthy; Abbas Ardehali

Purpose: Normothermic regional perfusion (NRP) is increasingly used in donation after circulatory death (DCD) heart procurement, but its impact when the lung is also procured is unknown. The goal of this study was to examine utilization and outcomes of lung transplants in the setting of DCD heart procurement with or without NRP.

Methods: We examined the United Network for Organ Sharing of all DCD heart donors from December 1, 2019 to June 23, 2022 with recorded brain death and cross clamp times, with a difference of greater than 30 minutes considered NRP procurements. Baseline characteristics, in-hospital outcomes, and one-year survival of lung transplant recipients were compared between those whose donors were managed with NRP versus no NRP.

Results: Of 447 DCD heart procurements with adequate data, 157 (35%) were conducted with NRP. There were 62 DCD lung transplant recipients where the heart was also procured, of which 22 (35%) came from NRP-managed donors and 40 (65%) from non-NRP managed donors. Lung utilization rates were not significantly different between NRP and non-NRP managed DCD heart donors (14% vs. 14%, p=0.95). Donors in the NRP group were more frequently male (100% vs. 70%, p<0.01) while recipients had significantly lower lung allocation scores [37 (34-41) vs. 40 (36-57), p=0.02]. There were no other differences in other baseline characteristics, including EVLP use (18% vs. 14%, p=0.73). Rates of ECMO (14% vs. 15%, p=0.92), grade 3 PGD (18% vs. 23%, p=0.70), intubation (36% vs. 48%, p=0.40), and inhaled nitric use (14% vs. 15%, p=0.88) 72 hours post-transplant were not significantly different. One-year survival was comparable between the two groups (86% vs. 86%, p=0.94).

Conclusion A small number of DCD lung transplants are performed when the heart was also procured, with approximately one-third of these donors managed with NRP. While sample size was limited, NRP did not have a detrimental impact on short-term outcomes or one-year survival in lung transplant/recipients.
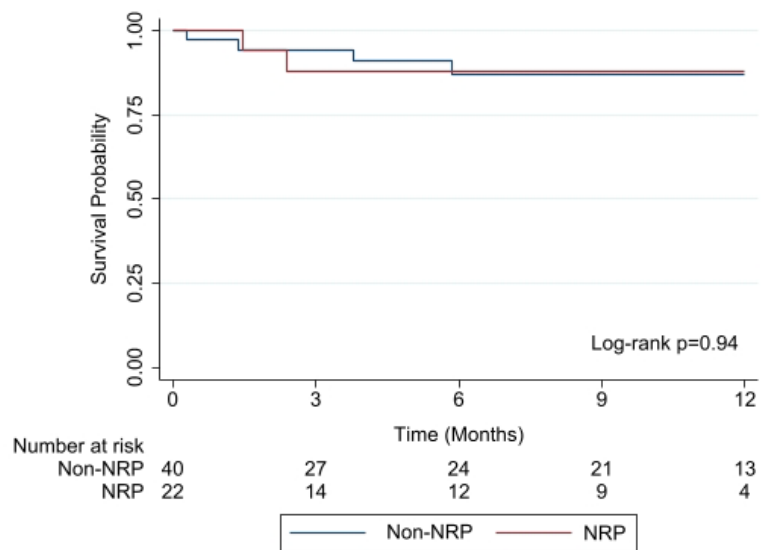
Ex-Vivo Lung Perfusion May Have a Detrimental Impact on Lung Transplants from Donation after Circulatory Death Donors

Yu Xia; Samuel T. Kim; James Maloney; Malcolm DeCamp; Erin Lowery; Daniel McCarthy; Abbas Ardehali

Purpose: Ex-vivo lung perfusion (EVLP) may allow for evaluation and rehabilitation of marginal donor lungs, including those from donation after circulatory death(DCD) donors, with outcomes understudied. We evaluated the short-term and mid-term outcomes of DCD lungs managed with or without EVLP. Methods We conducted retrospective review of the United Network for Organ Sharing(UNOS) registry of all primary adult DCD lung transplants performed from February 18, 2018 onwards, dichotomizing them as those managed with or without EVLP. Baseline characteristics and short-term outcomes were compared. Two-year survival was examined with Kaplan Meier curves and multivariable Cox proportional hazards regression.

Results: Of 757 DCD lung transplants, 189(25%) were managed with EVLP with no significant differences in donor characteristics. Recipients of EVLP-managed lungs had longer wait-list duration(40 vs 32 days, p=0.01), longer organ preservation times(12.6±3.8 vs 6.6±2.2 hours, p<0.01), and longer distance traveled[268 (98-490 vs 132(49-305) nautical miles, p<0.01]. Recipients of EVLP-managed DCD lungs were more likely to remain intubated (51% vs 43%, p=0.04), be on ECMO (22% vs 14%, p<0.01), and have grade 3 primary graft dysfunction (31% vs 23%, p=0.04) at 72 hours. One(86% vs 77%) and two-year(74% vs 65%, log-rank p=0.02) survival were significantly worse with EVLP-managed lungs. On multivariable Cox proportional hazards regression, EVLP was significantly associated with worse two-year survival(adjusted HR 1.45, 95% CI 1.01-2.08) when preservation time was not used as an adjuster(EVLP aHR 1.28, 95% CI 0.74-2.21).

Conclusion: A quarter of DCD lung transplants are managed with EVLP in the United States, with inferior short-term and mid-term outcomes compared to those not managed with EVLP, possibly related to the obligate increase in preservation times. Further studies are needed to define the role of EVLP in the preservation of DCD lungs prior to transplantation.
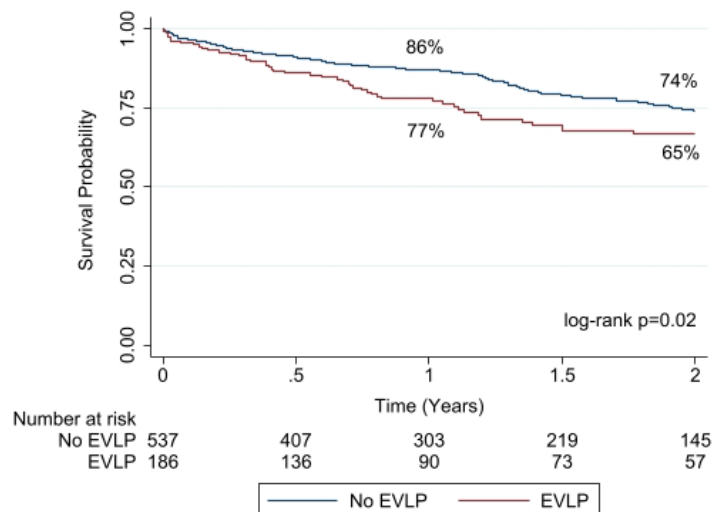
# Mid-term Outcomes of Heart Transplants from HCV NAT+ Donors

Yu Xia; Samuel T. Kim; Joshua Hermsen; Ravi Dhingra; Maryl Johnson; Abbas Ardehali

Purpose: The advent of direct acting antivirals has allowed for utilization of HCV NAT+ donors with good short-term outcomes. The goal of this study was to compare clinical outcomes among heart transplant recipients who received hearts from HCV NAT+ donors to those from NAT- donors.

Methods: We examined the UNOS registry of all primary orthotopic adult heart transplants from March 15, 2015 to August 31, 2021 and identified their donors as HCV NAT+ or NAT-. Those with multi-organ transplants or waitlisted for other organs were excluded. Baseline characteristics, three-year survival, and treatment for rejection at one year were compared between the two groups.

Results: Of 16,491 heart transplants meeting study criteria, 729 (4%) hearts came from HCV NAT+ donors. HCV NAT+ donors were older (34±8 vs. 32±11 years, p<0.01), more likely to be male (75% vs. 70%, p<0.01), white race (83% vs. 63%, p<0.01), and blood group O (60% vs. 50%, p<0.01). They were more likely to have drug use as cause of death (59% vs. 18%, p<0.01) and classified as CDC high risk (87% vs. 29%, p<0.01). Recipients were more likely blood group O (48% vs. 39%, p<0.01) and have positive hepatitis C serologies (5% vs. 2%, p<0.01). They were less likely Status 1A (58% vs. 67%, p<0.01) or Status 1 (4% vs. 9%, p<0.01) or 2 (36% vs. 48%, p<0.01). Distance traveled (241 vs. 139 nautical miles, p<0.01) and ischemia times (3.48 vs. 3.23 hours, p<0.01) were greater in the HCV NAT+ group, while wait list duration was similar (69 vs. 69 days, p=0.20). Three-year survival (87% vs. 85%, log-rank p=0.26; Figure) and treatment for rejection in first year post transplant (19% vs. 18%, p=0.72) were not significantly different between the two groups.

Conclusion HCV NAT+ donors are being increasingly used for heart transplantation, particularly for lower status recipients with otherwise longer wait times. Three-year survival and treatment for rejection at one year are comparable to those from HCV NAT- donors. Therefore, HCV NAT+ donor hearts should continue to be utilized with monitoring of long-term outcomes.
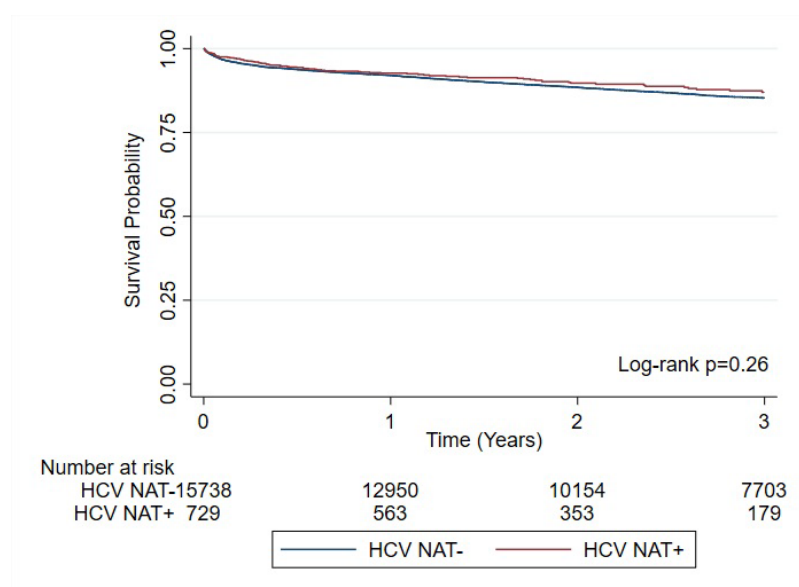
Prioritizing Cancer Care in Low and Middle-Income Countries Using Delta Mortality-to-Incidence Ratios

Thomas Diehl; Sheida Pourdashti; Daniel Schroeder; Syed Nabeel Zafar

Introduction: Cancer outcomes are disparate around the world. Low- and middle-income countries (LMICs) face higher cancer mortality rates than high-income countries (HICs), and the burden will only intensify as cancer incidence is projected to rise 81% by 2040. Mortality-to-incidence ratios (MIR), calculated by dividing mortality rates by incidence rates, have been used to study disparities in cancer control. By calculating delta mortality-to-incidence ratios (dMIR), the difference between MIRs in HICs and LMICs, we can develop country-specific cancer priority lists for cancer control planning and resource allocation.

Methods: We extracted country-specific incidence and mortality rates for 35 cancer types from 183 countries using GLOBACAN 2020. Countries were grouped into income categories as defined by the World Bank. Development indicators and country metadata were extracted from the United Nations Development Programme. MIRs were calculated for each cancer in every country. Linear regression was used to test relationships between MIRs and development indicators. Delta MIR was calculated for each cancer type by subtracting the average MIR for HICs from the average MIR for LMICs.

Results: For all cancers combined, MIRs varied widely across the globe, ranging from 0.33 in Australia to 0.80 in Gambia. Variation in MIR was low for certain diseases such as pancreas cancer (range=0.80-1.0), but high for screenable cancers such as breast (0.11-0.63) and colon (0.28-1.0) cancers. Upon multivariate linear regression, MIRs were associated with life expectancy and income index. Cancers of the nasopharynx (0.90), Kaposi sarcoma (0.51), anus (0.46), salivary grands (0.38), and prostate (0.34) had the highest dMIRs.

Conclusions: Delta MIRs can be employed to systematically address disparities in global cancer survival. Cancers with the highest dMIRs represent those with the greatest proportion of potentially avoidable deaths and should be targeted first for maximum impact on global cancer mortality. These data can inform country-specific cancer priority lists.

Development and Implementation of a Peri-Operative Surgical Registry in Hawassa, Ethiopia

Taylor J. Jaraczewski; Thomas Diehl; Yonas Nigussie; Winta Melaku; Tinbete Esayas; Chris Dodgion; Girma Tefera; Belay Mellesse; Syed Nabeel Zafar

Introduction: Postoperative morbidity and mortality is high in low- and middle-income countries (LMICs). Surgical quality improvement (QI) programs that rely on the systematic and prospective collection of surgical outcome data have been successful at reducing postoperative morbidity and mortality in high-income countries (HICs). Unfortunately, most low-income settings lack a sustainable system for collecting surgical outcomes data. Taking advantage of mobile health technology, we developed and piloted a surgical outcome registry at a single institution in Ethiopia.

Methods: Surgical QI was identified as a key priority for Hawassa University Hospital. A local QI champion was identified and a working group established to set priorities and examine system opportunities for improvement. Variables were selected after an iterative process by key stakeholders that included an extensive literature review to identify common and feasible data elements captured in LMICs during prior cross-sectional outcome studies, reviewing data elements included in HIC registries, and evaluating congruency with local priorities. We addressed feasibility and redundancy in the variables, while ensuring inclusion of data elements required for analyzing risk adjusted outcomes. A data entry form was developed using REDCap.

Results: The surgical registry is cloud-based and completely electronic. Data input is performed utilizing smart phones and transmitted via WiFi and cellular networks. It includes 60 demographic, clinical, operative, and postoperative variables. After ethical approval, pilot data acquisition was initiated in May 2022. Weekly meetings are held to evaluate the validity of the data and trouble shoot issues. Data elements have been collected with high fidelity and low missingness. After five months of data acquisition, data for 141 eligible patients have been entered into the database. The most common procedures include exploratory laparotomy (55, 39.0%), appendectomy (20, 14.2%), enteroenterostomy (13, 9.3%), urologic (7, 5.0%), cholecystectomy (7, 5.0%), and adhesiolysis (7, 5.0). Average patient age is 40±16.7 years and the gender distribution is 58.2% male. Postoperative complications include 13.2% surgical site infection (n=7), 9.2 % sepsis (n=5), 5.6% AKI (n=3), 5.6% anastomotic leak (n=3), and 7.4% mortality (n=4).

Conclusions: This pilot demonstrates the feasibility of implementing a surgical registry in an LMIC setting. Using a systematic approach and working in concert with hospital leadership, we overcame several technical, behavioral, and organizational barriers. Such a perioperative registry can be used to further surgical outcome research in low resource settings and can be used for QI programs aimed at improving postoperative morbidity and mortality.

Barriers and Facilitators to Collecting Surgical Outcome Data in Low- and Middle-Income Countries (LMICs): An International Survey of Stakeholders

Taylor Jaraczewski; Thomas Diehl; Ewen Harrison; Girma Tefera; Muhammad Rizwan Khan; Asad Latif; Belay Mellese; Kelly McQueen; Syed Nabeel Zafar

Introduction: Despite performing only 6.5% of global surgeries, approximately 50% of perioperative mortality occurs in low- and middle-income countries (LMICs). Collection and analysis of perioperative mortality and morbidity data is a cornerstone of surgical quality improvement. Unfortunately, perioperative data collection from LMICs remains sparse. The aim of this study was to understand the barriers, facilitators, perceptions, and attitudes of key stakeholders towards collecting surgical outcomes data in LMIC settings.

Methods: A survey tool was developed after interviews with stakeholders and a review of existing literature. Themes were informed by the Performance of Routine Information System Management (PRISM) framework. The internet-based survey conformed to CHERRIES guidelines, available in English, French, and Spanish and disseminated via social media platforms and email. Frequencies and proportions were used to describe the responses and Chi-square analysis was used to test for associations.

Results: A total of 424 responses from 34 different LMICs were analyzed. Surgeons and surgical trainees made up 69.8% (N=187) of respondents followed by clinical officers (11.2%, N=30) and anesthesiologists (8.9%, N=23). Perioperative data collection was ongoing by 59.5% (N=138), with 48.9% (N=65) reporting publications from this data. Further, 72.9% of respondents reported modification of clinical care practices based on collected data. In terms of resources, 92.2% had access to computers, 69.9% had reliable internet connectivity, and 31.1% had dedicated research space. Key barriers and solutions to collecting surgical outcomes data fall into broad categories of organizational, technical, and behavioral. The most common barriers were burden of clinical responsibilities (64.3%), research costs (55.6%), and lack of funds to pay personnel (52%). Availability of an easy-to-use electronic platform for data collection was the most cited solution (95.3%), followed by having dedicated research personnel (93.3%). Common perceptions included that local surgical outcomes data are valuable (93.4%) and necessary for appropriate data-driven decisions (93.4%). We found no differences in attitudes and perceptions by respondent seniority, academic level, or country income level (all p>0.05).

Conclusions: We report barriers to collecting surgical outcomes data in LMIC settings. Common issues include burden of clinical responsibilities and costs. Proposed solutions include implementation of electronic data collection platforms and dedicated research personnel. This data can be utilized to inform interventions to increase collection of surgical outcomes data in LMICs.

Education
Research Abstracts

Diversity in Plastic Surgery Match: Effect of Program Chair, Program Director and Faculties' Race and Gender on Matched Applicants

Quinn Steiner; Armin Edalatpour; Allison Seitz; Michael L. Bentz; Ahmed M. Afifi

Introduction: Prior studies have identified the lack of diversity within the field of plastic surgery and associated residency matches. In this study, we aimed to examine the effect of plastic surgery chairs (PSC) and plastic surgery residency program directors' (PSRPD) race and gender on plastic surgery applicants and matriculates within the same program.

Methods: Applicant data from 2017-2021 submitted to the University of Wisconsin-Madison's integrated plastic surgery program via the American Medical Colleges Electronic Residency Application Service (ERAS) was analyzed. Applicants' self-reported gender and race were collected. Integrated plastic surgery program websites were assessed to determine whether applicants matched into an integrated plastic surgery program. Race and gender of PSC and PSRPD were collected from each program's website. This study's primary outcome was to determine the likelihood of an applicant matching to any given integrated residency program based on their race and/or gender compared to the gender and/or race of PSC and PSRPD.

Results: Overall, 79 integrated plastic surgery programs' websites and 1470 applicants were reviewed. The majority of PSC and PSRPD were male (87.3% and 81.0%, respectively) and white (74.7% and 70.9%, respectively). Most applicants were male (54.0%) and white (60.8%). Between 2017-2021, 71.6% of applicants matched. Applicant gender was not significantly associated with the applicant matching (p=0.226). However, significantly more white applicants matched into plastic surgery compared to other races (p<0.001). For a given program, white PSCs and PSRPDs have 5 and 6 times, respectively, the odds of matching an applicant of the same race as them (p<0.001 for both). Having a male PSC and PSRPD did not significantly increase the odds of matching an applicant of the same gender (p=0.198 and p=0.905, respectively).

Conclusion: In this study, we found that white PSCs and PSPDs have significantly higher odds of matching an applicant with the same race as them in their respective programs. There was no association between the PSC and PSPD's gender and the odds of matching a same gender applicant. Our specialty has made great strides to close the gender gap within the plastic surgery match; however, our data highlights the continued discrepancy for non-white applicants.

Quality Control in Plastic Surgery Research

Grant Seils; Anna Jesch; Aaron Dingle

Introduction: All research methodologies and standard operating procedures should be executed with the objective of obtaining quality results. Measures used to ensure that products possess integrity, quality, and reproducibility are referred to as quality control.

Methods: In the realm of plastic surgery, data relating to the development of novel surgical procedures, drugs, or devices from preclinical experiments or the outcomes studied in a clinical setting are to be considered in the course of quality control.

Results: Organizations that provide oversight, such as institutional review boards and agencies that provide funding, often require proof of quality control efforts with regard to assessing the optimization of policies, resources, and funding. Additionally, quality control measures can be used to confirm that data is collected and analyzed in compliance with set regulations to protect privacy and guarantee all research procedures are conducted ethically.

Conclusions: The implementation of quality control measures requires thorough evaluation by the researcher as ethical, regulatory, and funding requirements must be executed in combination with quality control methods. From the beginning to the end stages, quality control measures establish a firm foundation of quality and validity in plastic surgery research.

Latex Infused Porcine Abdominal Model: A Novel Microsurgery Simulator for Deep Inferior Epigastric Perforator Dissection

Ellen C. Shaffrey; Weifeng Zeng; Peter J. Nicksic; Sahand Eftekari; Jennifer M. Frank; Aaron M. Dingle; Samuel O. Poore

Introduction: Perforator dissection and flap elevation are routinely performed for microsurgical reconstruction; however, there is a steep learning curve to mastering these technical skills. Though live porcine models have been utilized as a microsurgical training model, there are significant drawbacks that limit their use, including cost, limited ability for repetition, and obstacles associated with animal care. Here we describe the creation of a novel perforator dissection model using latex-augmented non-living porcine abdominal walls. We provide anatomic measurements that demonstrate valuable similarities and differences to human anatomy to maximize microsurgical trainee practice.

Methods: A total of twelve dissections of the deep cranial epigastric artery (DCEA) were performed across six latex-infused porcine abdomens. Dissection was centered over the abdominal wall mid-segment between the second and fourth nipple line. Dissection steps included: exposure of lateral and medial row perforators, incision of anterior rectus sheath with perforator dissection, and dissection of DCEA pedicle. DCEA pedicle and perforator measurements were compared to deep inferior epigastric artery (DIEA) data in the literature. Additionally, the number of identified perforators, number of selected perforators for dissection, perforator length, branching pattern, and perforator course were recorded.

Results: An average of seven perforators were consistently identified within each flap. Assembly of the model was performed quickly and allowed for two training sessions per specimen. On average, dissections required 91.3 ± 24.2 minutes. Porcine abdominal walls demonstrate similar DCEA pedicle (2.6 +/- 0.21 mm) and perforator (1.0 +/- 0.18 mm) diameter compared to a human's DIEA (2.7 +/- 0.27 mm, 1.1 +/- 0.85 mm). A majority of medial row perforators demonstrated a direct cutaneous course (70%) compared to a majority of lateral row perforators demonstrated a musculocutaneous course (69%).

Conclusions: The latex-infused porcine abdominal model is a novel, realistic simulation for microsurgical trainee perforator dissection practice. Impact on resident comfort and confidence within a microsurgical training course is forthcoming.

Table 1. Average Number of Perforators and Average Perforator Measurements

	Porcine DCEA averages +/- SD (range)	Human DIEP averages	p value
Total number of perforators	7.5 +/- 1.98 (4-10)	5.2 +/-3.5	**p=0.002**
Number of perforators selected for dissection Medial Lateral	2.8 +/- 0.94 (1-5) 3.1 +/- 1.08 (1-5) 2.4 +/- 0.67 (1-3)		
Pedicle Diameter	2.6 +/- 0.21 (2.28-3.03) mm	2.7 +/- 0.27 mm	p=0.139
Perforator Diameter	1.0 +/- 0.18 (0.72-1.22) mm	1.1+/- 0.85 mm	p=0.257
Pedicle Length Medial Lateral	3.3 +/- 0.87 (1.5-6) cm 3.0 +/- 0.66 (1.8-4.2) cm 3.7 +/- 0.96 (1.5-6) cm		
Operative Time	91.3 +/- 24.2 (49-116) min		

Abbreviations: DCEAP: Deep cranial epigastric artery perforator, DIEP: Deep inferior epigastric artery perforator, SD: standard deviation, mm: millimeter, cm: centimeter

α: p<0.05

Diversity Drives Representation: An Internal Audit into Gender Representation in Citation Practices of a Single Surgical Laboratory

Yunee Lo; Gabriela A. Fioranelli; Matthew J. Laluzerne; D'Andrea Donnelly; Sarah M. Lyon; Aaron M. Dingle

Introduction: The underrepresentation of women in medicine is quite evident when looking at gender roles up the academic ladder. The broader spectrum of academia has been persistent in improving gender imbalances at all levels of systemic inclusion, but many medical disciplines lack women in leadership positions. Gender-based homophily in scientific research elicits same-sex co-authorship, leaving women-led papers and mixed-sex collaborations scarce and unrecognized. To establish a more equitable framework in citation practices, it is crucial to address field biases in consequence of "the leaky pipeline." Previous studies have compared gender of authorship to their relative citation popularity but there are minimal resources to directly assess one's own citation behavior before publication at a laboratory level. In this study, we perform an internal audit of our own laboratory citation practices and behavior, looking at the underrepresentation of women authors in our own bibliographies.

Methods: For our data analyses, we used a simulation originally constructed and used by authors from the University of Pennsylvania. The bibliographies used from our publications were broken down by date (2015-2020) and a single senior author within our lab. The simulation categorized the names of the first and last author of each paper within our bibliographies by gender: man or woman. The assignments of gender were solely determined by its relative statistical likelihood according to external database records (Gender-API and Census Bureau) between a 0.3-0.7 positive correlation. The simulation generated a diversity statement of the author's genders, representing the prevalence of men or women authors.

Results: Of the 785 citations, the first and last authorship sequences displayed to be 70.7% male/male, 9.1% male/female, 16.2% female/male and 4.4% female/female. Male-led papers within our lab cited 73.2% male/male articles in their bibliographies compared to female-led papers citing 53.7%. The average of female/female citations were 3.06 times higher in female-led papers within our lab.

Conclusions: Overall, there is a significant difference in first author (male or female) citation behavior. This statistical data provided us a framework of actionable information to improve gender inclusivity citation practices that can be applied at the surgical research level. Our data demonstrates a statistical shift toward male authors and no change in citation behavior over the last five years. With this being discovered, we ought to alter and discuss equitable citation practices within our lab and break the consequences of research homophily.

Microsurgical Simulation Training Enhances Medical Student Acting Internship Experience

Rosaline Zhang; Weifeng Zeng; Aaron Dingle; Samuel Poore

Introduction: Microsurgical education typically does not begin until surgical residency and requires significant investment of time and practice. Various models and simulations have been reported to support microsurgical training and have mostly focused on post-graduate surgical trainees. It has been demonstrated that medical students are capable of learning microsurgical techniques and exposure to microsurgery may improve their interest in plastic surgery. There is limited literature on how exposure to microsurgery training influences senior medical students applying to plastic surgery residency.

Methods: Fourth year medical students completed a four-hour, individual training session with an expert microsurgeon (WZ) during their acting internship. Pre-training and post-training survey responses were compared using Wilcoxon signed rank test.

Results: Nineteen medical students completed the training session. Eighty-nine percent of students (17/19) came from institutions without a microsurgery fellowship program. Seventy-nine percent of students (15/19) had no prior hands-on microsurgery experience. Eight-nine percent of students (17/19) were either extremely or somewhat uncomfortable performing end-to-end anastomoses of synthetic vessels. After the session, 74% of students (14/19) felt extremely or somewhat comfortable, with only 10% (2/19) feeling somewhat uncomfortable (p=0.001). All students rated the session as very or extremely useful, with 95% finding the level of instruction and skills practiced reasonable. When asked to rank their interest in plastic surgery subspecialties, five students ranked microsurgery higher than they did prior to the training session (p=0.270). Ninety-five percent of students reported that it was important for them to be at a residency program that would prepare them to perform microsurgery independently after graduation.

Conclusions: Medical students can successfully learn microsurgical skills, including vessel anastomoses, in just a single training session. Hands-on microsurgical practice opportunities enrich the acting internship experience, and may inspire greater medical student interest in the subspecialty as well as the hosting residency program. A microsurgical curriculum for medical students is in development, with plans to further optimize learning and professional growth.

Microsurgical Education Streaming: A Method to Provide Remote Education to International Microsurgeons

Sahand C. Eftekari; Weifeng Zeng; Ellen C. Shaffrey; Samuel O. Poore

Introduction: Microsurgery is a sub-specialty within the field of plastic surgery that is resource-intensive and often goes overlooked at many residency programs. With its low case volumes, complex maneuvers, and flap integrity at stake, residents often do not receive adequate and continued microsurgical education throughout their residency training. Moreover, many institutions do not have the specialized and expensive equipment for an in-depth and longitudinal training experience. Here, we propose a highly accessible and low-cost method to stream a microsurgical educational session over popular online platforms to enable international collaboration for microsurgical training. We aim to provide a more accessible source of training for aspiring microsurgeons and to lift the current restrictions around microsurgical education.

Methods: A three-camera system was developed to provide a seamless and complete view of a fully trained microsurgeon to stream via Zoom or Facebook. A direct camera tethered to a camera link for a direct view down the microscope, a camera on the surgeon's hands and equipment, and a camera on the surgeon's face enabled a complete view of the maneuvers executed by the surgeon for fundamental microsurgery tasks. Open Broadcasting Software (OBS) was used to compile these three cameras onto a canvas to share the video and audio over a streaming platform.

Results: A total of three separate four-hour education sessions were completed at the University of Wisconsin-Madison over Zoom. Each session was comprised of an introduction to the microscope as well as basic microsurgical instruments and handling. Suture choices and explanations of each suture selection was completed, as well as basic knot tying and cutting under the microscope. Each session ended with a medical student learning alongside the teaching microsurgeon to complete a basic end-to-end microsurgical anastomosis with guidance throughout the process. A total of 96 students and practicing microsurgeons joined the educational sessions representing 14 countries worldwide.

Conclusions: Microsurgery education is a highly complex and specialized field within plastic surgery that is often overlooked due to lack of proper equipment and training opportunities. Here, we propose an accessible and low-cost method to deliver virtual microsurgery education and overcome many of the educational barriers associated with this field.

Creating an Augmented Reality Microsurgery Training Kit for Surgery Residents: A Proof of Concept

Sahand C. Eftekari; Ellen C. Shaffrey MD; Samuel O. Poore

Introduction: Microsurgery is a highly complex and resource-intensive field that is often overlooked at many training facilities. Given the low case volumes, complex maneuvers, vital anatomy at stake, and more senior residents in line, most junior surgical residents do not receive substantial microsurgery training until their third or fourth year of residency. For these reasons, a low-cost and highly accessible microsurgery training kit may vastly improve training access so junior surgical residents can prepare and build muscle memory in advance of their microsurgery operative experiences.

Methods: A stereoscopic augmented reality microscope was created using a raspberry pi model 4B with two webcams built into a 3D printed microscope chassis. Stereoscopic output was sent over a WiFi signal and received by an Oculus Quest 2 viewfinder using the Unity development environment. This prototype will be tested within the Division of Plastic and Reconstructive Surgery to compare to a traditional optical stereomicroscope for resident training purposes within the coming months.

Results: Primary endpoints will be measured through ease of use, portability, and effectiveness of the augmented reality microsurgery training kit compared to a traditional optical microscope. Experiments quantifying the value of this augmented reality training kit remain ongoing.

Conclusions: Microsurgery training throughout residency is often restricted due to lack of resources and microscope time for junior surgical residents. A low-cost and accessible microsurgery training kit may improve these access barriers, leading to earlier exposure for junior residents to build their dexterity.

Predicting a Successful Plastic Surgery Resident Applicant: The Linear Rank Model

Ellen C. Shaffrey; Steven P. Moura; Pradeep K. Attaluri; Peter J. Wirth; Alyssa Schappe; Armin Edalatpour; Venkat K. Rao

Introduction: Linear rank modeling (LRM) is an algorithm that uses relevant inputs to model expert judgment. Over the last five years, we have used LRM to assist with screening and ranking integrated plastic surgery residency (PRS) applicants. The primary aim of this study was to determine if LRM scores are predictive of match success and, secondarily, to compare LRM scores between gender and self-identified race categories.

Methods: LRM scores were calculated for applicants who applied and were interviewed at a single institution between 2019-2022. Data was collected on applicant demographics, traditional application metrics (Step 1 & 2 scores, number of poster presentations and publications), global intuition rank, and match success.

Results: Using area under the curve (AUC) modeling, LRM score was the most predictive indicator for match success compared to traditional application metrics. With every one-point increase in LRM score, there was an 11% and 8.3% increase in the likelihood of applied and interviewed applicant match success (p <.001). An algorithm was developed to estimate the probability of match success based on LRM score. No significant differences in average LRM scores were appreciated for interviewed applicant gender or self-identified race groups.

Conclusions: LRM score is the most predictive indicator of match success for PRS applicants. This model is a valuable tool to assist in creating rank lists by calculating a numerical score for each applicant that represents a holistic evaluation. Further, the model can estimate an applicant's probability of successfully matching into an integrated PRS residency.

Evaluation of the Veterans Affairs Pharmacogenomic Testing for Veterans (PHASER) Program: Barriers and Facilitators to Patient Uptake of Pharmacogenomic Testing

Karina Melendez; Diana Gutierrez-Meza; Esra Alagoz; Nina Sperber; R. Ryanne Wu; Deepak Voora; Abigail Silva; Kara Gavin; Allison Hung; Megan C. Roberts; Corrine Voils

Introduction: This qualitative analysis examined the barriers and facilitators to patient acceptance of pharmacogenomic testing (PGx) among the Veteran population through the VA PHASER program.

Methods: We conducted 30-minute structured videoconference interviews with Veterans who accepted, declined, or have yet to decide about PGx testing between January and August 2022 per PHASER program data. We utilized the TDF framework to design patient interview guides and asked participants about their knowledge of genetic testing, what influenced their decision, the accessibility of the test, and their suggestions for how to improve informing patients about PHASER. A codebook was developed and the transcribed interviews were coded in NVivo by two different coders. Codes were compared and discussed by the larger group until consensus was reached.

Results: We interviewed 14 Veterans who accepted testing, 9 Veterans who declined testing, and 8 Veterans who abstained from testing until further information was provided at various VA sites. Veterans who accepted testing were informed about the program from VA providers, friends, and family, and found those influences and previous knowledge on genetics as primary facilitators to their acceptance. They expressed optimism that their decision on testing would allow their providers to select and/or amend the dosage of the best medications. Veterans who declined and abstained were more skeptical of the program. Veterans who declined saw data security, privacy, distrust in medical institutions, fear, and impact on VA benefits as the main barriers to them receiving PGx testing. Abstainers had similar optimism as the acceptors but were not responsive to initial interactions of receiving information about genetic testing and the PHASER program due to misconceptions of the program. They lacked clarity on what procedures were involved, data security, and what changes would occur after the testing had been completed. They found that a discussion with a provider was a key facilitator to removing these barriers and helping them make a more informed decision.

Conclusions: Future research should evaluate whether providing clarity about data security and impact on benefits would address patient concerns about PGx testing. Research should also evaluate whether personal testimonies and conversations with providers would facilitate those considering PGx testing. Further insight from providers and site stakeholders will be important to identify other strategies to maximize uptake of PGx testing for Veterans.

VISUAL ABSTRACTS
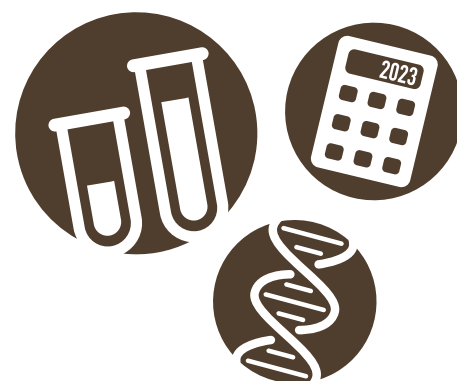
# *Ex vivo* Lentiviral Gene Delivery to Kidneys

Grace Heise, Bret Verhoven, Rahul Das, Heather Jennings, David Al-Adra

Immune-inhibitory proteins decrease the immune response. We show feasibility of transducing kidneys during *ex vivo* perfusion with the goal of transducing an immune inhibitory protein to decrease kidney rejection after transplantation.

+/-
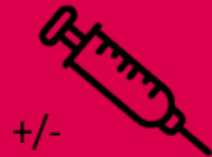
A lentivirus containing green fluorescent protein (GFP) and mCherry reporters was injected into the perfusate during kidney perfusion

Transplant kidney demonstrating successful transduction; mCherry shown by fluorescence (inset), and GFP histologically (arrows)
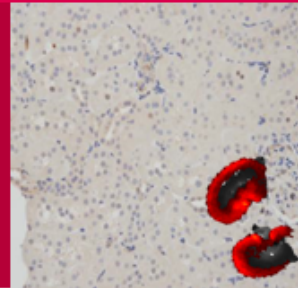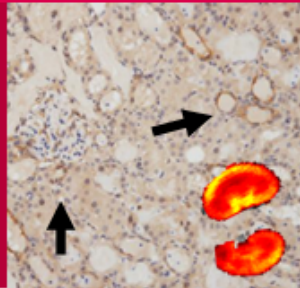
Control kidneys show no transgene expression (fluorescence or histological staining)

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SCHOOL OF MEDICINE AND PUBLIC HEALTH

Ref: Paul PK, Das R, Drow T, et al. *Am J Transplant*. January 2022

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Vocal Phenotypes in Two Mouse Models of Down syndrome

Charles Lenell PhD CCC-SLP*, Nadine P. Connor PhD CCC-SLP, Tiffany J. Glass PhD*

Background: Down syndrome (DS) is typically caused by a trisomy of chr 21. DS involves vocal communication challenges.

Question: How are ultrasonic vocalizations (USV) of the Ts65Dn mouse model of DS, (which has a partial trisomy), & the Dp(16)1Yey model of DS, (which has a genetic duplication), different from control mice?

Methods: USV were analyzed in DeepSqueak. Ten call types were analyzed for eleven acoustic measures.

USV of both Ts65Dn and Dp(16)1Yey are different from control mice.
Ts65Dn calls are lower in some frequency measures (kHz), are louder, and less complex. Dp(16)1Yey calls are higher in some frequency measures (kHz) and are louder.

$* p < .05, ** p < .01, *** p < .001, **** p < .0001.$ Eu = euploid control mice
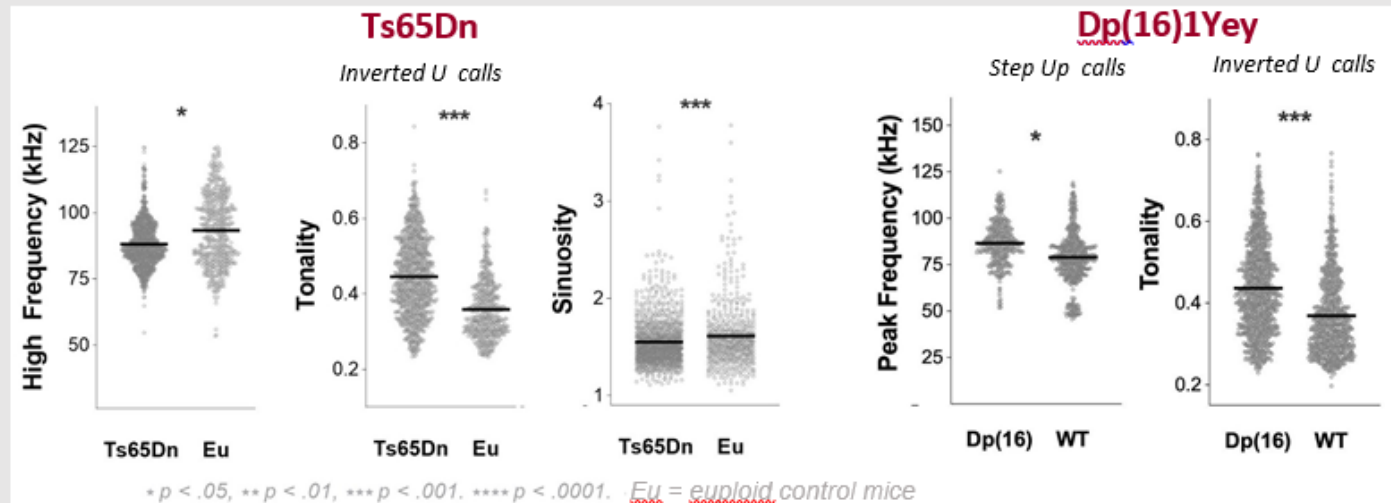
Conclusion: Ts65Dn shows more USV differences than Dp(16)1Yey. Ts65Dn may be the better model of vocal communication challenges in DS.

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* These authors contributed equally to this work

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A Diffusion Model for 5-Aminolevulinic Acid Delivery into Canine Vocal Fold Epithelium and Lamina Propria

Sebastian Kiehn, Matthew Silverman, Jack J Jiang M.D., Ph.D.

Average Epithelial Thickness

68.13μm

Diffusion Coefficients with Least Amount of Error
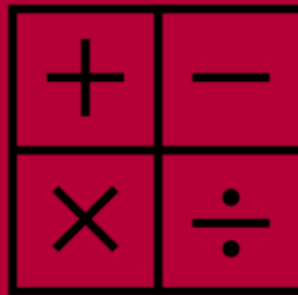
0.0142 cm^2/minute for Epithelia and 0.00275 cm^2/minute for Lamina Propria

Concentration estimate at given depths and times

Average error of 2.94% based on experimental data

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Daily injections of resveratrol alter limb motor function and inflammatory profiles in the *Pink1-/-* rat

Sarah A. Lechner, David G.S. Barnett, and Cynthia A. Kelm-Nelson

Parkinson disease affects 1% of the world's population.

Prodromal mechanisms are unknown.

Pink1-/- rats model PD behavioral and genetic dysfunction.

Drug repurposing identified effectors of gene transcription.

Resveratrol increased locomotion and reduced inflammation.

Translational application may improve signs in PD.

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The Relative Importance of Treatment Outcomes to Patients with Low-Risk Thyroid Cancer: A Comparison by Treatment Choice

Low-Risk Papillary Thyroid Cancer
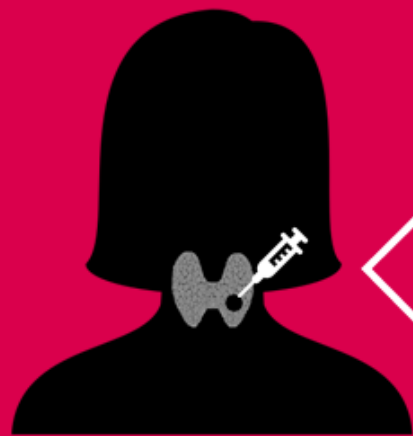
Biopsy-proven (cT1-2N0M0) or ≥70% risk on molecular testing

Treatment selected

Total Thyroidectomy

Thyroid Lobectomy
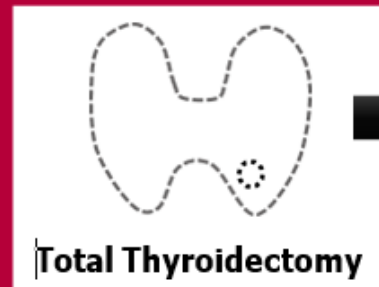
The relative importance of treatment outcomes significantly differed by treatment choice (p=0.014)
(Top 3 outcomes shown left to right)
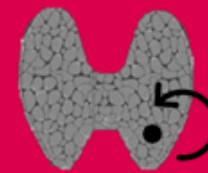
Risk of Recurrence — Removal of the Cancer — Survival

Removal of the Cancer — Return to Normalcy — Risk of Recurrence

Catherine B. Jensen, MD, Megan C. Saucke, MA, Kyle J. Bushaw, MA, Sophie Dream, MD, Abbey Fingeret, MD, Masha J. Livhits MD. Aarti Mathur, MD, PhD, Alexandria McDow, MD, Sanziana Roman, MD, Corrine I. Voils, PhD, Justin Sydnor, PhD, Susan C. Pitt, MD, MPHS

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Assessment of Racial Disparities in Reconstructive Breast Surgery Receipt and Outcomes in Wisconsin

Zeeda H. Nkana BS; Kasey Leigh Wood Matabele BS; Kirsten A. Gunderson MD; Rachel Weber BS; Erin L. Doren MD MPH; Aaron M. Dingle PhD; Samuel O. Poore MD PhD

Breast Reconstruction Post-Mastectomy

1,845 White patients

88 Non-White patients

Perioperative Factors

0.4% White

VS

2.3% Non-White

HIGHER incidence of bleeding disorders in non-White patients (p=0.019)

Insurance Status
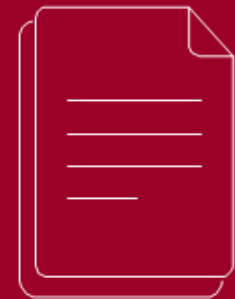
RACIAL DISPARITIES in insurance status ($p<0.001$)

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SURGERY SCIENCE IMAGES
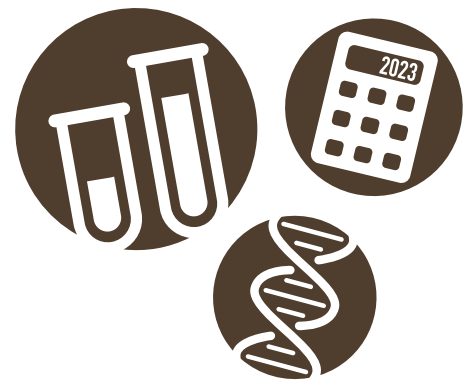
Heterotopic Auxiliary Whole Liver Transplant in Rat
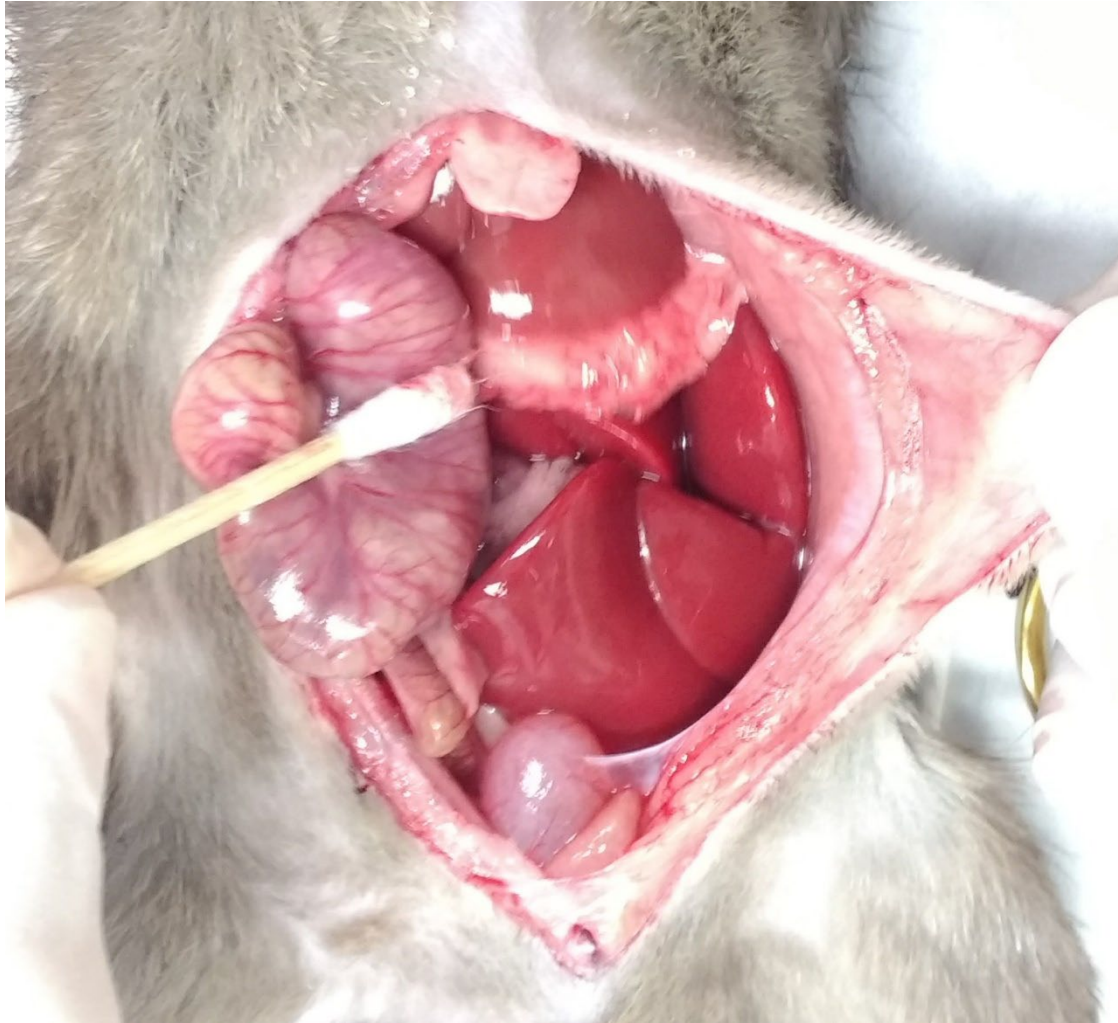
Caption: *Heterotopic liver transplantation is a method in which the recipient's liver is left in place and a donor's liver is attached at an ectopic site. The image depicts a freshly transplanted auxiliary rat liver utilizing the renal vein, artery, and ureter (for bile clearance) from the recipients excised left kidney. The native liver is seen at the top of the surgical incision and the transplanted whole liver occupies the center right of the image. This heterotopic surgical method provides a significant new experimental system to help overcome the considerable surgical demands of orthotopic liver transplantation in rats for studying and improving human transplant outcomes.*

Photo Credit: Bret Verhoven and Weifeng Zeng

Teratoma: Monster Tumor
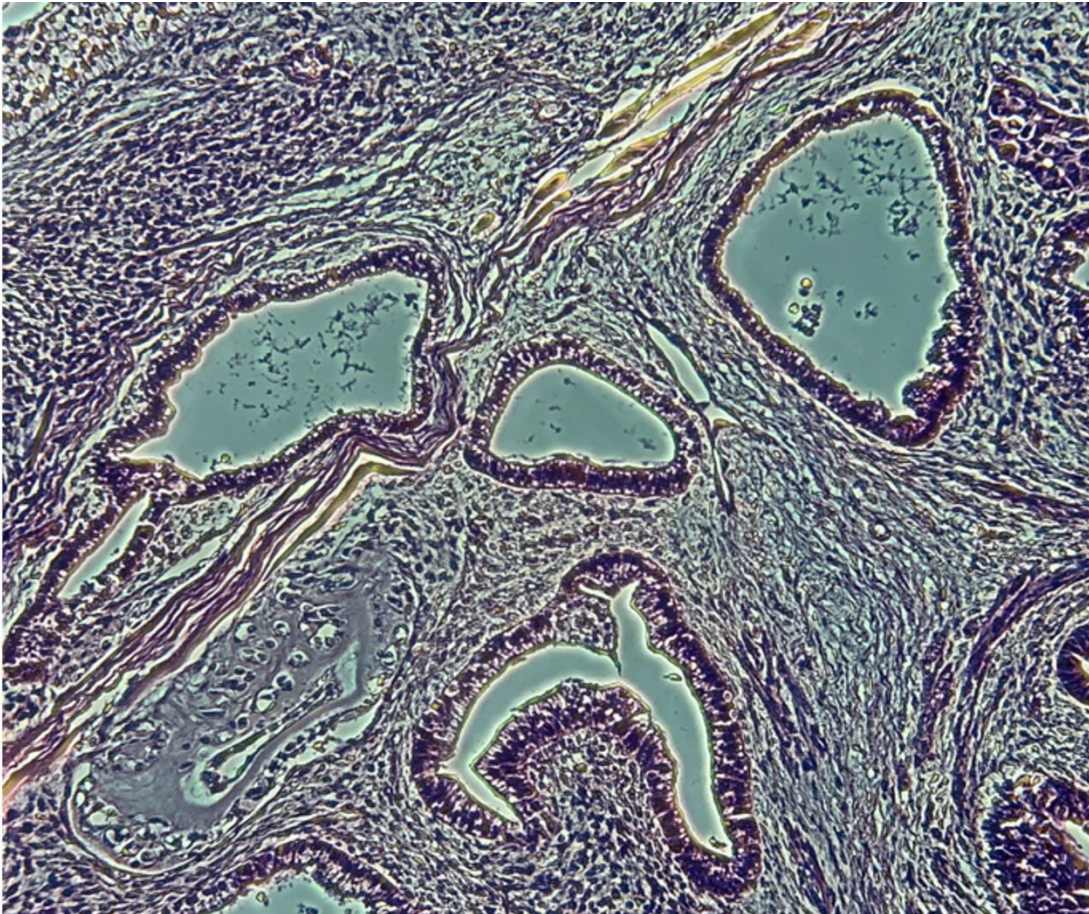
Caption: *This is an image of a teratoma. The sample is prepared by injecting human pluripotent stem cells into an immune-deficient mouse; after 6 weeks of growth, the tumor is removed and fixed for histological analysis. The image was taken on an Echo Revolve microscope, after the histology slide was stained with hematoxylin and eosin (H+E).*

We selected this image of a monster-like face because the word 'teratoma' is derived from the Greek words for monster and tumor. The perceived face makes for interesting art, while the numerous cell types present within the sample provide crucial information about the pluripotent nature of the input stem cells (i.e., their potential for developing into multiple human cell types). One day, the cells within this image may be transformed into life-saving treatments for a number of diseases.

Photo Credit:
Image taken by Matthew E. Brown, PhD
Histology by Sierra Raglin

Dual L1/K14 Immunofluorescence in MmuPV1-infected Mouse Cervical Epithelium
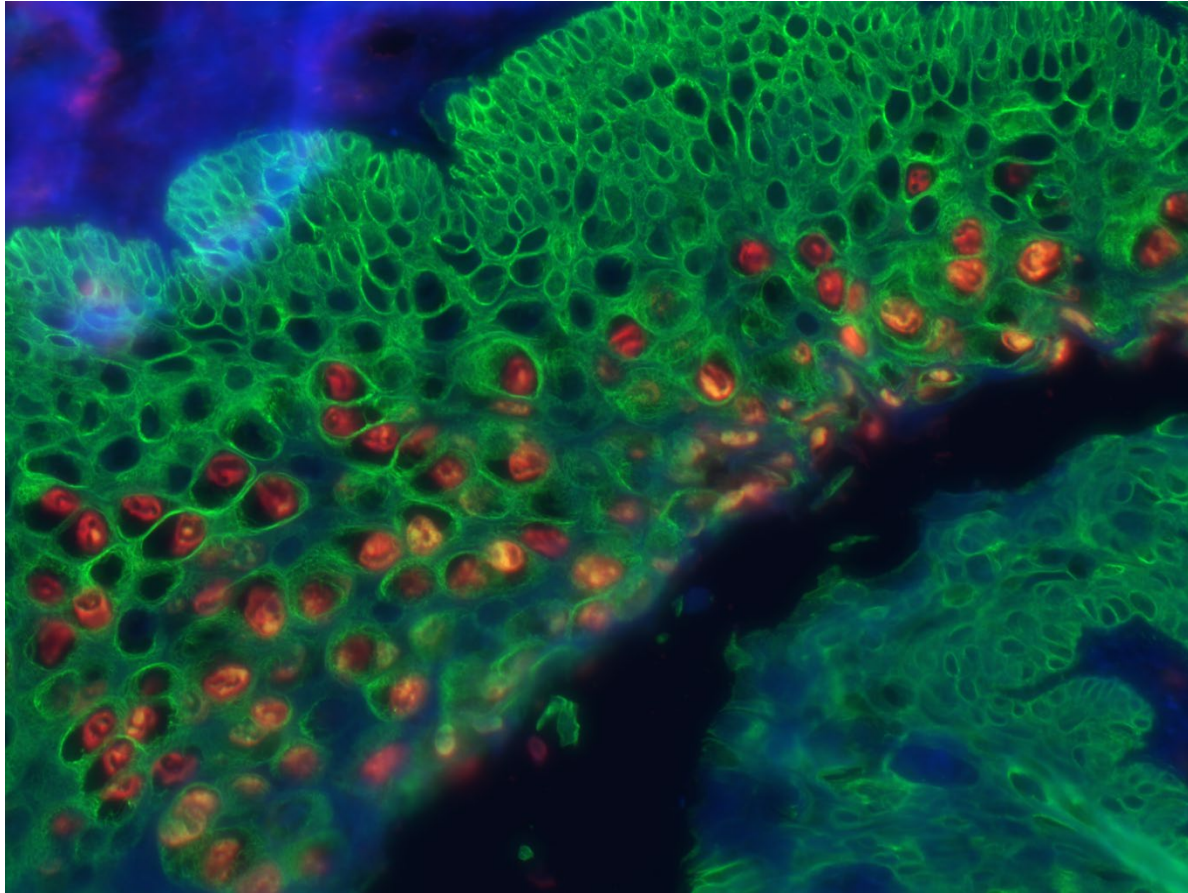
Caption: This is a section of fixed tissue from an immunocompromised NOD SCID gamma mouse infected with mouse papillomavirus (MmuPV1) in the cervicovaginal canal. Dual L1/K14 tyramide signal amplification (TSA) immunofluorescence was performed: L1 stained red and Keratin14 stained in green. The image was taken using a Zeiss Axio Imager M2 imaging system. This stain allows for visualization of productive virus in tissue.

Photo Credit: Laura Gunder and Evie Carchman, MD

Fischer 344/Brown Norway Rat Genioglossus Muscle
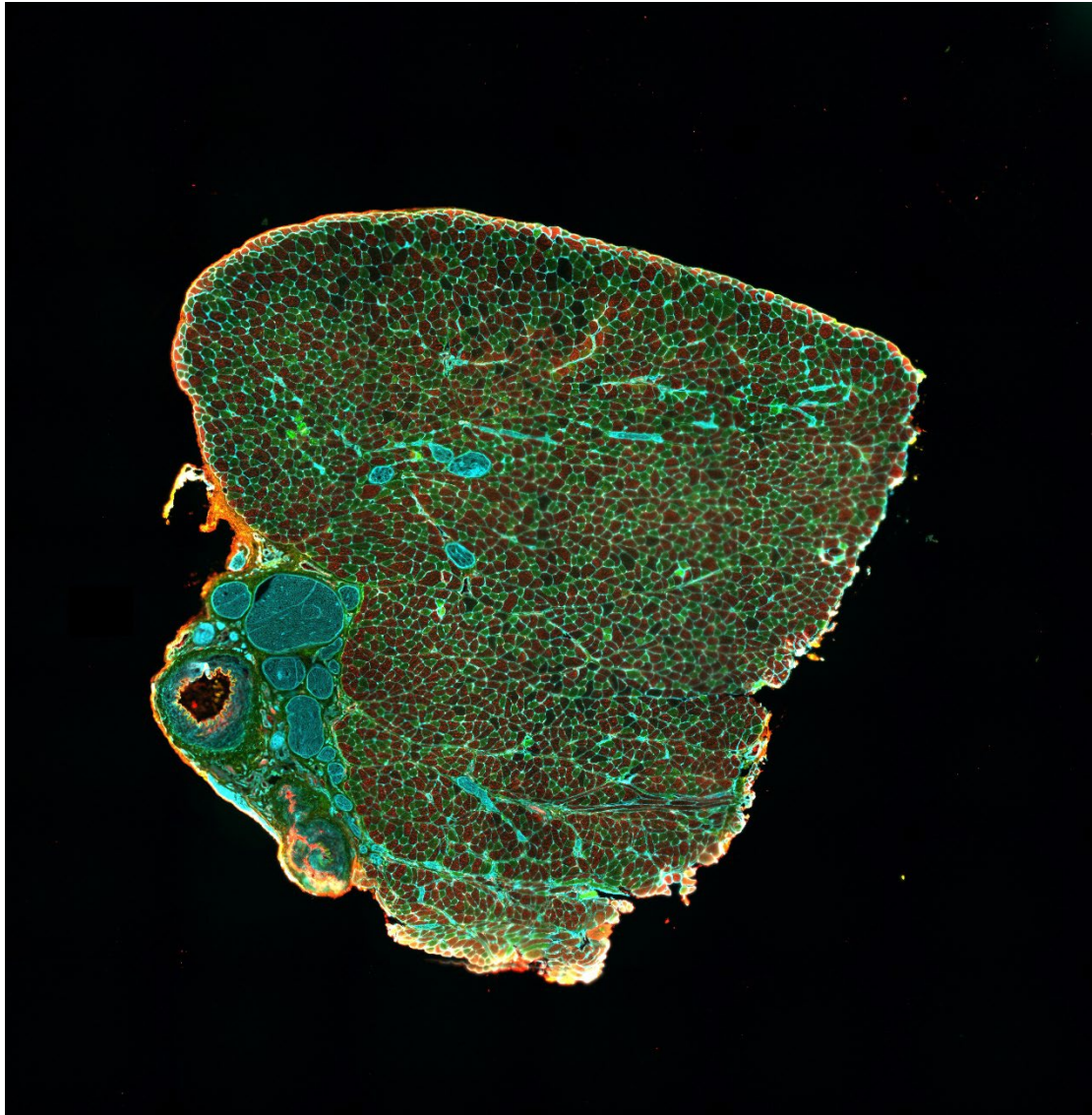
Caption: *This picture shows a cross section of a Fischer 344/Brown Norway rat genioglossus extrinsic tongue muscle stained using a technique called immunohistochemistry. It was taken with an Olympus epifluorescence microscope. Nerves and muscle fiber cell membranes are stained in blue; fast contracting muscle fibers are stained in red and green. This image can be analyzed by quantifying the clustering of like muscle fiber types, which may signify remodeling of the muscle due to denervation and reinnervation following a stroke.*

Photo Credit: Julia Mordarski from the Connor Lab

Intrinsic Tongue of Ts65Dn Down Syndrome Mouse
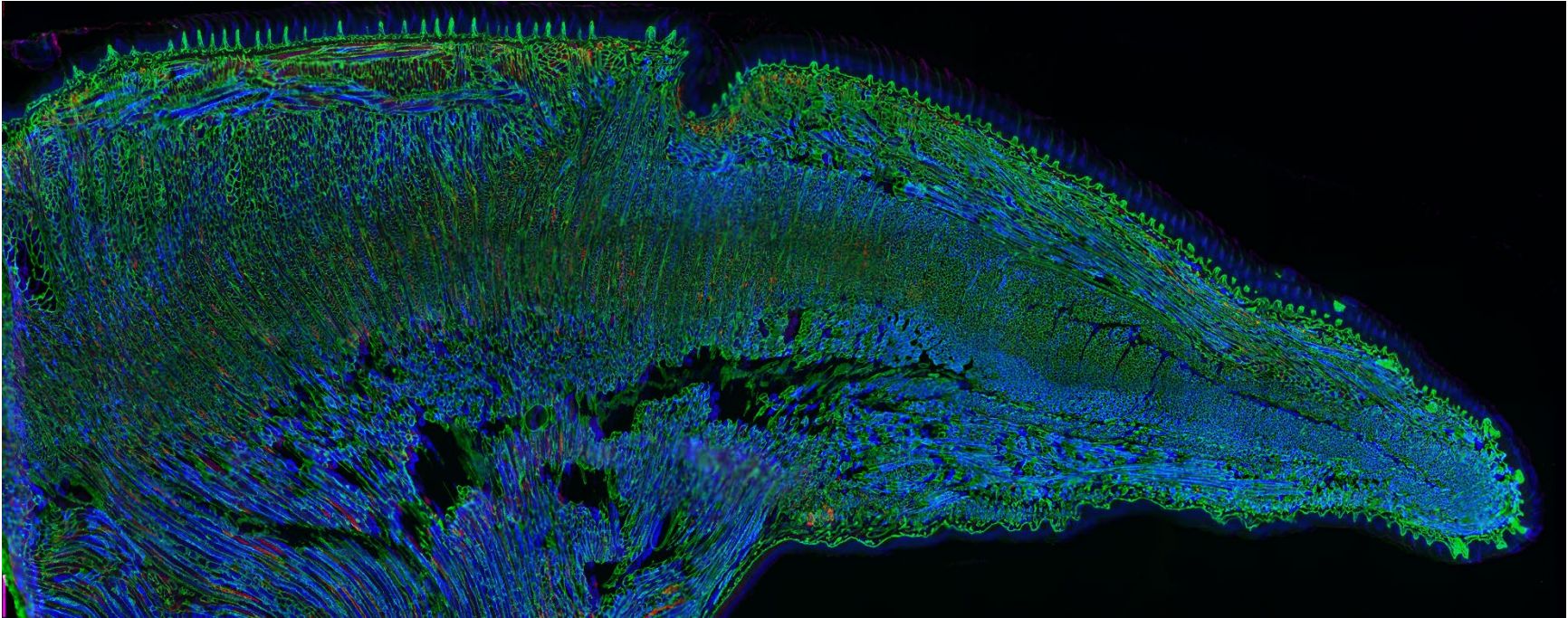
Caption: *This is an image of the intrinsic tongue muscles of a 35-day old Ts65Dn mouse model of Down syndrome. The image was taken using an Olympus epifluorescence microscope. Relatively fast tongue myofibers are stained in blue, and relatively slower myofibers are stained in red. As you move from the tip of the tongue (on the far right) towards the middle and posterior regions, the transverse myofibers (located in the central tongue) tend to be less blue and more red. This image is useful because it allows us to quantify how biological attributes of tongue muscles change in different regions of the tongue during postnatal maturation in this mouse model. This research may help us to better understand developmental differences in tongue function that can occur in Down syndrome.*

**Photo Credit:** Ben Chatwin

The Booth

Caption: *In vivo, it is incredibly difficult to observe and study the behavior of the larynx. Because human skin is not translucent, the only visuals that can be achieved are videos taken from the start of the oral cavity, pharynx area, which only provides a top view of the larynx. Therefore, to fully study the larynx, it needs to be extracted and studied independently. Our lab mainly uses canine larynges, which are always harvested ethically. In the lab, we have a booth that gives us the ideal set up for an isolated larynx and allows for many different manipulations of it. This photo depicts this very important area. It contains a lot of technologies that mimic the behavior of a larynx's surroundings. Additionally, it is set up to automatically take measurements and record on computers that are connected to the booth. This photo was taken on a Google Pixel 7, a newer type of cellphone. An interesting fact about the booth is that this piece of technology was integral to my PI's research and his most cited paper used it to measure the pressure inside the glottis that is created when the lung provides air for speech.*

Photo Credit: Katerina Smereka and Kyle Harkin

Utility of Intraoperative Fluorescence in Assessment of Tissue Perfusion
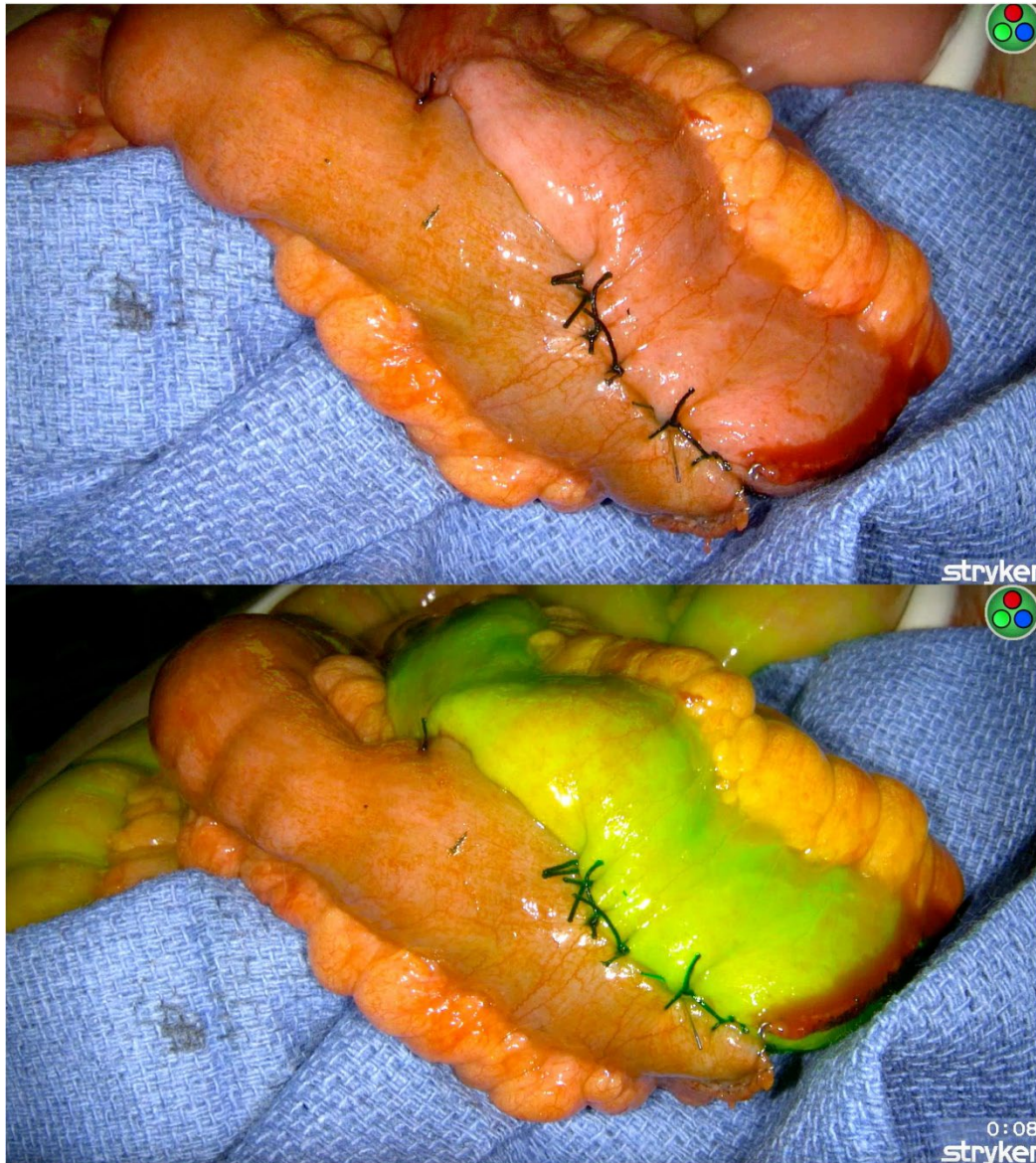

Caption: *The upper panel of this image depicts the two sides of a bowel anastomosis done after resection of a small bowel neuroendocrine tumor with associated mesentery. When the anastomosis was performed, both ends of the bowel appeared healthy and viable, but after it was completed, one side appeared congested but still pink and viable. 2.5mg of indocyanine green was administered IV and the SPY-PHI was utilized to assess tissue perfusion. There was a marked differential in fluorescence between the two sides. Furthermore, the cut-off point where the bowel on the poorly-perfused side fluoresced well was quite far (approx. 15cm) from the anastomosis, and beyond the area where the bowel appeared healthy and normal grossly (lower panel). Intraoperative fluorescence can clearly demonstrate where tissue is well perfused and guide where an anastomosis should be performed, beyond what can be appreciated with the naked eye. As a result of this finding, this anastomosis was re-done.*

Photo Credit: Kaitlyn Kelly

When Science meets Mindfulness – My Approach towards Productive Research
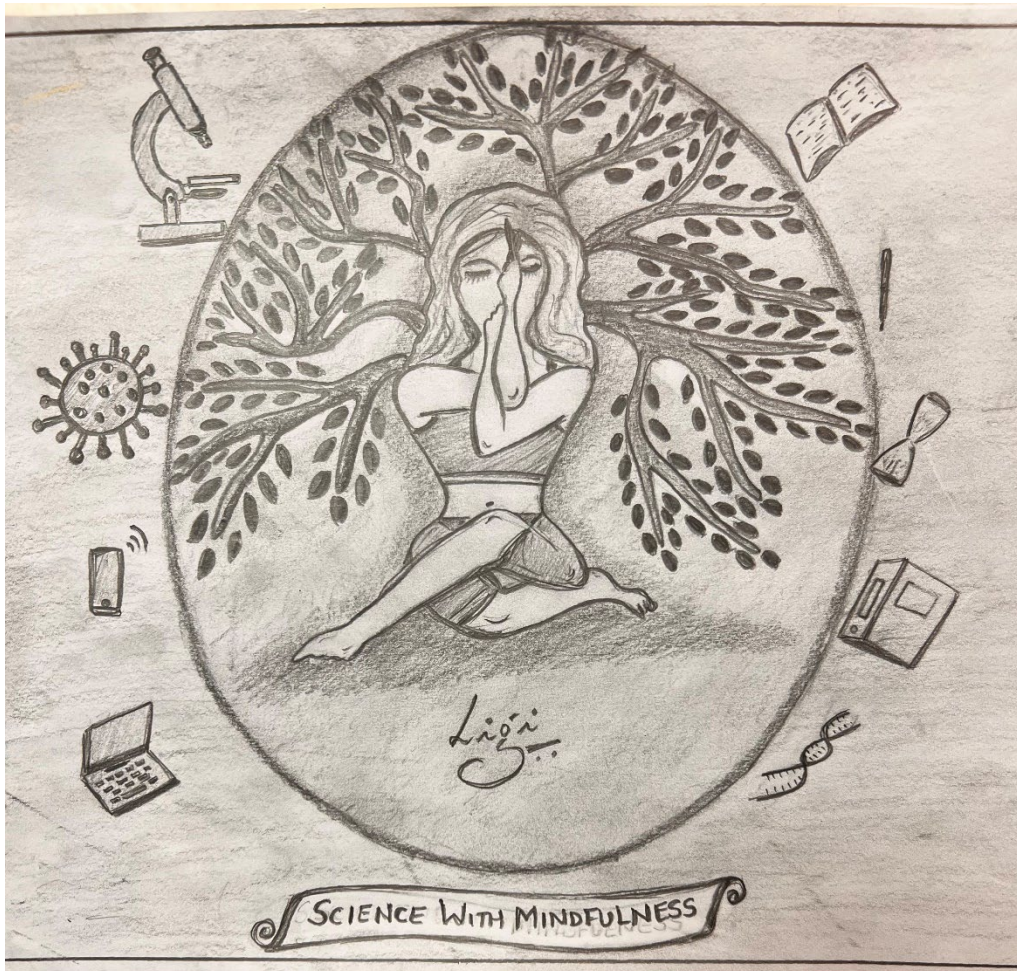
Caption: *The Image depicts my approach towards productive research by taming my mind to focus on what's happening in the present moment. It typically involves directing our awareness to our breath, our thoughts, the physical sensations in our body, and the feelings that we are experiencing with focus on mind and body integration causing downstream effects throughout the body.*

The art depicts how to control our minds and be focused on our research with various challenges and responsibilities. My art showcases Science with mindfulness where the branches depicts various challenges and responsibilities and how to deal with the present situation with the sense of mindfulness thus allowing us to prioritize the task and be more productive in our duties.

I feel in this stressful life, we all should practice mindfulness as it's a skill to control our minds. The more we are able to control it, the more we will be focused on our present duties including research, which in turn will result in good outcomes. My art aims to promote science with mindfulness, which enhances focus, resilience, empathy, and well-being amongst everybody thus creating a positive environment and reducing stress.

Photo Credit: Ligi Milesh

Half-Born; Ex-Utero Intrapartum Treatment

Caption: *Ex-Utero Intrapartum Treatment (EXIT) is a delivery option for infants with high risk of cardiorespiratory compromise and death at birth. During an EXIT, the fetus is partially delivered and airway is obtained, mass resected or cannulation for ECMO is performed while maintaining the fetus attached to the placenta and partially in-utero prior to full delivery. This image was taken intraoperatively and depicts an EXIT procedure bringing a fetus into the world with a stable airway who may not have survived otherwise. After several attempts, an endotracheal tube was passed over a naked scope to secure the airway. EXIT is an extremely rare procedure with little agreement in the fetal community on true indications, timing, and technique. Thus, any experience in EXIT is a significant contribution to the field, specifically one such as this with a favorable outcome.*

Photo Credit: Inna Lobeck, Casey Winchester, Michael Puricelli, Michael Beninati

Teaching Microsurgery International Livestream

Caption: *This is a screenshot of Dr. Weifeng Zeng's Livestream during his teaching session to over 60 microsurgeons in 12 different countries around the world. Countries in attendance included the USA, Oman, Egypt, Ukraine, Taiwan, India, Vietnam, Yemen, Nigeria, Algeria, China, and Argentina. Dr. Zeng's Livestream is a recurring free educational tool for microsurgeons around the world to share his expertise. Each session is tailored to the skill level of the audience and focuses on topics such as an introduction to the surgical microscope and instruments, and the principles of connecting small blood vessels underneath the microscope. The sessions are interactive so that audience members can ask questions in real-time during the Livestream. In doing so, Dr. Zeng is enabling the dispersion of microsurgical knowledge to regions of the world that otherwise would not have this training.*

Photo Credit: Weifeng Zeng, Sahand Eftekar

A Swanky Sankey: What Surgeons Talk About When They Talk About Surgery
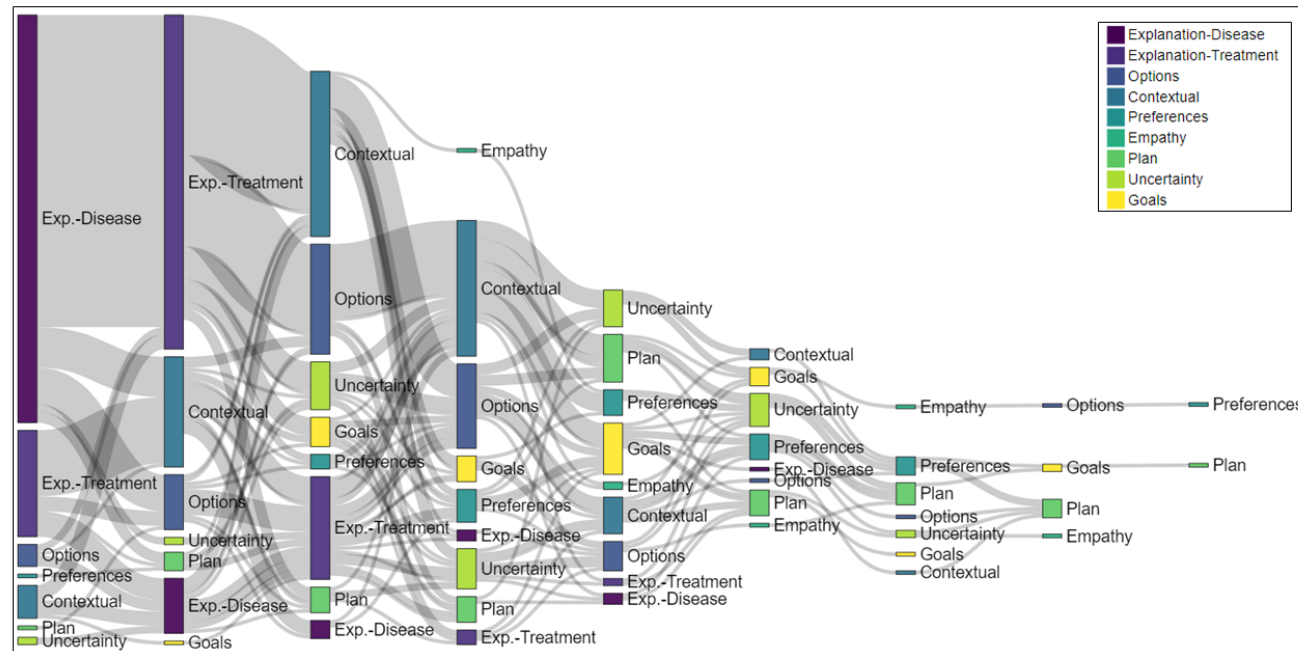
Caption: *This Sankey Diagram displays the order surgeons introduced content in 169 consultations about high-risk surgical intervention. Although most domains appeared multiple times throughout each conversation, the Sankey diagram shows only a domain's first occurrence within each conversation. The columns represent the order new content occurred, such that the leftmost column includes content that appeared first, and the second column represents subsequent content. The vertical space associated with a domain in each column is proportional to the number of conversations introducing that content in that position. The height of the grey connections between columns illustrates the frequency of transitions from one content area to another. This diagram shows that surgeons frequently began conversations with a description of the disease followed by an explanation of treatments. In-depth assessment of communication patterns might reveal opportunities to better support patient deliberation and encourage engagement. This figure was created using R version 4.0.2.*

Photo Credit: Lily N. Stalter, Nathan D. Baggett, Bret M. Hanlon, Anne Buffington, Elle L. Kalbfell, Amy B. Zelenski, Robert M. Arnold, Justin T. Clapp, Margaret L. Schwarze