

# Department of Surgery Research Day

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## Abstract Book

May 05 & 12, 2021



School of Medicine  
and Public Health

UNIVERSITY OF WISCONSIN-MADISON

# RESIDENT RESEARCH DAY – PART 1

## DEPARTMENT OF SURGERY

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**WEDNESDAY, MAY 05, 2021**

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<b>6:30 – 6:35 AM</b>	<b>Introduction and Welcome</b> Ann O'Rourke, MD, MPH
<b>6:35 – 6:50 AM</b>	<b>Identifying Behavioral Facilitators to Weight Loss After Bariatric Surgery: Are there differences between Medicaid and non-Medicaid patients?</b> <i>Presenter:</i> Jacqueline Murtha, MD - General Surgery, PGY3R <i>Mentor:</i> Luke Funk, MD <i>Discussant:</i> Dan Abbott, MD
<b>6:50 – 7:05 AM</b>	<b>Perceptions of Communication Practices and Workflow of Surgical Residents and Nurses on General Medical-Surgical Floors</b> <i>Presenter:</i> Laura Krecko, MD - General Surgery, PGY3R <i>Mentor:</i> Caprice Greenberg, MD, MPH and Sarah Jung, PhD <i>Discussant:</i> Julia Berian, MD, MS
<b>7:05 – 7:20 AM</b>	<b>Circadian Disruption Alters the Pancreatic Lipid Phenotype to Promote Diacylglycerol Formation</b> <i>Presenter:</i> Patrick Schwartz, MD - General Surgery, PGY3R <i>Mentor:</i> Sean Ronnekleiv-Kelly, MD <i>Discussant:</i> David P. Al-Adra, MD, PhD
<b>7:20 – 7:35 AM</b>	<b>Promoting Patient Engagement During Care Transitions After Surgery Using Mobile Technology: Lessons learned from the MobiMD pilot study</b> <i>Presenter:</i> Tom Diehl, MD - General Surgery, PGY3R <i>Mentor:</i> Daniel Abbott, MD <i>Discussant:</i> Sharon Weber, MD
<b>7:35 – 7:50 AM</b>	<b>Investigating the Role of Receptor Interacting Protein Kinase 3 (RIPK3) in Venous Thrombosis</b> <i>Presenter:</i> Elise DeRoo, MD - Vascular Surgery, PGY3R <i>Mentor:</i> Bo Liu, PhD <i>Discussant:</i> Mehreen Kisat, MD
<b>7:50 – 8:05 AM</b>	<b>Improving the Virtual Meet and Greet Experience: A Survey of Otolaryngology Residency Applicants</b> <i>Presenter:</i> Allison Knewitz, MD – Otolaryngology Head & Neck Surgery, PGY2 <i>Mentor:</i> Tiffany Glazer, MD <i>Discussant:</i> A Neil Salyapongse, MD

# RESIDENT RESEARCH DAY – PART 2

## DEPARTMENT OF SURGERY

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WEDNESDAY, MAY 12, 2021

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6:30 – 6:35 AM	<b>Introduction and Welcome</b> Ann O'Rourke, MD, MPH
6:35 – 6:50 AM	<b>Short-course Neoadjuvant Intratumoral Immunocytokine Establishes Immunologic Memory in Murine Melanoma</b> <i>Presenter:</i> Taylor Aiken, MD - General Surgery, PGY3R <i>Mentor:</i> Paul M. Sondel, MD, PhD <i>Discussant:</i> Sean Ronnekleiv-Kelly, MD
6:50 – 7:05 AM	<b>Extracting Health-Related Quality of Life Information From Patient Language in Thyroid Cancer using BERT</b> <i>Presenter:</i> Vivian Hsiao, MD - General Surgery, PGY3R <i>Mentor:</i> David F. Schneider, MD, MS <i>Discussant:</i> Heather B Neuman, MD, MS
7:05 – 7:20 AM	<b>Overlapping Surgery; An Ethical, Professional and Legal Analysis</b> <i>Presenter:</i> Elle Kalbfell, MD - General Surgery, PGY3R <i>Mentor:</i> Margaret L. Schwarze, MD, MPP <i>Discussant:</i> Charles Heise, MD
7:20 – 7:35 AM	<b>Comprehensive Measurement of Functional Status and Quality of Life of Targeted Muscle Reinnervation Patients using Patient Reported Outcomes</b> <i>Presenter:</i> Rosaline Zhang, MD – Plastic Surgery, PGY2 <i>Mentor:</i> Brett Michelotti, MD <i>Discussant:</i> Ben Zarzaur, MD, MPH
7:35 – 7:50 AM	<b>Why and How do Surgeons Implement New Procedures into Practice? A Qualitative Study</b> <i>Presenter:</i> Bethany Powers, MD - Otolaryngology Head & Neck Surgery, PGY5 <i>Mentor:</i> David O. Francis, MD, MS <i>Discussant:</i> Angela Ingraham, MD, MS

## **SHORT-COURSE NEOADJUVANT INTRATUMORAL IMMUNOCYTOKINE ESTABLISHES IMMUNOLOGIC MEMORY IN MURINE MELANOMA**

*Taylor J. Aiken, David Komjathy, Mat Rodriguez, Arika Feils, Stephen D. Gillies, Amy K. Erbe, Alexander L. Rakhmilevich, Paul M. Sondel*

**Background:** GD2 is disialoganglioside preferentially expressed in neuroblastoma and melanoma and anti-GD2 directed therapies are used clinically in neuroblastoma, with ongoing clinical trials in melanoma. We are currently developing an *in situ* vaccination approach using intratumoral (IT) delivery of an immunocytokine (IC) consisting of IL-2 linked to an anti-GD2 monoclonal antibody. While IT-IC monotherapy does not cure mice bearing immunologically cold melanoma tumors, it is effective when combined with other modalities such as radiation therapy (RT). We tested whether neoadjuvant IT-IC monotherapy prior to surgical resection could result in a robust adaptive immune response against distant disease.

**Methods:** Mice bearing 100mm<sup>3</sup> GD2-expressing B78 melanoma tumors were treated with a 5-day course of 50µg IT-IC and complete surgical resection was performed 3 days following the final treatment. The immune infiltrate of resected tumors was assessed by flow cytometry. Rechallenge experiments were performed to assess for immunologic memory and consisted of either 2x10<sup>6</sup> B78 cells injected into the contralateral flank or 2x10<sup>5</sup> B16 cells injected via tail vein for pulmonary metastasis rechallenge.

**Results:** IT-IC treated tumors had fewer viable tumor cells, increased CD8 T-cells, and an improved CD8:Treg ratio. Rejection of B78 contralateral flank rechallenge (implanted 40 days following surgical resection of the primary tumor) was observed in 78% (7/9) of mice treated with IT-IC compared to 50% (5/10) that received surgery alone and 0% (0/5) of naïve mice. Immunologic memory was potent in neoadjuvant-treated mice early after surgery, with all mice (5/5) rejecting contralateral B78 rechallenge that occurred on the day of surgery compared to 0% (0/5) in both surgery-alone and naïve mice. Neoadjuvant IT-IC also prevented the development of B16 lung metastasis compared to naïve mice or the surgery-alone group.

**Conclusions:** While ineffective in curing large B78 melanoma flank tumors as monotherapy, mice receiving neoadjuvant IT-IC developed robust immunologic memory preventing recurrence following surgery. The memory response was present as early as the day of surgery and was sufficient to prevent pulmonary metastasis. IT-IC should be further investigated as a neoadjuvant therapy for preventing recurrence in high-risk settings.

## **INVESTIGATING THE ROLE OF RECEPTOR INTERACTING PROTEIN KINASE 3 (RIPK3) IN VENOUS THROMBOSIS**

*Elise DeRoo, MD; Mitri Khourey, MD; Bo Liu, PhD.*

**Objectives:** Venous thromboembolism (VTE) is a disease that encompasses both deep vein thrombosis (DVT) and pulmonary embolism (PE). Recent investigations have shown that Receptor Interacting Protein Kinase 3 (RIPK3), a protein known for its role in the programmed form of cell death necroptosis, may play a role in thrombosis. Specifically, RIPK3 has been shown to promote platelet activation in arterial thrombosis and Mixed Lineage Kinase Domain Like Pseudokinase (MLKL), a protein downstream of RIPK3 in the necroptosis pathway, has been shown to promote neutrophil extracellular trap (NET) formation in DVT. This investigation sought to comprehensively investigate the role of RIPK3 in DVT.

**Methods:** The inferior vena cava (IVC) ligation model of DVT was used in C57BL/6J, littermate wildtype (*Ripk3*<sup>+/+</sup>), and littermate RIPK3 deficient (*Ripk3*<sup>-/-</sup>) mice. RIPK3 levels were determined by western blotting and immunostaining.

**Results:** *Ripk3*<sup>-/-</sup> mice formed smaller DVTs compared to *Ripk3*<sup>+/+</sup> mice. C57BL/6J mice showed significant increases in thrombus weight from 6 to 24hrs and 24 to 48hrs. RIPK3 progressively accumulated in the vein wall from 6 to 48hrs after DVT. RIPK3 was present in the thrombus, but decreased in abundance relative to total protein over time. While MLKL was present in the thrombus at 6, 24, and 48hrs, no appreciable MLKL was detected in the vein wall by western blot at any timepoint. At 48hrs after DVT, immunostaining revealed high RIPK3 in the vein wall. RIPK3 primarily colocalized to endothelial and smooth muscle cells. Phosphorylated-MLKL, the active form of MLKL and executioner of necroptotic cell death, was detectable by immunostaining in the thrombus, but was present at low to undetectable levels in the vein wall. Propidium iodide staining revealed a high burden of necrotic cells within the thrombus at 48hrs, but low burden of necrotic cells within the vein wall.

**Conclusions:** In the setting of VTE, RIPK3 rapidly accumulates within the vein wall. While markers of necroptosis (MLKL, pMLKL, PI positivity) were noted within the thrombus by 48 hours after DVT, these markers were present at low to undetectable levels in the vein wall despite high levels of RIPK3. While further investigation is needed, these findings suggest a potentially novel role for RIPK3 in DVT at the level of the vein wall outside of its roles in promoting platelet activation, NET formation, and necroptosis.

## RETROSPECTIVE REVIEW OF GASTROSCHISIS IN A LOW-RESOURCE SETTING: CAN IMPROVED ANTIBIOTIC STEWARDSHIP REDUCE LATE INPATIENT DEATHS?

Thomas M. Diehl; Edmond Ntaganda; James R. Davis; Alice Nsengiyumva; Deborah Igiraneza; Kyung W. Hong; Rosine Umutohi; Dan Neal; Robin T. Petroze

**Background:** Gastroschisis has a <4% mortality rate in high-income countries, but 75-100% mortality in LMICs. While early deaths (<48hrs after presentation) are affected by delays in transport and initial resuscitation, late deaths (>48hrs) are often secondary to sepsis and slow gastrointestinal recovery with resultant malnutrition. Anti-microbial resistance is a widely acknowledged problem across Africa; however, exact patterns of resistance are not well understood. This study aimed to understand the gastroschisis population and antibiotic management at a low-resource hospital in Rwanda to identify modifiable factors for increased survival.

**Methods:** Data was collected retrospectively for all gastroschisis patients presenting from 1/2016—6/2019 to Centre Hospitalier Universitaire de Kigali, which receives all of Rwanda's gastroschisis referrals. Descriptive and univariate analyses were conducted with primary outcome being survival to discharge. Secondary analysis evaluated antimicrobial usage, time to enteral nutrition, and mortality in patients surviving to abdominal closure.

**Results:** 92 gastroschisis patients were identified during the study period. Overall mortality was 77.2% (n=71). 8.7% (n=8) died within 48 hours and 51% (n=47) died before silo removal and bedside abdominal closure. 95.7% (n=88) were treated for sepsis on arrival. There was no difference in antibiotic usage between survivors and non-survivors. Antibiotic selection included 90% penicillin, 63% aminoglycosides, 35% cephalosporins, 32% carbapenem, and 21% vancomycin. Of patients surviving to abdominal closure (n=44), there was no difference in time to closure, time to enteral feeds, or length of stay between survivors and non-survivors (Table 1).

**Conclusions:** Mortality from gastroschisis remains high in Rwanda. Early survival is improving, but frequent late deaths highlight the need for larger prospective studies to evaluate nutritional support and antimicrobial stewardship. The high proportion of hospital days on antibiotics and frequent use of vancomycin and carbapenems in this retrospective study raise concern for antibiotic resistance and will affect data collected in an upcoming prospective registry.

### Abbreviations:

LMICs = Low- and middle-income countries

**Table 1.** Comparison of Gastroschisis Management Between Late Death Patient Subset Who Died After Abdominal Closure versus Patients Who Survived to Hospital Discharge.

	Late Deaths – Died After Closure (N=23, 52.3%) (median [IQR])	Survived to Discharge (N=21, 47.7%) (median [IQR])	p-value
Proportion of hospital days on antibiotics	87.5% [71-100]	75.9% [64-86]	0.17
Proportion of post-closure days on antibiotics	80% [61-100]	66.7% [57-77]	0.19
Days from admission to final closure	8 [6-13]	7 [6-10]	0.39
Days from admission to initiation of enteral feeds	10 [8-13]	8.5 [7-11]	0.10
Total length of stay	28 [18-34]	28 [22-36]	1

*\*\*Research Day Presentation*

## PROMOTING PATIENT ENGAGEMENT DURING CARE TRANSITIONS AFTER SURGERY USING MOBILE TECHNOLOGY: LESSONS LEARNED FROM THE MOBIMD PILOT STUDY

Thomas M. Diehl, MD; James R. Barrett, MD; Linda M. Cherney Stafford, MPH; Sharon M Weber, MD; Corrine Voils, PhD; Daniel E. Abbott, MD

**Importance:** Poorly coordinated transitions of care in complex abdominal surgery patients contribute to frequent hospital readmissions and inflated healthcare spending. Mobile health (mHealth) transitional care technologies may reduce surgical readmissions yet remain understudied in high-risk surgical populations.

**Objective:** Pilot an mHealth transitional care app in complex surgical patients

**Design:** Prospective, single-arm study, completed November 2019 to June 2020

**Setting:** Single-center, large academic hospital

**Participants:** 50 patients undergoing complex abdominal surgery in the divisions of surgical oncology and colorectal surgery. Enrollment occurred either at pre-operative clinic visits or during post-operative hospital admission.

**Main Outcome(s) and Measure(s):** The main outcome was app engagement, calculated by participant response rate (number of patient-entered datapoints divided by the total number of app-requested datapoints) over the 30-day post-operative period. Secondary outcomes included changes in engagement over time and by individual app feature (medications, vital signs, wound image upload, etc.).

**Results:** 85% (50/59) of eligible patients provided consent and downloaded the MobiMD app. Most participants were male (62%, n=29), and mean age was 49 years (range 24-80 years). 62% of participants (29/47) engaged with the app at least once after discharge (active engagers) with a 45% average response rate. The mean notification response rate among active engagers decreased over time from 50% to 32% between weeks 1 and 4 after discharge. Engagement with individual app features ranged from 48-81%, with highest engagement for symptom reports and vital signs and lowest engagement for wound care instructions and wound image uploads.

**Conclusions and Relevance:** mHealth transitional care and home monitoring is feasible in complex surgical patients using only patients' existing smart devices. Randomized trials are required to determine the impact on hospital readmissions, surgical outcomes, patient satisfaction and overall resource utilization.

## NOT ALL CONTROL ARE CREATED EQUALLY: DIFFERENCES IN CUTANEOUS GENE EXPRESSION AMONG CONTROL GROUPS USED IN BREAST RESEARCH

Kirsten A. Gunderson, BS; Rebecca L. Farmer, MD, PhD; Sarah M. Lyon, MD; Jacqueline S. Israel, MD;

Sandra Splinter BonDurant, MS; Zeeda H. Nkana, BS; Katherine M. Gast, MD; Samuel O. Poore, MD,

PhD; John W. Siebert, MD

**Introduction:** In breast cancer research, it is common practice to define a control group as any non-cancerous breast tissue. A variety of tissue sources have been used throughout the literature to serve as controls, including the contralateral, unaffected breast in cancer patients, prophylactic risk-reducing mastectomy specimens, and tissue from patients undergoing elective, non-oncologic breast procedures. The purpose of this study was to define the gene expression profiles of commonly used control groups in breast cancer research and to assess for major differences in the activity of particular biologic pathways.

**Methods:** Full thickness skin samples were collected from patients undergoing non-oncologic breast procedures (i.e., breast reduction or breast augmentation) or prophylactic, risk-reducing mastectomy. Additionally, samples were taken from the contralateral breast of breast cancer patients who chose to have simultaneous risk-reducing mastectomy of the unaffected breast. Patients with known inflammatory or immunologic conditions were excluded. All samples were analyzed using RNA-Seq technology to determine their cellular transcriptome. Gene expression was then analyzed via hierarchical clustering to identify biologic pathways that showed differing levels of activity between the three groups.

**Results:** A total of 81 skin samples were included for analysis, including 20 non-oncologic breast procedure samples, 26 risk-reducing mastectomy samples, and 35 samples from the unaffected breast of breast cancer patients. Analysis showed distinct differences between the gene expression profiles of each group. Several pro-oncologic and inflammatory pathways were found to be up-regulated in patients undergoing prophylactic mastectomy, including TNF, PI3Kakt and JAK-STAT, when compared to non-oncologic samples. Similarly, MAPK and Ras signaling pathways were found to be upregulated in the unaffected breast in breast cancer patients as compared to both benign controls and those undergoing prophylactic mastectomy.

**Conclusions:** We have demonstrated that there are significant, fundamental differences in the cutaneous gene expression profiles of healthy patients, patients known to be at increased risk of breast cancer, and the unaffected breast of breast cancer patients. These findings suggest that control groups for breast cancer research must be carefully chosen in order to eliminate confounding variables due to baseline differences in gene expression.

## DISPARITIES IN TELEMEDICINE ACCESS: A CROSS-SECTIONAL STUDY OF A NEWLY ESTABLISHED INFRASTRUCTURE DURING THE COVID-19 PANDEMIC

Vivian Hsiao MD, Thevaa Chandereng PhD, Robin L. Lankton MPH CHES, Jeffrey A. Huebner MD, Jeffrey J. Baltus MS, Grace E. Flood MD MPH, Shannon M. Dean MD, Amye J. Tevaarwerk MD, David F. Schneider MD MS

**Background:** The COVID-19 pandemic led to dramatic increases in telemedicine use to provide outpatient care without in-person contact risks. Telemedicine increases options for healthcare access, but a “digital divide” of disparate access may prevent certain populations from realizing the benefits of telemedicine.

**Objectives:** To understand telemedicine utilization patterns after a widespread deployment in order to identify potential disparities exacerbated by expanded telemedicine usage.

**Methods:** We performed a cross-sectional retrospective analysis of adults who scheduled outpatient visits between 6/1/2020 and 8/31/2020 at a single integrated academic health system encompassing a broad range of subspecialties and a large geographic region in the Upper Midwest, during a period of time after the initial surge of COVID-19 when most standard clinical services had resumed. At the beginning of this study period, approximately 72% of provider visits were telemedicine visits. The primary study outcome was whether a patient had one or more video-based visits, compared to audio-only (telephone) visits or in-person visits only. The secondary outcome was whether a patient had *any* telemedicine visits (video-based *or* audio-only), compared to in-person visits only.

**Results:** 197,076 individuals were eligible (average age 46 years, 56% female). Increasing age, rural status, Asian or Black/African American race, Hispanic ethnicity, and self-pay/uninsured status were significantly negatively associated with having a video visit. Digital literacy, measured by patient portal activation status, was significantly positively associated with having a video visit, as were Medicaid or Medicare as payer and American Indian/Alaskan Native race.

**Conclusions:** Our findings reinforce previous evidence that older age, rural status, lower socioeconomic status, Asian race, Black/African American race and Hispanic/Latino ethnicity. are associated with lower rates of video-based telemedicine use. Health systems and policies should seek to mitigate such barriers to telemedicine when possible, with efforts such as digital literacy outreach and equitable distribution of telemedicine infrastructure.

## **OVERLAPPING SURGERY; AN ETHICAL, PROFESSIONAL AND LEGAL ANALYSIS**

*Elle Kalbfell, MD; Margaret L. Schwarze, MD, MPP*

**Abstract:** In 2015, the Boston Globe released a highly publicized investigational series on overlapping and concurrent surgery. Surgeons were accustomed to overlapping and concurrent surgery, yet the general public was blindsided, unaware of its practice. This fostered mistrust in the surgical community and led to allegations of physician misconduct, patient harm and inappropriate billing. As a result, the American College of Surgeons and the Senate Finance Committee published overlapping surgery recommendations and guidelines and strong opposition against concurrent surgery. However, current overlapping and concurrent surgery policies vary widely across institutions and lack well defined protocols, implementation and enforcement. The absence of a standardized policy and oversight threatens the surgeon-patient relationship and patient welfare and autonomy. We discuss the evolving practice of overlapping and concurrent surgery including its ethical, professional and legal implications.

## **IMPROVING THE VIRTUAL MEET AND GREET EXPERIENCE: A SURVEY OF OTOLARYNGOLOGY RESIDENCY APPLICANTS**

*Christie F. Cheng, BS; Tiffany A. Glazer, MD; Allison P. Knewitz, MD; Thomas R. Pasic, MD, FACS*

**Background:** The COVID-19 pandemic altered how graduate medical education and residency recruitment occurred in the 2021 application cycle. As a result, many programs adapted by creating virtual opportunities to connect with applicants such as clerkships, open houses, meet and greets, and interviews. Recent research has explored applicant impressions on virtual interviews and open houses, but none have assessed the utility of meet and greets, the optimal structure, or desired topics to be addressed.

**Methods:** We hosted two virtual meet and greets for otolaryngology applicants and subsequently conducted a structured survey to assess the benefit, gather insight into desired topics, and determine how these sessions could be optimized in the future.

**Results:** The majority of participants learned about the event through social media (n=15) or online resources such as OtoMatch or HeadMirror (n=12). Desired topics to be addressed included faculty-resident relationships (85%), research (80%), the city of Madison (75%), breadth and depth of faculty (75%), and ability to train residents for future positions/fellowships (75%) among others. Overall, participants found the virtual meet and greet helpful in conveying the culture and environment, exposure to faculty and residents, addressing questions, and providing insight into intangible aspects of the program. The main area of improvement identified was related to having more breakout rooms, longer sessions, and varying the topics for each room.

**Conclusion:** Virtual meet and greets facilitate outreach and provide opportunities for applicants to engage with residency programs and demonstrate interest. While initially implemented due to the COVID-19 pandemic, they will likely remain helpful in generating interest, reaching broader audiences, and possibly facilitating a successful match. It is critical, however, to understand and incorporate the content that applicants wish to learn about at virtual meet and greets in order to best address questions, highlight key features, and demonstrate the intangible aspects of a residency program.

## **PERCEPTIONS OF COMMUNICATION PRACTICES AND WORKFLOW OF SURGICAL RESIDENTS AND NURSES ON GENERAL MEDICAL-SURGICAL FLOORS**

*Laura K. Krecko, MD; Shannon Carnahan; Sudha Pavuluri Quamme, MD, MS; Caprice Greenberg, MD, MPH; Sarah Jung, PhD*

**Background:** Communication errors contribute to a significant proportion of preventable adverse hospital events<sup>1–3</sup>. Although communication in healthcare is in need of improvement, effective communication remains incompletely understood<sup>4</sup> and there is a paucity of data on communication patterns on general medical-surgical floors<sup>3</sup>. Barriers to interprofessional communication have been previously characterized into three domains of complexity: Organizational (e.g., differences in workflow patterns and care models), Cognitive (e.g., the need for multiple forms of communication, use of an electronic health record), and Social (e.g., interpersonal relationships, hierarchy).<sup>5,6</sup> Such complexity is particularly pronounced for resident physicians and nurses caring for surgical patients, as these providers often rely on disruptive communication methods (e.g., paging) while residents are off-unit in the operating room or emergency department<sup>7</sup>. Despite these established challenges, there remains little standardization to inpatient communication practices for surgical residents and nurses. The aim of this study was to explore perceptions of communication practices and workflows of residents and nurses caring for inpatient general surgery patients. Our ultimate goal is to utilize the resulting qualitative data to inform the design of an interprofessional intervention to improve communication and patient safety.

**Methods:** Focus groups were conducted with general surgery residents and nurses via a secure video chat platform. Five groups were held, two for residents (total n=14, PGY1-PGY5) and three for nurses from both a general and a general/intermediate care unit (total n=13, nursing experience 6 months-15 years). Two facilitators (LKK, SJ) led each group and a third study team member (SC) observed, documented, and provided technical support. Focus groups were audio/video recorded and transcribed verbatim. Qualitative data was analyzed and themes were generated and coded using an abductive approach. Two coders (LKK, SJ) independently reviewed and coded transcripts and met regularly throughout the coding process to reach consensus. NVivo software was used for data organization and analysis.

**Results:** A number of themes were developed that fit within the previously described framework of organizational, cognitive, and social complexity<sup>5,6</sup>, including issues related to workflow misalignment, misunderstanding, and variability; situation-dependent advantages and disadvantages of synchronous versus asynchronous communication; and the importance and difficulty of explaining clinical reasoning and “closing the loop.” Participants cited numerous limitations of available communication technology (e.g., paging, Secure Chat) including inefficiency, disruptiveness, and lack of standardized usage. Residents and nurses alike emphasized the importance of choosing communication tools that align with the perceived urgency of messages to be conveyed, while recognizing that perceptions of urgency between providers often differ. Finally, multiple themes reflected how current communication practices compromise both provider and patient well-being.

**Conclusions:** The themes in this study are consistent with the known complexity of interprofessional communication and raised issues related specifically to limitations of current communication technology. Significantly, this study revealed how current communication practices compromise patient and provider well-being. It is clear that there remains a critical need to rigorously study and improve interprofessional communication between residents and nurses, and to optimize and standardize the use of communication technology to improve the safety and well-being of surgical patients and providers alike.

## **EXTRACTING HEALTH-RELATED QUALITY OF LIFE INFORMATION FROM PATIENT LANGUAGE IN THYROID CANCER USING BERT**

*Ruixue Lian, MS; Vivian Hsiao, MD; Juwon Hwang, MA; Sarah Robbins; Nadine Connor; Cameron MacDonald; Rebecca Sippel, MD; William A. Sethares, PhD; David F. Schneider, MD MS*

**Objective:** Patient-reported outcomes (PRO) such as health-related quality of life (HRQOL) allow clinicians and researchers to understand what matters most to patients in the course of their treatment, but measuring PRO requires surveys which are not part of routine care. We aimed to develop a natural language processing (NLP) program to extract HRQOL trajectory based on state-of-the-art deep learning models using patient language.

**Materials and Methods:** Our data consisted of up to five transcribed interviews of 100 patients undergoing surgical intervention for low-risk thyroid cancer, paired with HRQOL assessment surveys completed during the same visit. Our outcome measure was HRQOL trajectory measured by the SF-12 physical and mental scores (PCS and MCS), and the average THYCA-QoL score. We computed a baseline performance using logistic regression trained on a bag-of-words representation of each transcript obtained using Linguistic Inquiry and Word Count (LIWC). We then experimented with a fine-tuned bidirectional encoder representations from transformers (BERT) model for the same task. Finally, we describe two novel methods of data augmentation which optimized classification accuracy.

**Results:** The LIWC-based model achieved an area under curve (AUC) of 0.58, 0.55 and 0.55 in classifying PCS, MCS, and average THYCA trajectories, respectively. A fine-tuned BERT outperformed the LIWC model with AUCs of 0.69, 0.69 and 0.65. Further improvements up to 0.78 were obtained using two novel data augmentation methods.

**Discussion:** the BERT-based NLP program achieved good performance in classifying HRQOL trajectory. Two optimization methods based on augmentation improved performance, indicating that more data would further enhance accuracy.

**Conclusion:** These NLP methods show promise in extracting PRO from unstructured narrative data.



## COMPLICATIONS IN THE SURGICAL MANAGEMENT OF MICROPAPILLARY THYROID CARCINOMA

*Tyler Light, MD; Michael Tao, MD; Hsiao Vivian, MD; Mary Hitchcock; Natalia Arroyo, David O. Francis MD, MPH*

**Background:** Recent guidelines endorse a de-escalated approach to the treatment of micropapillary thyroid cancer (<1cm), with a recommendation to perform lobectomy rather than total thyroidectomy. However, uptake of these recommendations has been modest (at best) partly because clinicians lack adequate evidence to understand the differential risk profiles. The goal of this systematic review/meta-analysis was to compare complications between lobectomy and total thyroidectomy for treatment of micropapillary thyroid cancer.

**Methods:** A systematic review of the PubMed database was queried with a search strategy implemented by reference librarian between years 1990-2018. Two investigators independently reviewed abstracts and full-texts based on inclusion criteria. Risk of bias and strength of evidence were assessed for each included article. Surgical complications including vocal fold paralysis, hypocalcemia/hypoparathyroidism, and need for thyroid replacement were quantified and meta-analyzed.

**Results:** In all, 1441 abstracts were reviewed and 8 articles were included; 5 provided data on lobectomy (LOB) (n=900) and 6 data on total thyroidectomy (TT) (n=1825). Temporary vocal fold paralysis for LOB and TT were 2.0% and 3.9%. Permanent vocal fold paralysis occurred in 0% vs 0.7%, respectively. There was a 2-fold increased odds of vocal fold paralysis for TT vs. LOB. Hypocalcemia and hypoparathyroidism were combined for analysis (HYPO). Rate of temporary HYPO were 1.6% vs 23.1% and permanent HYPO were 0% vs 1.8%, for LOB and TT, respectively. Of articles reporting thyroid replacement, supplementation was required in 36% vs. 95% of LOB and TT patients.

**Conclusions:** Complications in the surgical management of micropapillary thyroid carcinoma increase with the extent of surgery performed. The body of literature lacks RCTs and relies on observational case-control studies and case series. A better understanding of the differential complication risks is needed for patient counseling.

## ASSESSING EFFICIENCY IN MICROSURGERY USING MOTION TRACKING TECHNOLOGY

*Sarah M. Lyon, MD; Weifeng Zeng, MD; Hossein Mohamadipanah, PhD; Carla Pugh, MD, PhD; and Samuel O. Poore, MD, PhD*

**Background:** Precise, efficient motions are important components of microsurgical technique and competency. This study compares motion patterns of microsurgeons in various career stages in a lab-based anastomosis model. We employ motion tracking technology to analyze hand and instrument motion to identify critical areas for trainee improvement.

**Methods:** Plastic surgeons with varying levels of microsurgical experience performed microsurgical anastomoses on a validated blue blood chicken thigh model in a laboratory setting. Each microsurgeon was equipped with motion-tracking sensors connected to standardized positions on their hands and instruments. Vessels (<3 mm diameter) were anastomosed using an end-to-end technique. The time, total path length and smoothness of motion for components of each anastomosis (i.e. suture approach to vessel, knot tying) were calculated using sensor derived position data. Pre- and post-activity surveys were administered to all participants.

**Results:** 17 participants including medical students, plastic surgery residents from years PGY1-PGY6 (trainees) and fellowship-trained microsurgeons (experts) were included in the study. 32 anastomoses were captured and analyzed. Motion smoothness ( $p < 0.03$ ), path length ( $p < 0.03$ ) and idle time ( $p < 0.001$ ) were significantly different between experts and trainees. This trend was consistent for both the right and left hands as well as the microsurgical instruments. 17/17 (100%) participants agreed or strongly agreed that the anastomosis model was realistic in nature and 16/17 (94%) agreed or strongly agreed that real time motion feedback would be useful in their microsurgical training experience.

**Conclusion:** Resident work hour restrictions and an emphasis on competency-based training create an increasing need for validated laboratory-based methods for microsurgical education. Quantifiable motion parameters may provide a basis for structured resident feedback and competency assessment in microsurgery.

# IDENTIFYING BEHAVIORAL FACILITATORS TO WEIGHT LOSS AFTER BARIATRIC SURGERY: ARE THERE DIFFERENCES BETWEEN MEDICAID AND NON-MEDICAID PATIENTS?

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**Background:** The literature suggests that Medicaid patients who undergo bariatric surgery achieve lower weight loss than non-Medicaid patients. Reasons for this reported disparity are unknown. Our objective was to identify behavioral facilitators to optimal weight loss in Medicaid and non-Medicaid patients after bariatric surgery.

**Methods:** Using a semi-structured interview guide, we asked patients from a single institution to describe their behaviors after bariatric surgery within three domains: dietary habits, physical activity, and adherence to recommended follow-up care. Interviews were recorded, transcribed, and uploaded to NVivo. Five coders iteratively developed a codebook and used directed content analysis to identify themes within Torain's Surgical Disparities Model and Andersen's Behavioral Model of Health Services Use. We created matrices organized by insurance status and weight loss (>50% excess body weight loss defined as "optimal") to organize themes pertaining to weight loss facilitators.

**Results:** Twenty-four patients were interviewed at a median of 4.1 years postoperatively. Mean participant age was 50.6 (±10.7) years, and 83.3% were female. Medicaid patients who experienced optimal weight loss reported behavioral facilitators to weight loss in all three domains (Table 1). Patients with suboptimal weight loss (Medicaid and non-Medicaid) identified fewer facilitators to diet, physical activity, and follow-up care.

**Conclusion:** Medicaid patients who maintained optimal weight loss nearly five years after bariatric surgery commonly used proactive behavioral strategies to overcome barriers. Behavioral interventions targeting these behaviors may help other patients, including patients in lower socioeconomic strata, achieve optimal weight loss after bariatric surgery.

Table 1. Behavioral facilitators to optimal weight loss for Medicaid and non-Medicaid patients

Facilitators to optimal weight loss		Medicaid		Non-Medicaid	
		Optimal (n=9)	Suboptimal (n=6)	Optimal (n=5)	Suboptimal (n=7)
Dietary	Established a new relationship with food (i.e., reset food preferences)	X		X	
	Developed strategies to prevent overeating/emotional eating	X		X	
Physical activity	Modified physical activity regimen if exercising was painful or inaccessible (e.g., due to Covid-19 restrictions)	X	X		X
	Incorporated new activities/exercise classes with accountability to overcome lack of motivation	X		X	
	Inspired friends/family members to be more active	X			
Follow-up care	Took initiative and demonstrated flexibility in scheduling clinic visits and communicating with providers	X			

# INDIVIDUAL-LEVEL BARIATRIC SURGERY BARRIERS IN THE VETERANS HEALTH ADMINISTRATION: A QUALITATIVE STUDY

Jacqueline Murtha, MD, MPH; Esra Alagoz, PhD; Catherine Breuer, MS; Alex Finn, BS; Susan D. Raffa, PhD; Corrine Voils, PhD; Luke Funk, MD, MPH

**Introduction:** Bariatric surgery is the most effective weight loss treatment for individuals with severe obesity, but <1% of U.S. adults and <0.1% of U.S. Veterans who meet body mass index (BMI) criteria undergo it. We previously characterized 8 barriers to bariatric surgery care at the health system level. Our objective in this study was to identify patient and provider perceptions of individual-level barriers to undergoing bariatric surgery within the Veterans Health Administration (VHA).

**Methods:** We conducted semi-structured interviews with Veterans with severe obesity (defined as a body mass index [BMI] ≥35 kg/m<sup>2</sup>) and providers, including primary care physicians (PCPs), registered dietitians (RDs), health psychologists and bariatric surgeons. Veterans were from two Midwest VA medical centers (VAMCs) and had either been referred for bariatric surgery or were participating in the VHA's behavioral weight management program. PCPs, RDs and health psychologists were recruited from three VAMCs in the VA Great Lakes Health Care System, and bariatric surgeons were recruited from all 21 VHA bariatric surgery programs. Participants were asked to describe their experiences with obesity care treatment within VHA. Conventional content analysis identified individual-level barriers within Anderson's Behavioral Model of Health Services Use, which describes how service utilization is influenced by an individual's need, health behaviors, and predisposing beliefs or social structure.

**Results:** Thirty-three veterans and 40 providers (15 PCPs, 13 bariatric surgeons, 6 RDs and 6 health psychologists) were interviewed. Nearly 50% of Veterans had an annual household income less than \$50,000 and 40% were disabled. We identified six individual-level barriers to undergoing bariatric surgery (Table 1): lack of social support, fear of surgery and its outcomes, fear of change, difficulty adhering to required dietary changes, the patients' perception that weight had not reached its "tipping point," and patient characteristics influencing provider referral.

**Conclusions:** Patient and provider education is needed to address patient fears of surgery and the lifestyle changes that are essential after surgery. Furthermore, patients must be empowered by providers to change their personal health practices.

Table 1. Individual barriers to bariatric surgery from provider and patient perspectives within Anderson's Behavioral Model of Health Services Use

Individual determinant	Theme	PCP	Bariatric surgeon	Registered dietitian	Health psychologist	Veteran
Social	1. Lack of social support	X			X	X
	2. Fear of surgery and its potential outcomes	X	X	X		X
Beliefs	3. Fear of change	X	X	X		X
	4. Patient characteristics influencing provider referral	X		X	X	X
Need	5. Perception that weight had not reached its "tipping point"	X	X	X		X
Personal Health Practices	6. Difficulty adhering to dietary changes	X	X	X		X

X indicates the barrier was identified as a theme during interviews with that type of study participant

# WHY AND HOW DO SURGEONS IMPLEMENT NEW PROCEDURES INTO PRACTICE? A QUALITATIVE STUDY

*Bethany Powers, MD; Natalia A. Arroyo, MPH; Sara Fernandes-Taylor, PhD; Cara Damico Smith, MPH; David O. Francis, MD*

**Introduction:** Surgical techniques and procedures are evolving with increases in innovative technology, evidence-based practices, and opportunity for reduced risk and improved outcomes. However, there is little information on why and how surgeons adopt new practices and what barriers and facilitators to adoption exist. This is especially true in specialty surgical practice where procedure volume is lower and practice communities tend to be smaller. The objective of the study was to characterize the clinical and decision making process by which otolaryngologists decide to implement new surgical techniques.

**Methods:** Semi-structured interviews were conducted with Otolaryngology faculty members at a large, tertiary care hospital. Participants were asked to describe a new surgical procedure that they had incorporated into their practice in the last 2-5 years and that they did not learn during residency or fellowship. The interview guide included questions about communication, reflection, outcomes, and logistic considerations surrounding the procedure. Interviews were recorded and transcribed, deidentified and then coded.

**Results:** Twenty otolaryngologists were interviewed including general otolaryngologists and subspecialists. Participants had a mean 18 years practicing in an academic setting (70%) and 6 years in private practice (30%); 15% were female. Primary themes across the clinical care process included professional identity, skills, and leadership, wavering anxiety and confidence, and individual and institutional goals in improving patient outcomes and communication. Facilitators for adopting a new procedure, in order, were 1) the potential to improve patient outcomes, 2) reducing patient burden (e.g. less invasive surgery), 3) desire to be considered innovative and a leader in their field, and 4) concern for losing patients who are seeking “cutting edge” treatments. Cost was the most commonly cited barrier to adoption, but was rarely discussed as preventing practice change. Most surgeons incorporated new procedures without undergoing further formal training because they felt these new procedures were variations on core techniques they already knew. In patient consultations for the new procedure, most surgeons characterized the conversations as highly transparent involving a detailed informed consent process encouraging shared-decision making. Surgeons often felt preoperative anxiety before trying a new procedure but then describe intraoperative confidence and a sense of accomplishment. Postoperatively surgeons noted that new procedures reduced length of stay, shifted care from inpatient to outpatient, and reduced pain. Measures of success that reinforced the decision to continue to implement the procedure were anecdotal, personally reflective, and based on patient feedback, rather than driven by outcomes data.

**Conclusions:** When presented with a new procedure in their field, surgeons are principally concerned with patient outcomes and burden and secondarily their professional identity, skill level, and beliefs about their capabilities. Barriers to implementation included perceived lack of financial resources and negative emotional response to trying a new procedure and potential complications. Surgeons' decisions to implement new procedures were reinforced by familiar skills which were variations of techniques that they already practice, increased capacity for shared-decision making, care efficiency, and positive patient feedback.

# CIRCADIAN DISRUPTION ALTERS THE PANCREATIC LIPID PHENOTYPE TO PROMOTE DIACYLGLYCEROL FORMATION

*Patrick B Schwartz, MD; Sean M Ronnekleiv-Kelly, MD*

**Introduction:** Circadian disruption associated with chronic jetlag (CJ) (e.g. shiftwork) is associated with several pancreatic diseases, including obesity, diabetes mellitus, and cancer, but the mechanisms are poorly understood. We have previously shown that CJ of the pancreas promoted aberrant expression of genes involved in lipid metabolism, which may provide a mechanistic link between CJ and disease pathogenesis. However, circadian control over the pancreatic lipidome has not been investigated. Therefore, we sought to first demonstrate circadian control over the lipidome, then determine the effects of CJ on lipid phenotype.

**Methods:** To evaluate the CJ-induced impact on the pancreatic lipidome, four-week-old C57BL/6J wild-type mice (n=72) were subjected to normal circadian (NC) or CJ conditions using an established CJ protocol (12-hour light-dark cycle phase-shifted 8 hours every 2-3 days) for 9 months. Mice were sacrificed (n=3 male/female per condition) every 4 hours for 24 hours and the pancreatic lipids were extracted and subjected to untargeted liquid chromatography-mass spectrometry (LC-MS). Comparisons were then made with LipidR and the rhythmicity across time was detected using RAIN.

**Results:** Approximately 19.6% (56/286) of NC and 23.1% (66/286) of CJ pancreatic lipids were considered rhythmic ( $q < 0.1$ ), indicating circadian control over the pancreatic lipidome. We found that CJ conditions led to a significant enrichment of triglycerides and diacylglycerols ( $p < 0.05$ ), while NC conditions were associated with enrichment of phosphatidylethanolamines and lysophosphatidylcholines (Figure 1).

**Conclusions:** Concordant with our prior work, we demonstrated several pancreatic lipids exhibited rhythmic fluctuations over 24 hours – indicating circadian control over the pancreatic lipidome. Following CJ there was an enrichment of diacylglycerols, which are known mediators of insulin resistance. Future studies will focus on how CJ drives diacylglycerol formation, and whether diacylglycerol signaling promotes disease pathogenesis.



Figure 1. Experiences during Adoption of New Surgical Procedures

## ASSESSMENT OF A 3D, INTERACTIVE LEARNING EXERCISE ON PLASTIC SURGERY EDUCATION

*Ellen C Shaffrey, MD; Ava G Grotting; Michael L Bentz, MD*

**Purpose:** Surgical simulation enhances resident preparation for operative experiences. Many teaching models predominantly rely on didactic lectures. An interactive learning model, where a senior surgeon provides guidance to trainees in a lecture-based setting, is a novel educational technique that has yet to be evaluated. The purpose of this study is to evaluate the impact a 3-D, interactive educational experience has on resident reconstructive planning and confidence with assessment of MOHS defects.

**Methods:** 17 residents in an integrated plastic surgery program preformed a pre-learning questionnaire to assess their baseline ability to plan a reconstructive flap for 5 index MOHS defects. They subsequently underwent an interactive learning session and were instructed to design flaps on life-sized Styrofoam heads with feedback by the senior author. The residents completed a post-learning questionnaire to assess improvements in confidence and knowledge. Three attending surgeons anonymously reviewed each resident's designs for accuracy and estimated the resident's level of training.

**Results:** When analyzing all residents, participant-reported confidence in ability to draw and select the correct reconstructive option increased for all index cases (mean Likert scores 0.25-1.25) (Figure 1-5). Junior residents had a greater increase in average score responses (mean difference in Likert scores 0.5-1.5) compared to senior residents (mean difference in Likert scores 0-0.75). Large majority of participants stated that this study "moderately or highly" improved their ability to assess MOHS defects for reconstruction and improve their ability to draw specific reconstructive options. Senior residents were significantly more accurate across the index cases compared to junior residents (Figure 6-10). PGY1-2 residents were more likely to be estimated above their training level compared to co-residents (Table 1).

**Conclusion:** Participation in a novel 3-D, interactive learning model demonstrates beneficial improvements in resident comprehension in assessing reconstructive options for index MOHS cases, particularly impacting junior residents.

## EVALUATION OF HOW PARTICIPATION IN ATHLETICS IMPACTS INTEGRATED PLASTIC SURGERY APPLICATIONS

*Ellen C Shaffrey, MD; Armin Edalatpour, MD; Peter Nicksic, MD; Zeeda H Nkana, BS; Ahmed M Afifi, MD*

**Purpose:** The integrated plastic surgery residency match is highly competitive with last year over 290 applicants vying for only 180 spots. Prospective medical students use their application to highlight personal attributes and prior experiences. Every year, a few candidates are former athletes. Participation in high level athletics requires significant dedication that can foster favorable qualities that residencies look for in future plastic surgeons. However, it is challenging for athletes to balance their athletic commitments with academic responsibilities, which potentially could lead to gaps in their CVC. We sought to evaluate if participation in athletics impacts applicant anticipated rank, research productivity, academic success, and letter of recommendation review.

**Methods:** All applications received by the University of Wisconsin Division of Plastic Surgery from 2017 to 2020 were reviewed for participation in athletics in addition to demographic information, membership in AOA or gold humanism honors society, number of research publications including first authorships, reviewer rating including anticipated rank, and STEP scores.

**Results:** After reviewing 946 applications, 37 applicants were elite athletes, 24 applicants were competitive athletes, and an additional 57 applicants had other level of sports involvement. We found applicants involved in sports were ranked significantly higher by their references ( $p=0.001$ ) on the standardized application form. Despite the concern that individuals involved in athletics would have potentially weaker CV's, we found no significant difference in research productivity or USMLE step 1 scores between those who participated in sports and those that did not.

**Conclusion:** Former athletes applying to become integrated plastic surgery residents overcome the challenges of balancing athletic and academic pursuits with higher anticipated rank in the integrated plastic surgery match while having comparable academic achievement.

## PREOPERATIVE IMMUNONUTRITION DECREASES WOUND COMPLICATIONS IN IMMEDIATE BREAST RECONSTRUCTION

*Carol E. Soteropoulos, MD; Kylie M. Edinger, MD; Kishan M. Thadikonda, MD; Katherine M. Gast MD, MS*

**Introduction:** Recent literature in various surgical specialties has shown the use of enteral immunonutrition prior to major surgery to reduce infectious complications, length of stay and overall morbidity<sup>1,2</sup>. To date, no studies have examined the use of immunonutrition within plastic and reconstructive surgery. The purpose of this study is to evaluate the impact of preoperative immunonutrition supplementation on the outcomes of immediate breast reconstruction.

**Methods:** All patients undergoing immediate autologous or alloplastic breast reconstruction at the University of Wisconsin, Madison beginning February 2018 were contacted and offered enrollment in this study. All patients who consumed Impact Advanced Recovery for 5 days prior to surgery were reviewed (n=59, 36 autologous, 23 alloplastic). This group was compared with a retrospective control group (n=106, 40 autologous, 66 alloplastic) of patients who underwent surgery prior to February 2018. No other major changes in perioperative care or operative technique were made within the timeframe of the retrospective or prospective collection period. Chart review was performed on all patients in a 30-day (autologous, direct-to-implant) or 90-day (expander) postoperative window. The rates of surgical site infection, wound dehiscence, seroma, and mastectomy skin flap necrosis were analyzed individually and combined to form an aggregate "wound complication rate".

**Results:** Aggregate wound complication rate was reduced from 49.06% to 32.20% after intervention (p=0.0361). Specifically, the rate of mastectomy skin flap necrosis was reduced from 24.53% to 8.47% (p=0.0114), and the rate of wound dehiscence was reduced from 15.09% to 1.69% (p=0.0067) in the cohort who received preoperative immunonutrition supplementation. The rates of infection, unplanned return to the operating room, and aborted reconstruction were not significantly different between the control and interventional cohorts.

**Conclusions:** Based on the initial results of this ongoing trial, preoperative immunonutrition supplementation with Impact Advanced Recovery may significantly improve wound complication rate in patients undergoing immediate autologous and alloplastic breast reconstruction.

## RENAL FUNCTION AFTER RETROPERITONEAL SARCOMA RESECTION WITH NEPHRECTOMY: A MATCHED ANALYSIS OF THE UNITED STATES SARCOMA COLLABORATIVE DATABASE

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**Background:** Nephrectomy often is required during en bloc resection of a retroperitoneal sarcoma (RPS) to achieve an R0 or R1 resection. The impact of nephrectomy on postoperative renal function in this patient population, who also may benefit from subsequent nephrotoxic systemic therapy, is not well described.

**Methods:** The United States Sarcoma Collaborative (USSC) database was queried for patients undergoing RPS resection between 2000 and 2016. Patients with missing pre- or postoperative measures of renal function were excluded. A matched cohort was created using coarsened exact matching. Weighted logistic regression was used to control further for differences between the nephrectomy and non-nephrectomy cohorts. The primary outcomes were postoperative acute kidney injury (AKI), acute renal failure (ARF), and dialysis.

**Results:** The initial cohort consisted of 858 patients, 3 (0.3%) of whom required postoperative dialysis. The matched cohort consisted of 411 patients, 108 (26%) of whom underwent nephrectomy. The patients who underwent nephrectomy had higher rates of postoperative AKI (14.8% vs 4.3%; p < 0.01) and ARF (4.6% vs 1.3%; p = 0.04), but no patients required dialysis postoperatively. Logistic regression modeling showed that the risk of AKI (odds ratio [OR], 5.16; p < 0.01) and ARF (OR 5.04; p < 0.01) after nephrectomy persisted despite controlling for age and preoperative renal function.

**Conclusions:** Nephrectomy is associated with an increased risk of postoperative AKI and ARF after RPS resection. This study was unable to statistically assess the impact of nephrectomy on postoperative dialysis, but the risk of postoperative dialysis is 0.5% or less regardless of nephrectomy status.

## **SURGEON VARIABILITY IMPACTS COSTS IN LAPAROSCOPIC CHOLECYSTECTOMY: THE VOLUME-COST RELATIONSHIP**

*Christopher C Stahl, MD; Shreyans Udani, MD; Patrick B Schwartz, MD; Taylor Aiken, MD; Alexandra W Acher, MD; James R Barrett, MD; Jacob A Greenberg, MD; Daniel E Abbott, MD*

**Background:** Physician variation in adherence to best practices contributes to the high costs of health care. Understanding surgeon-specific cost variation in common surgical procedures may inform strategies to improve the value of surgical care.

**Methods:** Laparoscopic cholecystectomies at a single institution were identified over a 5-year period and linked to an institutional cost database. Multiple linear regression was used to control for patient-, case-, and hospital-specific factors while assessing the impact of surgeon variability on cost.

**Results:** The final dataset contained 1686 patients. Higher surgeon volume (reported in tertiles) was associated with decreased costs (\$5354 vs. \$6301 vs. \$7156,  $p < 0.01$ ) and OR times (66 min vs. 85 min vs. 95 min,  $p < 0.01$ ). After controlling for patient-, case-, and hospital-specific factors, non-MIS fellowship training type ( $p < 0.01$ ) and low surgeon volume ( $p < 0.01$ ) were associated with increased costs, while time in practice did not contribute to cost variation ( $p = \text{NS}$ ).

**Conclusions:** Surgeon variability contributes to costs in laparoscopic cholecystectomy. Some of this variability is associated with operative volume and fellowship training. Collaboration to limit this cost variability may reduce surgical resource utilization.

## **ACUTE TYPE B AORTIC DISSECTION EARLY IN-HOSPITAL OUTCOME AT A SINGLE INSTITUTION**

*Andrea Um, MD; F.C. Razalan-Krause, Girma Tefera, MD; Charles Acher, MD; Paul DiMusto, MD*

**Introduction:** Acute type B aortic dissection (ATBAD) is a life-threatening condition that requires early diagnosis and management. The objective of this study is to better understand the current in hospital outcomes of patients with ATBAD.

**Methods:** This is a retrospective chart review of patients admitted with the diagnosis of ATBAD over a period of 10 years (May 2010 to March 2020). All patients with the diagnosis of ATBAD are generally admitted to the vascular surgery service. Patients who presented with acute symptoms and had evidence of a type B aortic dissection on Computed Tomographic Angiography (CTA) were included in the study while patients who presented with acute type A aortic dissection, intramural hematoma or penetrating aortic ulcer were excluded. Initial management for all patients included beta blockade and vasodilation. Surgical intervention was performed for malperfusion, persistent pain with refractory hypertension, rupture, and progressing dissection on CT. Demographics, clinical presentation, radiologic findings, hospital course, length of stay and mortality were recorded for analysis.

**Results:** There were 59 consecutive patients. The average age of the patients was 61 years and 70% were male. Eighty one percent of the patients had history of hypertension and they presented with an average systolic pressure of 183 mmHg. The most common presenting symptoms were back pain (76%) and chest pain (72.3%) while abdominal pain (52.5%) and extremity pain (13.6%) were less frequent. Twenty two percent of the patients presented with complications, visceral malperfusion (10) and rupture (3). These patients required emergency surgery. The remaining 46 patients were initially medically managed however 21 of these patients subsequently required intervention within 30 days. Of these 21, 6 developed malperfusion after presentation, 12 had refractory pain and hypertension, 2 had progressive dissection changes on CTA, and one had concern for associated symptomatic aneurysm. During the first 30 days, 58% of all the patients underwent required surgery, primarily Thoracic Aortic Endograft in 26 patients. There were three deaths within the first 30 days, rupture in 1, retrograde dissection after stent graft in 1 and a third patient died the day of discharge probably due to rupture. The average length of stay was 10.6 days (range 1 to 43). Patients who required intervention averaged a length of stay of 13.2 days compared to patients without intervention averaging 6.4 days.

**Conclusion:** ATBAD remains a serious condition. While the initial medical management is successful in many patients, over 50% ultimately required surgical intervention during the initial 30 days.

## BEYOND ADDING THE CORE SUTURE: AN ENTIRELY NEW APPROACH TO TENDON REPAIR

Weifeng Zeng, MD; Nicholas J Albano, MD; Ruston J. Sanchez, MD; Ray Vanderby, PhD; Ronald McCabe, PhD; Samuel O. Poore, MD, PhD; Aaron M. Dingle, PhD

**Introduction:** Despite significant improvements to zone II flexor tendon over the last two decades, function-limiting complications persist. This article describes two novel techniques utilizing flexor digitorum superficialis (FDS) autografts to buttress the flexor digitorum profundus (FDP) repair site without the use of core sutures. The hypothesis being that the reclaimed FDS tendon autograft will redistribute tensile forces away from the FDP repair site, increasing overall strength and resistance to gapping in Zone II flexor tendon injuries compared to the current clinically utilized techniques.

**Methods:** Two novel FDP repair methods utilizing portions of FDS are described: 1) Asymmetric repair (AR), and 2) Circumferential repair (CR). Ultimate tensile strength and cyclical testing were used to compare novel techniques to current clinical standard repairs: 2-strand (2St) and 4-strand (4St) modified Kessler methods and 6-strand (6-St) M-Tang method. All repairs were performed in sheep tendons (n=10/group) by a single surgeon.

**Results:** Ultimate tensile strength testing demonstrated that both AR and CR techniques were comparable in strength to 6-St repairs, all of which were able to tolerate significantly stronger loads than the 2-St and 4-St repairs ( $p<0.001$ ). Cyclical testing demonstrated that AR and CR were able to withstand significantly more cumulative force ( $p<0.001$  and  $p=0.0064$  respectively) and tolerated significantly greater force to 2mm gap formation ( $p=0.022$  and  $p=0.026$ ) than the 6-st repair.

**Conclusions:** Incorporating FDS as an autologous graft for FDP repair provides at least equivalent ultimate tensile strength and significantly greater cumulative force to failure and 2mm gapping than a traditional 6-St repair.

## THE INFUSED PIG CHEST WALL “SANDWICH” - A NOVEL TRAINING MODEL FOR INTERNAL MAMMARY ARTERY PREPARATION IN BREAST RECONSTRUCTION

Weifeng Zeng, MD; Ruston Sanchez, MD; Kirsten Gunderson, MS; Nicholas J Albano, MD; Aaron M. Dingle, PhD; Samuel O. Poore, MD, PhD

**Introduction:** Preparation of the internal mammary artery (IMA) as a recipient vessel is crucial in free flap breast reconstruction. Practicing the procedure using live laboratory pigs reportedly provides realistic simulation but is expensive and inconvenient. We aimed to develop a simple, inexpensive, and effective simulator for IMA preparation.

**Methods:** Chest walls were harvested from adult Wisconsin mini pigs at the termination of other projects. This included the sternum and ribs 1-7 bilaterally. Skin and fat above the pectoralis muscle were removed. The proximal and distal ends of the IMA were cannulated with angiocatheters. The proximal IMA was attached with tubing to a “blue blood” infusion bag (500mL fluids mixed with 1cc blue food dye) and placed at gravity to mimic real-time blood flow. A collection bag was placed below the field and connected with tubing to the distal IMA. A chest wall “sandwich” was assembled by placing the infused pig rib cage between two mannequin shells. Specifically, the rib cage was placed on the surface of one mannequin, covered with a layer of yellow sponge, and then sandwiched by a second identical mannequin shell with cut out windows exposing the parasternal area of ribs 3, 4, and 5 bilaterally. To perfuse, running the drip at approximately ten drops per minute was efficacious.

**Results:** This infused pig chest wall “sandwich” IMA preparation simulator could be set-up in any microsurgical suite. Residents can practice IMA preparation including elevating the perichondria, removing cartilage, dissecting the IMA, and anastomosing the IMA. With the perfusion of “blue-blood”, the model provides immediate feedback on the quality of anastomosis.

**Conclusion:** This novel model can provide highly realistic simulation of IMA preparation. The effect of applying this model on improving the proficiency and confidence of plastic surgery residents will be studied in the upcoming educational study.

## APPLICANT PERSPECTIVES ON THE VIRTUAL PLASTIC SURGERY RESIDENCY INTERVIEW

Rosaline Zhang, MD MS; Alyssa Schappe, BS; Neil Salyapongse, MD; Michael Bentz, MD

**Background:** This study surveys applicants from the 2020-2021 residency application cycle to determine the perceived impact of the virtual interview format on costs, ability to learn about programs, and opportunities to meet other applicants.

**Methods:** Applicants to the University of Wisconsin integrated plastic surgery program in the 2020-2021 cycle were invited to participate in an electronic survey.

**Results:** Early data results were obtained from 27 applicants who completed the survey. Eighty-nine percent applied to 51 or more programs, and 65% attended at least 11 interviews, with Zoom being the most preferred platform (96%). Sixty-nine percent spent less than \$500 and 88% missed fewer than 7 days of medical school due to interviews. Ninety-six percent view the interview as very or extremely important for the residency application process. Applicants ranked getting a “gut feeling” about a program, meeting the program director/division chair and meeting with residents/assessing resident morale as the most value gained from residency interviews. Due to the virtual interview format, 70% found it somewhat or much harder to get a “gut feeling” about programs, 48% found it made no difference in their ability to meet program directors/division chairs, and 75% found it somewhat or much harder to meet residents/assess resident morale. 65% were somewhat or extremely dissatisfied by their opportunity to meet other applicants on the interview trail. If given the choice, 41% of applicants would prefer a combination of some in-person and some virtual interviews, and only 15% prefer all virtual.

**Conclusion:** The virtual interview helped to decrease financial and time costs for applicants. However, most applicants found the virtual format made it more difficult to learn about programs and to engage with other applicants. Ultimately, a combination of in-person and virtual interviews may help to maximize the benefits and minimize the costs of the residency interview.

## CAN GLOBAL SURGERY PARTICIPATION AMELIORATE SYMPTOMS OF BURNOUT?

Rosaline Zhang, MD, MS; Michael Bentz, MD

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

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

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

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



# COMPREHENSIVE MEASUREMENT OF FUNCTIONAL STATUS AND QUALITY OF LIFE OF TARGETED MUSCLE REINNERVATION PATIENTS USING PATIENT REPORTED OUTCOMES

Rosaline Zhang, MD; Carol Soteropulos, MD; Brett Michelotti, MD

**Background:** Targeted muscle reinnervation (TMR), both primary (at time of amputation) and secondary (subsequent to amputation), can prevent or improve pain from neuroma, phantom and residual limb pain. The aim of this study was to evaluate the functional status and quality of life of patients who underwent Targeted Muscle Reinnervation (TMR), utilizing Patient-Reported Outcomes Measurement Information System (PROMIS) measures.

**Methods:** This is a single-institution study, with a retrospective and prospective arm. PROMIS T Scores were calculated using the HealthMeasures Scoring Service (T Score 50 = mean of general US population, SD=10).

**Results:** Six patients were recruited retrospectively (median follow up 1.6 years), four patients prospectively.

Four patients underwent primary TMR at time of amputation (3 above-knee amputation (AKA), 1 below-knee amputation (BKA)). Postoperatively and compared to general population, patients had better mental health (mTS55.1, SD6.7), emotional support (mean T Score (mTS) 58.9, SD4.3), self-efficacy (mTS56.0, SD3.3) and less social isolation (mTS43.8, SD3.4) and pain (mTS43.6, SD14.6).

Two patients underwent secondary TMR, one at 7 years and one at 10 months, after BKA (follow up time 2.6 years and 9 months, respectively). Both had more intense pain (mTS59.6, SD0.99) and lower ability to participate in social roles (mTS46.3, SD 2.9), but better emotional support (mTS62.0, SD 0) than general population.

Of the four patients (1 AKA, 3 BKA) who were recruited prospectively, all underwent secondary TMR (median interval 6.2 years). Pre-operatively, patients had more pain (mTS69.3, SD 7.9), sleep disturbance (mTS 56.2, SD 3.8), social isolation (mTS62.0, SD 9.9), lower ability to participate in social roles (mTS38.0, SD 0.8), and worse mental health (mTS38.9, SD 11.7) and emotional support (mTS43.0, SD 9.1).

**Conclusion:** Overall, patients who have undergone primary TMR have better functional status and quality of life than the general population, while patients who have undergone secondary TMR continue to have some limitations. Preoperatively, patients undergoing secondary TMR report poorer functional status and quality of life outcomes. These patients will be followed prospectively over two years to identify post-operative changes.

# ICP MONITORING IN PEDIATRIC CRANIOSYNOSTOSIS: A CROSS-SECTIONAL SURVEY OF CRANIOFACIAL CENTERS

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**Purpose:** The purpose of this study was to characterize the protocols used for intracranial pressure (ICP) monitoring in children with craniosynostosis.

**Methods:** Surgeons and clinical coordinators from the American Society of Craniofacial Surgeons (ASCFS), American Society of Pediatric Neurosurgeons (ASPN), and American Cleft Palate-Craniofacial Association (ACPA) were invited via email to complete an electronic survey.

**Results:** In total, 177 clinical coordinators, 251 cleft/craniofacial surgeons and 147 pediatric neurosurgeons received survey invitations, and 72 responded (30 pediatric neurosurgeons, 40 craniofacial surgeons, 2 clinical coordinators). Fifty-six percent (40/72) of respondents are at high volume centers (3 or more craniosynostosis cases per month), 36% (26/72) at medium centers (1-2 cases per month), 8% (6/72) at low volume centers (0-1 cases per month).

Preoperatively, dilated eye exams (39%, 28/72), symptom screening (21%, 15/72) and skull Xrays/head CTs (18%, 13/72) are considered most useful for assessing ICP for clinical management decisions. However, 67% (4/6) of respondents from low volume centers do not routinely obtain pre-operative imaging (skull Xray, head CT or MRI) to screen for elevated ICP, while 84% (22/26) of medium and 80% (32/40) of high volume centers do ( $p=0.030$ ). Only 15% (11/72) of respondents utilize optical coherence tomography (OCT), 3% (2/72) utilize visual evoked potentials (VEP) and 8% (6/72) utilize invasive devices for preoperative screening.

Post-operatively, dilated eye exams (32%, 21/64) and skull Xrays/head CTs (32%, 21/64) are considered most useful, while 11% (7/64) report no routine screening for elevated ICP. A greater proportion of craniofacial surgeons than pediatric neurosurgeons find dilated eye exams useful for assessing ICP both pre-operatively (48% vs 23%) and post-operatively (44% vs 12%) ( $p<0.05$ ).

Neuropsychology testing is performed at 81% (55/68) of respondents' centers. Lack of or limited access (77%, 10/13) and difficulty obtaining insurance coverage (38%, 5/13) are primary reasons for centers not performing neuropsychology testing.

**Conclusions:** Monitoring protocols for patients with craniosynostosis vary widely among craniofacial centers. While attention is paid in the literature to neuropsychological testing and other advanced methods (VEP, OCT, and invasive monitoring) for assessing elevated ICP, currently, few surgeons/centers appear to be using these strategies routinely, and dilated eye exams and symptom screening predominate in practice. More prospective studies are needed to determine optimal ICP monitoring practices and duration of follow up for craniosynostosis patients.

## **INFORMED CONSENT PRACTICES IN GLOBAL SURGERY AMONG PLASTIC SURGERY ORGANIZATIONS**

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**Background:** Global surgery organizations often serve vulnerable populations but there is limited knowledge on the protocols used to obtain informed consent for procedures and content sharing.

**Methods:** The Plastic Surgery Foundation Volunteers in Plastic Surgery database was queried for plastic surgery organizations actively involved in global surgery. 79 organizations received email invitations to participate in a survey study regarding their protocols for obtaining consent and content sharing practices.

**Results:** A total of 17 (21.5%) organizations completed the survey. All have been active for at least 10 years and 88.2% (15/17) organize at least two mission trips annually. 88.2% (15/17) obtained written consent for surgical procedures while 11.8% (2/17) obtained only verbal consent. 58.8% (10/17) reported that their staff or volunteers were primarily responsible for obtaining informed consent, while 41.2% (7/17) primarily relied on local health staff/administrators.

With regards to consent for sharing content related to global surgery experiences (i.e. photographs, videos, written narratives), 18.8% (3/16) obtained verbal consent only for content sharing, 56.2% (9/16) obtained a separate written consent, 18.8% (3/16) obtained consent concurrently with the surgical informed consent, and 6.3% (1/16) did not routinely obtain any consent. Organizations shared content via their websites (93.3%, 14/15) Facebook (73.3%, 11/15), Instagram (53.3%, 8/15), blog posts (46.7%, 7/15), peer-reviewed articles (40.0%, 6/15), internal grand rounds (40.0%, 6/15), and Twitter (20.0%, 3/15).

All organizations reported using interpreters to obtain informed consent. However, only 37.5% (6/16) utilized formally trained professional interpreters, with others utilizing either volunteers (31.3%, 5/16), local health care workers (18.8%, 3/16), or other community members (6.3%, 1/16).

**Conclusion:** Practices related to obtaining informed consent for procedures and content sharing vary widely among global surgery organizations. Trained interpreters, essential for ensuring clear and accurate patient communication, are not consistently utilized. Global surgery organizations have a responsibility to safeguard patients' rights, especially their privacy, when creating and sharing publicly viewable content. The development of standardized protocols and guidelines will ensure that global health organizations, in collaboration with their local partners, properly collect informed consent for procedures and content sharing.