2021 Research Day & 26th Annual Helen & John Schilling Lecture

UW Medicine
DEPARTMENT OF SURGERY

Pictured: Helen & John Schilling

AGENDA

WEDNESDAY, MARCH 3RD | SESSION 1

6:30AM **Welcome — Douglas E. Wood, MD, FACS, FRCSEd, *The Henry N. Harkins Professor and Chair***

6:35AM **26th Annual Schilling Lecture — Robin S. McLeod, MD, Professor, Department of Surgery and the Institute of Health Policy, Management and Evaluation, Vice Chair, Quality and Performance, Department of Surgery, University of Toronto**
"Implementing an Enhanced Recovery After Surgery Program"

7:20AM **Q&A — David R. Flum, MD, MPH, Associate Chair for Research, Professor of Surgery**

7:35AM **Research Symposium Introduction — David R. Flum, MD, MPH, Associate Chair for Research, Professor of Surgery**

7:39AM **Arezou Abbasi, MD, Postdoctoral Research Fellow**
"Preoperative Lanreotide May Reduce Clinically Significant Pancreatic Fistula Following Distal Pancreatectomy: Early Outcomes of a Phase II Trial" (Long Format Presentation) Page 9

7:44AM **Discussant: Teresa S. Kim, MD, Assistant Professor, Division of General Surgery**

7:49AM **Rocio Carrera Ceron, MD, CVES Research Fellow**
"Comparison of Outcomes Between Patients Undergoing Paraesophageal Hernia Repair with Mesh Vs Primary Repair" (Long Format Presentation) Page 10

7:54AM **Discussant: Roger P. Tatum, MD, Professor & Chief, Division of VA Health Care**

7:59AM **Nikhitha Thrikutam, MD, MPH, Plastic Surgery, R2**
"Epidemiology and Outcomes Of Cooking And Cookstove-Related Burn Injuries: A World Health Organization (WHO) Global Burn Registry (GBR) Report" (Short Format Presentation) Page 11

8:02AM **David Droullard, MD, Research Resident**
"Assessing the Impact of Diverticulitis on Quality of Life Over Time" (Long Format Presentation) Page 12

8:07AM **Discussant: Mukta K. Krane, MD, Associate Professor, Division of General Surgery**

8:12AM **Mariam Hantouli, MD, Postdoctoral Research Fellow**
"Acute Cholecystitis during Pregnancy: When and Should you Operate?" (Long Format Presentation) Page 13

8:17AM **Discussant: Andrew S. Wright, MD, Professor, Division of General Surgery**

8:22AM **Kevin Sullivan, MD, General Surgery, Chief Resident**
"IL–10 Blockade Rescues CAR–T Cell Function in The Tumor Microenvironment in Human Pancreatic Cancer and Colorectal Cancer Liver Metastases" (Short Format Presentation) Page 14

8:28AM **Closing — Douglas E. Wood, MD, FACS, FRCSEd, *The Henry N. Harkins Professor and Chair***

Kevin Sullivan, MD, General Surgery, Chief Resident

AGENDA

WEDNESDAY, MARCH 10th | SESSION 2

AGENDA

WEDNESDAY, MARCH 17th | SESSION 3

INTRODUCTION

Douglas E. Wood, MD, FACS, FRCSEd
The Henry N. Harkins Professor and Chair

David R. Flum, MD, MPH
Associate Chair for Research, Surgery, Professor, Surgery, Health Services, and Pharmacy

Welcome to the 26th Annual Department of Surgery Research Symposium and Schilling Lecture. Each year this Symposium provides us with an opportune moment to reflect on both the phenomenal quality of research in the Department and the distinguished group of scholars who have joined us as lecturers and visiting faculty over the years. Schilling lecturers represent the best and brightest across the spectrum of clinical and research disciplines in surgery while the Schilling Research Symposium is a forum to bring together faculty, residents, fellows, students, and friends to share the innovative research happening in our Department.

We regretfully had to cancel the 2020 event due to COVID19 and are excited to host the 2021 event using a virtual format and spread over 3 days. So much has changed in our day-to-day lives since March 2020 and we are proud of how resilient and adaptable everyone in this Department has been. The annual Schilling Lecture has always been a source of inspiration to residents and faculty alike and will certainly be a bright spot in 2021.

We are pleased to present the 2021 Schilling Lecturer: Dr. Robin McLeod, Professor, Department of Surgery and the Institute of Health Policy, Management and Evaluation, and Vice Chair, Quality and Performance, Department of Surgery, University of Toronto. Dr. McLeod will be giving a lecture entitled, *"Implementing an Enhanced Recovery after Surgery Program."*

The Surgery Research Symposium and Schilling Lecture are made possible by a generous gift from the late Helen Schilling in honor of her husband Dr. John Schilling. The Schillings were deeply committed to teaching, scholarship and research and this event, where residents showcase their research supported by faculty mentors, showcases a great aspect of their legacy. It is with tremendous pride and gratitude that we carry on this tradition and look forward to doing so for years to come.

It is also an important learning opportunity for residents and fellows to refine their scientific presentation skills through presentations, audience Q&A, and feedback from our panel of judges. The Schilling event is a celebration of the passion for research that exists within our Department. Every member of the Department plays a critical role in the success of our research mission and we are grateful for the hard work and dedication of our staff, faculty, and trainees who make events like this possible.

We are pleased that you are joining us and hope that you find the events both informative and inspiring.

Sincerely,

Douglas E. Wood, MD, FACS, FRCSEd
The Henry N. Harkins Professor and Chair
Department of Surgery
University of Washington

David R. Flum, MD, MPH
Associate Chair for Research, Surgery
Professor, Surgery, Health Services, and Pharmacy
Department of Surgery
University of Washington

LECTURER—ROBIN S. MCLEOD, MD

Dr. Robin McLeod received a BSc and MD from the University of Alberta. Following this, she completed training in General Surgery at the University of Toronto, Colorectal Surgery at the Cleveland Clinic, as well as training in clinical epidemiology at McMaster University before joining the faculty at the University of Toronto. She is a Fellow of the Royal College of Physicians and Surgeons of Canada, a Fellow of the American College of Surgeons and a fellow ad hominem of the Royal College of Surgeons of Edinburgh. She is a Diplomate of the American Board of Surgery and the American Board of Colorectal Surgery.

Dr. McLeod is a Professor in the Department of Surgery and the Institute of Health Policy Management and Evaluation and Vice Chair, Quality and Performance, in the Department of Surgery at the University of Toronto. In the latter position, she has led the Best Practice in Surgery initiative which supports quality initiatives in the University of Toronto affiliated hospitals.

Dr. McLeod is past president of the Canadian Association of General Surgeons and the Society for Surgery of the Alimentary Tract and a past Regent of the American College of Surgeons She is also an honorary member of the Association of Coloproctology of Great Britain and Ireland and a Life Member of the Colorectal Surgical Society of Australia and New Zealand. She is currently President of the American Surgical Association. In 2019, Dr. McLeod was named an Officer of the Order of Canada.

Dr. McLeod's clinical and research interests are colorectal cancer, inflammatory bowel disease, evidence based medicine, quality and knowledge translation. She has led a number of multicentre clinical trials and quality initiatives and has authored over 350 peer reviewed articles and 50 book chapters. She is also the founding Chair of Evidence Based Reviews in Surgery, an internet journal club jointly sponsored by the Canadian Association of General Surgeons & American College of Surgeons.

Robin S. McLeod, MD

Professor, Department of Surgery and the Institute of Health Policy, Management and Evaluation, Vice Chair, Quality and Performance, Department of Surgery, University of Toronto

ABOUT HELEN & JOHN SCHILLING

Helen & John Schilling

The Helen and John Schilling Endowed Lectureship was established by the late Helen Schilling to bring distinguished scholars to the Department of Surgery at the University of Washington, and to enhance the Department's commitment to the highest standards of patient care, teaching, research and scholarship. It was Mrs. Schilling's wish that the lectureship be named in honor of her husband, John.

Dr. Schilling devoted his life to academic medicine in a career spanning 50 years. He was born and raised just outside Kansas City, Missouri, and at the age of 15 entered Dartmouth College. After graduating from Dartmouth in 1937, he attended Harvard Medical School as a member of the class of 1941, the last class to graduate before World War II. In the six months before the start of his internship and residency at the Roosevelt Hospital in New York City, he signed on as a ship's doctor on the schooner Effie M. Morrissey for a scientific expedition to the Arctic sponsored by the U.S. Bureau of Standards. After a number of perilous adventures along the Greenland coast and in the Hudson Straits, he returned to New York and started his training in general surgery. He joined the surgical staff at the University of Rochester in 1945 where he began his life long work on wound healing. His career at Rochester was interrupted for several months by a stint in the central Pacific (Eniwetok) to participate in the study of flash burns as part of the atom bomb tests and the Manhattan Project. Subsequently he joined the Air Force as a volunteer and set up a surgical department at the new School of Aviation Medicine in San Antonio.

In 1956 Dr. Schilling was invited to be the chief of the first full–time department of surgery in the new medical school at the University of Oklahoma. He was successful in recruiting a number of outstanding junior faculty, many of whom went on to become chairs. In addition to his administrative responsibilities, he maintained an extensive research program in wound healing in collaboration with Dr. Betty White. At the end of 18 years Dr. Schilling and his faculty had trained 75 surgeons from Oklahoma and adjoining states, and had established a department known for its academic accomplishments.

Dr. Schilling came to the University of Washington in 1974 as a senior investigator and, upon the sudden resignation of the chair, was asked to take over the management of the Department of Surgery. Thus began his third chairmanship which lasted eight years until his retirement. His first responsibility was to recruit faculty to fill the many vacancies, a task he achieved after several stormy years. Upon his retirement in 1983, he had recruited 41 new faculty members and graduated a total of 40 chief residents.

His career in academic surgery was marked by a devotion to patient care and teaching, as well as research. But, despite his commitment to the profession, Dr. Schilling still found time to engage in other activities. From his early childhood, he enjoyed the outdoors and had become an expert tennis player, skier, and fly fisherman; he always believed that one's life work should be punctuated by intervals of travel and recreation.

Helen Schilling shared with her husband both the non–academic as well as the academic side of his life. They first worked together in Rochester and continued their professional association through the years in Oklahoma and Washington. They were married in 1979. Mrs. Schilling had a career in newspaper work and administration after graduating from Oberlin College. This dual background enabled her to be his close associate and administrative assistant for 40 years.

JUDGES

Saman Arbabi, MD, MPH
Professor

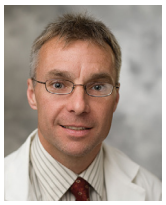
Giana H. Davidson, MD, MPH
Associate Professor

Farhood Farjah, MD, MPH
Associate Professor

Teresa S. Kim, MD
Assistant Professor

Ron V. Maier, MD
Professor & Chief

Michael S. Mulligan, MD
Professor & Chief

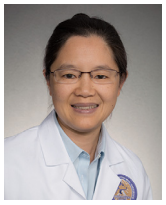


Grant E. O'Keefe, MD, MPH
Professor

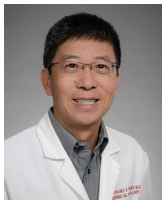
James O. Park, MD
Professor

Venu G. Pillarisetty, MD
Professor

Kimberly J. Riehle, MD
Associate Professor



Gale Tang, MD
Associate Professor

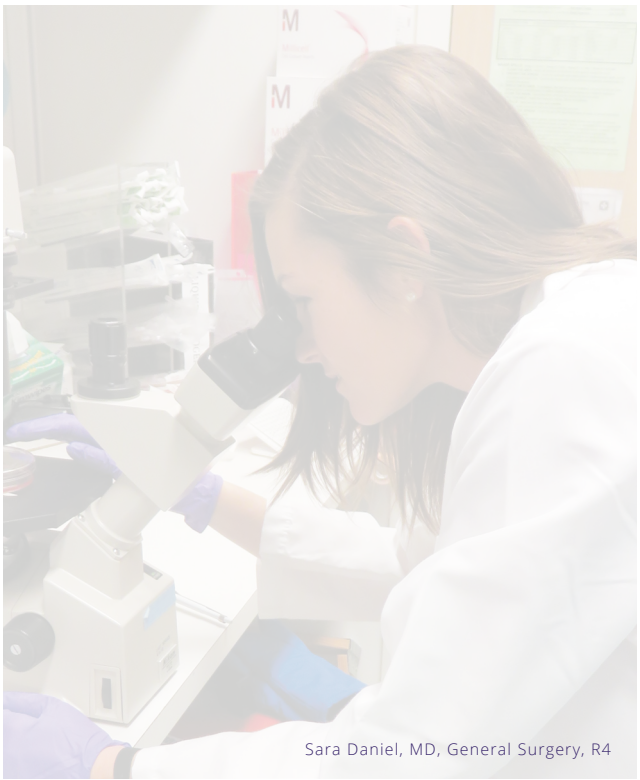


Raymond S. Yeung, MD
Professor

Department of Surgery Research Leadership

Douglas E. Wood, MD, FACS, FRCSEd
The Henry N. Harkins Professor and Chair

David R. Flum, MD, MPH
Associate Chair for Research,
Professor of Surgery



Sara Daniel, MD, General Surgery, R4

DEPARTMENT OF SURGERY FEATURED FACULTY

Ron V. Maier, MD

Professor & Chief
Division of Trauma, Burn & Critical Care Surgery

Dr. Maier holds the Jane and Donald D. Trunkey Chair of Trauma Surgery, and is Professor and Vice–Chair of the Department of Surgery at the University of Washington. In addition, he is the Director of the Regional Trauma Center, and Surgeon–in–Chief at Harborview Medical Center, the Level I Trauma Center in Seattle supporting four Northwest states representing one quarter of the landmass of the US.

Dr. Maier graduated magna cum laude with his BS from the University of Notre Dame, obtained his MD degree from Duke University Medical School, and completed his General Surgery residency at the University of Washington, after which he completed a post–doctoral fellowship in Immunopathology at the Scripps Research Foundation in La Jolla, California. He has been a member of the Faculty of the Department of Surgery at the University of Washington since 1981.

Dr. Maier recently served as President of the two most prestigious associations in American surgery; the American Surgical Association and the American College of Surgeons. He has served in numerous leadership positions, both nationally and internationally, including as past–President of the Society of University Surgeons, Shock Society, American Association for the Surgery of Trauma, Halsted Society, Surgical Infection Society, North American Trauma Association, and the International Association of Trauma, Surgery and Intensive Care of the International Surgical Society. He has served as a member of the American College of Surgeons' Committee on Trauma, including as Chief of Region X and as Chair of the COT's Injury Prevention and Control Committee, he continues as a consultant to the ACS Executive Program Committee and served as First–Vice President of the ACS in 2016.

He has received numerous honors for his research, teaching and clinical trauma work, including the Parker J. Palmer Courage to Teach Award from the Accreditation Council for Graduate Medical Education (2010); the John K. Stevenson Award for Teaching Excellence and Dedication to Resident Education (2012); the Dr. Rodman E. Sheen and Thomas G. Sheen Award from the American College of Surgeons for outstanding contributions to the medical profession (2013), and was awarded the Medal for Lifetime Achievement, for published work which has made the most notable and useful contribution to Surgical Science, International Society of Surgery/Societe Internationale de Chirurigie (ISS/SIC), 2017.

Throughout his career, Dr. Maier has been interested in the critically–ill surgical patient, focusing on the underlying pathophysiology driving the aberrant host immuno–inflammatory response, and subsequent clinical syndrome of multiple organ failure with its attendant high morbidity and mortality. Dr. Maier has been funded continuously by the NIH since 1981, totaling more than $20 million, and has been a member and Chair of the NIH Surgery, Anesthesiology and Trauma Study Section. His long–standing interest in trauma has also involved extensive clinical studies of the acute management of the severely injured and critically ill patient, and a number of studies investigating the impact of trauma system development on improvement in trauma care and outcomes of the severely injured, along with trials of injury prevention and assessment. Dr. Maier has presented his work worldwide, and has delivered more than 400 lectures on trauma, critical care medicine and surgical immunology. He has published over 400 peer–reviewed articles, and contributed to or co–authored 60+ book chapters.

Arezou Abbasi, MD
Postdoctoral Research Fellow

Faculty Mentor
Venu G. Pillarisetty, MD

Hometown
Tabriz, Iran

Medical School
Tehran University

Research Interests
Pancreatic cancer, hepatobiliary cancer

PREOPERATIVE LANREOTIDE MAY REDUCE CLINICALLY SIGNIFICANT PANCREATIC FISTULA FOLLOWING DISTAL PANCREATECTOMY: EARLY OUTCOMES OF A PHASE II TRIAL

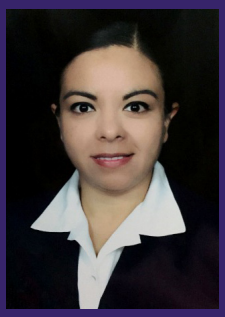
Abbasi A, Sham J, Park J, Pillarisetty V

Background: Pancreatic fistula (PF) is a common complication of Distal Pancreatectomy (DP) that contributes to major postoperative morbidity and mortality. Clinically significant PF (CSPF) following DP ranges between 20-30% in the literature. Lanreotide is an FDA approved somatostatin analogue that reaches therapeutic blood concentration rapidly and lasts for nearly two months. No prior trial has investigated the efficacy of this drug in decreasing PF following DP.

Methods: We conducted a phase II clinical trial to investigate the effect of preoperative subcutaneous Lanreotide on the pancreaticoduodenectomy or DP procedures. This is a report of the subset analysis of the enrolled DPs compared to historic controls. Primary outcome was CSPF and intraabdominal abscess, combined. Secondary outcomes were grade A PF and surgical site infection.

Results: Among 114 patients enrolled in the trial, 34 were DPs, of which 30 have completed the two-months postoperative follow up. The control group includes 30 patients who underwent DP in our institute prior to the start of the trial. The preoperative characteristics of two groups including age, sex, race and comorbidities were not significantly different. None of the patients in the Lanreotide group developed the primary outcome. However, 13.3% (n=4) of the control group experienced the primary outcome (p-value=0.11) The secondary outcomes occurred in 16% (n=5) of the Lanreotide group and 20% (n=6) of the control group. (p-value>0.05) Drug-related adverse event (AE) occurred in one patient who developed an injection site reaction (mild AE).

Conclusions: Lanreotide appears to decrease the rate of clinically significant PF in DP patients. Outcomes of our study along with the particular pharmacokinetic profile of this drug and its well-established adverse events provide strong rational for a multi-center randomized clinical trial.



Rocio Carrera Ceron, MD
CVES Research Fellow

Faculty Mentor
Andrew S. Wright, MD

Hometown
Mexico City, Mexico

Medical School
Universidad Nacional
Autonoma de Mexico

Research Interests
Esophageal and thoracic surgery, motility, surgical outcomes

COMPARISON OF OUTCOMES BETWEEN PATIENTS UNDERGOING PARAESOPHAGEAL HERNIA REPAIR WITH MESH VS PRIMARY REPAIR

Carrera Ceron R, Inaba C, Oelschlager B, Yates R, Chen J, Khandelwal S, Wright A

Background: Use of biologic mesh in paraesophageal hernia repair (PEHR) is associated with decreased short-term recurrence but no statistically significant difference in long-term recurrence. Our current practice is to selectively use mesh in patients we consider high risk for recurrence. Our aim was to describe the characteristics of patients who underwent PEHR with mesh vs primary repair, and to compare their outcomes.

Methods: We reviewed our prospective institutional database and performed a retrospective chart review of patients who underwent PEHR with biologic mesh vs. primary repair between October 2015-October 2018. The decision to use mesh was made intra-operatively by the surgeon. Recurrence was defined as the presence of >2cm intrathoracic stomach on postoperative upper gastrointestinal (UGI) series.

Results: 251 patients underwent PEHR during our period of study, including 169 (67.3%) patients undergoing first-time repair and 82 (32.7%) patients undergoing redo PEHR. Among first-time repair patients, 64% underwent a primary repair vs. 36% with mesh. Among redo-repair patients, 42.7% underwent a primary repair vs. 57.3% with mesh. There were no demographic differences between groups. Median LOS was 1 day for all groups. OR times were not significantly increased with use of mesh.

There were no mesh-related complications. We obtained a postoperative UGI in 51.5% of the first-time repair group and in 52.4% of the redo repairs. Most UGI studies were obtained for routine 6-month postoperative follow-up (median follow-up was 130 days). Radiographic recurrence was statistically higher in primary repair compared with mesh repair (p=0.04 first-time, p=0.02 for redo repair), table 1.

	First-time Repair (n=87)		Redo Repair (n=43)	
	Primary repair (n=53)	Mesh (n=34)	Primary repair (n=19)	Mesh (n=24)
Radiographic recurrence, n (%)	19 (35.8)	5 (15)	11 (58)	5 (21)
Reoperation, n (%)	2 (3.3)	0 (0)	1 (2.1)	1 (3)

Conclusions: Selective mesh reinforcement of the hiatus in both first-time and redo laparoscopic PEHR is associated with reduced incidence of early postoperative radiographic recurrence. Mesh use in patients the surgeon deemed at increased risk for recurrence further highlights the benefit of mesh reinforcement of the hiatus at reducing short-term recurrence.

Nikhitha Thrikutam, MD, MPH
Plastic Surgery, R2

Faculty Mentor
Barclay Stewart, MD, PhD, MscPH

Hometown
Plano, TX

Medical School
University of Texas-Southwestern

Research Interests
Diversity and inclusion, access to care, plastic surgery education quality improvement, burn surgery, microsurgery

EPIDEMIOLOGY AND OUTCOMES OF COOKING AND COOKSTOVE-RELATED BURN INJURIES: A WORLD HEALTH ORGANIZATION (WHO) GLOBAL BURN REGISTRY (GBR) REPORT

Thrikutam N, Mehta K, Stewart B, Hoyte-Williams P, Altamirano A, Peck M, Meddings D, Falk H, Nakarmi K

Background: Cooking and cookstove-related burns (CSBs) comprise a large proportion of burn injuries globally. There are limited data on patterns of cooking behaviors and CSBs to inform prevention initiatives and advocacy. Therefore, we aimed to describe the epidemiology, risk factors and outcomes of cooking-related burns and CSBs specifically, as well as highlight the potential of the World Health Organization (WHO) Global Burn Registry (GBR).

Methods: Patients with cooking and non-cooking related burns from 2018 to 2020 were identified in the WHO GBR. Patient demographics, cooking arrangement, injury characteristics and outcomes were described and compared. Bivariate regression was performed to identify risk factors associated with CSBs.

Results: GBR contained data of 6,965 burn-injured patients from 17 countries; 88% were from middle-income countries. ~25% of patients sustained cooking-related burns (n=1,723). More than half of cooking-related burns (55%) occurred among females. Median age for cooking-related burns was 11 years (IQR 2-35). Of cooking-related burns, 22% were cookstove-related burns (CSBs; 311 burns). The most common mechanism among CSBs was flame (87%), whereas the most common mechanism among other cooking burns was scald (62%). CSBs were significantly larger in TBSA size (30%, IQR 15-45 vs 15%, IQR 10-25; $p<0.001$), had higher revised Baux scores (70, IQR 46-95 vs 28, IQR 10-25; $p<0.001$) and more often resulted in death (41 vs 11%; $p<0.001$) than other cooking burns. Patients with CSBs were more likely to be burned by fires (OR 4.74; 95% CI 2.99-7.54) and explosions (OR 2.91, 95% CI 2.03-4.18) than other cooking injuries.

Conclusions: Cooking-related burns are common. CSBs specifically have different epidemiology than cooking-related burns broadly (e.g., more often female, larger burn size, higher mortality). CSBs were more likely caused by structural factors (e.g., explosion, fire) than behavioral factors (e.g., accidental movements or contact injury) when compared to other cooking burns.

David Droullard, MD
Research Resident

Faculty Mentor
Giana H. Davidson, MD, MPH

Hometown
Minneapolis, MN

Medical School
Columbia University

Research Interests
Patient reported outcomes in surgery, patient engagement in research, surgical decision-making, appendicitis and diverticulitis

ASSESSING THE IMPACT OF DIVERTICULITIS ON QUALITY OF LIFE OVER TIME

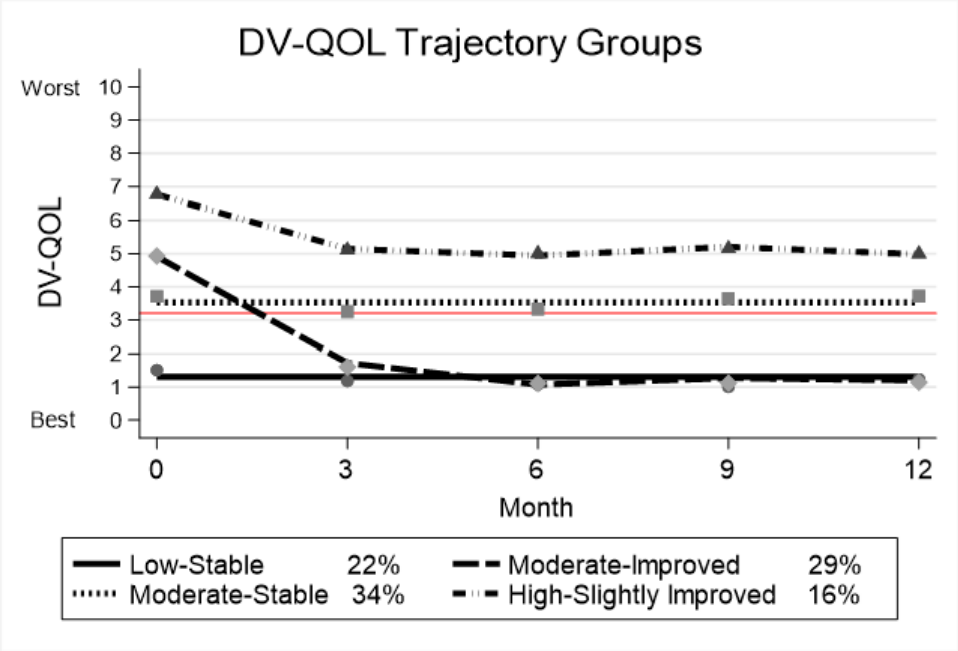
Droullard DJ, Khor S, Hantouli MN, Strate L, Flum DR, Davidson GH

Background: Guidelines recommend elective colectomy for uncomplicated diverticulitis based on an assessment of health-related quality of life (HRQL). However, for patients with HRQL-limiting disease, the likelihood of improvement without surgery is unknown. We aim to describe longitudinal patterns in diverticulitis HRQL to better inform shared decision-making.

Methods: A prospective observational cohort of adults with diverticulitis (2016-2020) completed the DV-QOL questionnaire at quarterly intervals, with higher scores indicating worse HRQL and scores below 3.2 considered acceptable by patients. Scores were censored at the time of surgery. Group-based trajectory modeling was used to identify distinct patterns of DV-QOL scores over one year.

Results: 263 patients (58% female, median age 56y) completed a baseline survey, with a median 1.5y since diagnosis (IQR 0.1-7.6y) and 3 acute diverticulitis episodes prior to enrollment (IQR 1-7). Median follow-up was 1.75y (IQR 0.75-3y). During the follow-up period, 40 underwent elective surgery and 4 emergent surgery. Four distinct trajectory groups were identified based on the severity and trend of DV-QOL impact over time (Figure): High-Slightly Improved (16% of patients), Moderate-Stable (34%), Moderate-Improved (29%) and Low-Stable (22%). Compared to the Low-Stable reference group, female sex and >3 reported episodes were significantly associated with the High-Slightly Improved group (Odds ratio 4.9 and 10.0, p= 0.008 and 0.001, respectively).

Conclusions: We describe four distinct patterns of HRQL in patients with diverticulitis, with 16% experiencing a high level of HRQL impairment over 1 year. Surgical decisions should be grounded in an understanding of expected HRQL impact, and further research is needed to identify those who derive the greatest benefit from surgery.



DV-QOL below 3.2 (red line) is considered "acceptable." Trendlines show the model fit to each group, and markers represent mean DV-QOL.

Mariam Hantouli, MD
Postdoctoral Research Fellow

Faculty Mentor
Giana H. Davidson, MD, MPH
David R. Flum, MD, MPH

Hometown
Jenin, Palestine

Medical School
An-Najah National University

Research Interests
Clinical outcomes research, patient-centered care, health equity

ACUTE CHOLECYSTITIS DURING PREGNANCY: WHEN AND SHOULD YOU OPERATE?

Hantouli MN, Fennern EB, Droullard DJ, Cook SB, Wolff EM, Benson LS, Flum DR, Davidson GH

Background: Management of cholecystitis during pregnancy balances the risk of adverse pregnancy outcomes (APO- fetal loss and preterm delivery) with surgery. Guidelines recommend early cholecystectomy (EC) regardless of trimester but the varying risk of APO across trimesters has not been characterized. We compared the APO between patients presenting with acute cholecystitis in different trimesters who did or did not receive EC.

Methods: Retrospective cohort study of acute cholecystitis during pregnancy using the Truven MarketScan Databases (2007-2016). APO, trimesters (T1, T2, T3), and EC (≤7 days of presentation) were defined by outpatient and inpatient claims. Propensity score adjustment was used to account for selection bias.

Results: Among 5,123 pregnant patients with cholecystitis, 36.8% underwent EC (45.1% of those presenting in T1, 48.5% in T2, and 15.5% in T3). In the unadjusted analysis, APO rates were similar between patients presenting in T1 and T3 who did/did not receive EC (38.9% vs. 36.6%, 12.2% vs. 14.7%, T1, T3 respectively, $p>0.05$). However, EC in patients presenting in T2 was associated with lower rates of APO (12% vs. 21.3%, $p<0.001$). Propensity adjustment also found that the odds of APO were lower in EC group only in T2 (OR 0.59, 95% CI [0.45- 0.79], $p<0.001$). Similar results were found comparing EC to delayed cholecystectomy (>7 days) or no surgery during pregnancy.

Conclusions: The effect of EC on APO appears to vary across trimesters with a significant effect identified in T2 and the potential for an underpowered analysis (T1 and T3). These findings may help individualize obstetric risk assessment related to cholecystectomy in different trimesters.

Kevin Sullivan, MD
General Surgery, Chief Resident

Faculty Mentor
Venu G. Pillarisetty, MD

Hometown
Milwaukee, WI

Medical School
Medical College of Wisconsin

Research Interests
Hepatopancreaticobiliary surgery, immunology

IL–10 BLOCKADE RESCUES CAR–T CELL FUNCTION IN THE TUMOR MICROENVIRONMENT IN HUMAN PANCREATIC CANCER AND COLORECTAL CANCER LIVER METASTASES

Sullivan KM, Jiang X, Guha P, Daniel SK, Kenerson HL,
Seo YD, Labadie K, Kim TS, Yeung R, Katz S, Pillarisetty V

Background: There are many challenges to using chimeric antigen receptor (CAR)–T cell therapy to treat patients with solid tumors. We hypothesized that blockade of immunosuppressive signaling by myeloid cell–derived IL–10 would enhance CAR–T cell anti–tumor activity in the tumor microenvironment.

Methods: Colorectal cancer (CRC) cells, anti–carcinoembryonic antigen (CEA) CAR–T cells, and murine myeloid–derived suppressor cells (MDSC) were incubated with anti–IL–10 monoclonal antibody (mAb), and CAR–T proliferation was quantified by carboxyfluorescein succinimidyl ester (CFSE) dilution using flow cytometry. We treated human tumor slice cultures (TSC) of 4 CRC liver metastases (CRCLM) or 3 pancreatic ductal adenocarcinoma (PDA) with anti–CEA CAR–T or anti–ROR1 CAR–T, respectively. After incubating the TSC with control or specific CAR–T and concurrently with either IgG control or anti–IL–10 mAb, we labeled tumor cells, CAR–T, and apoptotic cells with fluorescent markers and performed confocal microscopy. Additionally, we pre–treated CAR–T alone with anti–IL–10 receptor (IL–10R) mAb and then incubated TSC with the only the pre–treated CAR–T.

Results: Flow cytometry demonstrated that MDSC produced IL–10, and CAR–T expressed the IL–10 receptor. While 42% of CAR–T proliferated in response to tumor cells in the presence of MDSC, blockade of IL–10 increased this to 67% ($p<0.001$). The total percentage of tumor cells undergoing apoptosis was greatest in the TSC treated with combination CAR–T and IL–10 blockade (59% for CRCLM and 48% for PDA), compared to controls (<25% for CRCLM and <28% for PDA, both $p<0.01$). TSC in this combination treatment group also had greater percentages of tumor cells with CAR–T nearby. Furthermore, when treated with CAR–T and anti–IL–10 mAb, apoptotic tumor cell percentage was increased only when CAR–T was nearby, but tumor cell apoptosis was unchanged amongst all treatment types without a CAR–T cell nearby. Additionally, blockade of the IL–10R on CAR–T showed a similar pattern of greater tumor cell apoptosis compared to controls of increased apoptotic tumor cells, increased proximity of CAR–T to tumor cells, and highest tumor cell apoptosis only when CAR–T was nearby.

Conclusions: Myeloid cells produce a reversible immunosuppressive signal to CAR–T. Treatment of human CRCLM and PDA TSCs with CAR–T in combination with anti–IL–10 antibody leads to a marked increase in cell apoptosis as a result of CAR–T interaction with the nearby tumor cells. Blockade of IL–10, or alteration of the CAR–T such that the IL–10R does not respond to IL–10, may be a useful combination therapy to enhance CAR–T immunity in human solid tumors.

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Research Interests
Critical care, trauma, resuscitation, mathematical modeling

EARLY ICU RESUSCITATION IN CRITICALLY ILL TRAUMA PATIENTS: DO WE NEED A NEW STRATEGY?

Beni C, Arbabi S, Robinson B, O'Keefe GE

Background: Unlike recent advances in blood product resuscitation, crystalloid (IVF) use in hemorrhagic shock has received less attention and current recommendations are based on limited evidence. To address this knowledge gap, we aimed to determine associations between IVF administration during early ICU resuscitation and outcomes. We hypothesized that larger IVF volumes are associated with worse outcomes, and that bolus-based resuscitation contributes to larger volumes.

Methods: We linked our trauma registry with EHR data (2012-2015) to identify adults with initial lactate ≥ 4 mmol/L and documented lactate normalization (≤ 2 mmol/L) – excluding those with isolated head AIS ≥ 3. We focused on the period from ICU admission to lactate normalization, analyzing duration, volume of IVF, and proportion of volume as one-liter boluses. We used linear regression to determine associations with the outcomes ICU-free days and ventilator-free days, and logistic regression to identify associations with volume administration ≥ 6 L, adjusting for important covariates.

Results: We included 315 subjects. Median duration was 15 hours (IQR [6, 24]) and median IVF volume was 3.6 L (IQR [1.2, 5.9]). Hourly volumes tapered over time, but persistently aggregated at one liter (see Figure). Administration of larger volumes was associated with fewer ventilator-free days and ICU-free days. One hundred and ninety four patients received at least one one-liter bolus. These boluses represented 30% (IQR [0%, 60%]) of volume administered per subject. Higher bolus proportion was associated with administration of larger IVF volumes (OR 10.4, 95% CI [3.8, 28.8]).

Conclusions: There is substantial variation in volume administered during early ICU resuscitation, despite accounting for injury severity. The administration of IVF as one-liter boluses contributed to larger volumes, which are associated with worse outcomes. There is an opportunity to improve outcomes by focusing on this phase of resuscitation and investigating alternative approaches to IVF administration.

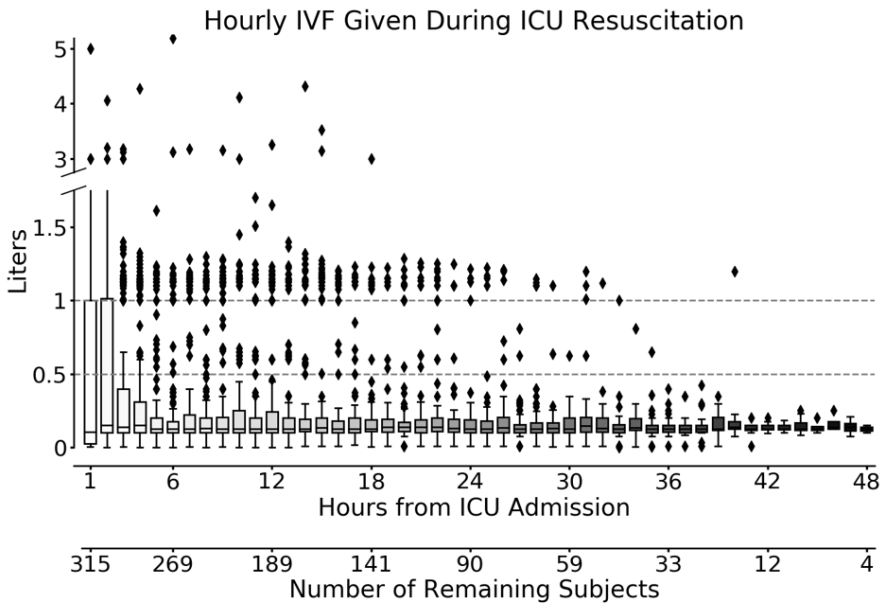
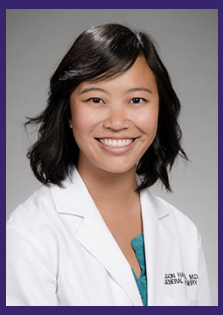


Figure: Volume of IVF given per hour of ICU resuscitation



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Research Interests
Surgical education, palliative care outcomes

DEVELOPMENT AND UTILIZATION OF NOVEL 3D PRINTED MODELS FOR EMERGENT SURGICAL AIRWAY CURRICULUM

Haruta A, Zern N

Background: Emergent surgical airways are potentially life saving procedures that require rapid and skillful technique in a time of chaos. At some of our hospitals, the first (and often only) responder is a junior resident and we receive no formal training on this procedure. We aim to demonstrate efficacy of a novel emergent surgical airway teaching curriculum by assessing residents' skill level before and after. We hypothesized that resident subjective comfort with surgical airways and objective knowledge of the anatomy and procedure will be improved after the module.

Methods: Residents were given a pre-test including questions about their subjective comfort level with airway anatomy, tools, and surgical technique, as well as multiple choice questions about the procedure steps, anatomy, and indications. They then received a short didactic session followed by a hands on session using the 3D printed model. After completing both, they took a post test with the same questions. Survey results were input into REDCap and excel was used to analyze participants' results pre and post module.

Results: Participants were mainly R1s and ranged across multiple surgical subspecialties with little airway experience. We found the majority of participants improved their comfort level post module; 71% improved comfort with anatomy and 100% improved comfort with surgical technique ($p<0.05$). There was a 30% improvement in multiple choice answers ($p<0.05$) with overall 94% correct answers post module.

Conclusions: Overall, most participants improved their comfort level with emergent airways post module and were able to successfully perform a cricothyroidotomy on the 3D model after our teaching session. Going forward, we hope to continue to make the models more realistic and continue to educate residents to improve adeptness at this emergent procedure.

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Surgical outcomes, foregut surgery, cost-effectiveness, value-based care

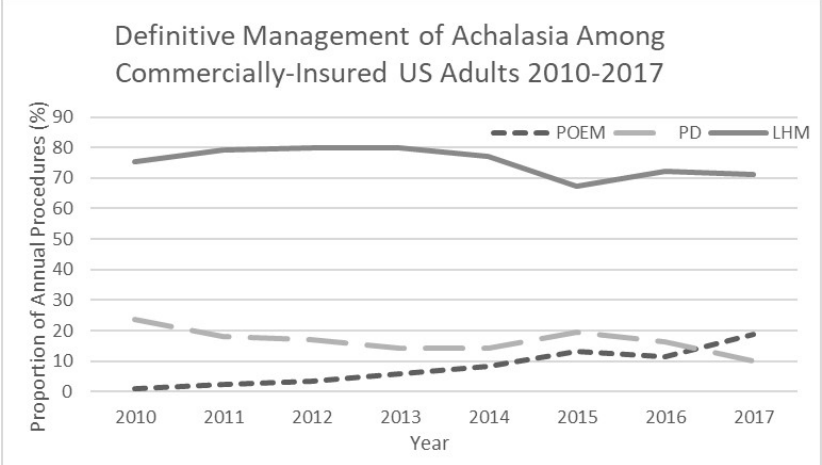
THE USE AND SAFETY OF POEM AND OTHER DEFINITIVE MANAGEMENT STRATEGIES FOR ACHALASIA

Lois A, Oelschlager B, Wright A, Templeton A, Cook S, Flum DR, Farjah F

Background: Per oral endoscopic myotomy (POEM) has shown similar efficacy to pneumatic dilation (PD) and laparoscopic heller myotomy (LHM) for relief of achalasia symptoms. We sought to describe the dissemination of this new technology into clinical practice and address unanswered questions regarding safety and the burden of healthcare utilization after POEM.

Methods: Retrospective cohort study of patients (18-63 years) with achalasia initially treated with POEM, PD, or LHM (2010-2017) using the MarketScan® claims databases. POEM cases were identified using an administrative definition validated in an institutional cohort. We compared rates of perforation requiring intervention and healthcare utilization in the one year following intervention.

Results: Among 1,921 patients (mean age 46.2 years, 48.7% women), 75.7%, 16.9%, and 7.4% underwent LHM, PD, and POEM, respectively. Comorbid disease burden was similar between groups (p=0.16). POEM increased from 1.1% of cases in 2010 to 18.9% in 2017 (Figure 1). Perforation occurred in 0.3% (95% confidence interval [CI]: 0.1-0.7) LHM vs 0.9% (95%CI: 0.2-2.7) PD vs 0.0% (95%CI: 0.0-2.6) POEM. After POEM, 72.5% (95%CI: 64.4-79.7) underwent achalasia-related diagnostic testing compared to 60.9% (95%CI: 58.3-63.4) and 57.8% (95%CI: 52.3-63.3) after LHM and PD, respectively. Reintervention was performed in 16.9% (95%CI: 11.1-24.1) after POEM compared to 7.8% (95%CI: 6.4-9.3) and 45.5% (95%CI: 40.0-51.1) after LHM and PD, respectively.



Conclusions: The use of POEM has increased, comprising nearly a fifth of definitive procedures performed for achalasia in 2017. Perforation requiring intervention was rare for all procedures. POEM was associated with more frequent subsequent diagnostic testing and reintervention compared to LHM.

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Pediatric surgery, surgical outcomes, health disparity, quality improvement

EPIDEMIOLOGY OF SWALLOW DYSFUNCTION IN CDH PATIENTS

Ramaraj A, Foster C, Stark R

Background: There is a growing body of literature regarding long-term pulmonary outcomes in children with congenital diaphragmatic hernia (CDH). Oral feeding skills in these children are often delayed. Chronic descending aspiration due to uncoordinated swallowing can further insult the already compromised lung parenchyma in these children. This study describes patterns of swallowing dysfunction and aspiration in patients with CDH.

Methods: Records of all children treated for CDH at our institution from January 2014 to December 2019 were reviewed. Concern for swallowing dysfunction was marked by performance of a video-fluoroscopic swallow study (VFSS). We determined the frequency of aspiration on VFSS and how frequently that finding changed patient management. We also evaluated for association between clinical suspicion of swallow dysfunction and descriptors of CDH severity.

Results: Sixty-nine patients were treated during this 6-year time period. Of those, 10 (14%) had a VFSS as an inpatient, and 25 (36%) had one as an outpatient. Eight (80%) inpatient and 17 (68%) outpatient studies identified aspiration. VFSS results changed management in 80% of patients, often by altering the consistency of oral feeds. There were no associations between CDH side, defect size or need for a patch and need for a VFSS.

Conclusions: The frequency of aspiration in the CDH population is high. Identification of aspiration on VFSS leads to changes in treatment aimed at protecting the lungs. Additionally, the severity of the CDH was not associated with aspiration on VFSS.

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Pediatric surgery, surgical oncology

UREA CYCLE DYSREGULATION IN FIBROLAMELLAR CARCINOMA

Utria A, Kenerson H, Nwosu Z, Hsiao WY,
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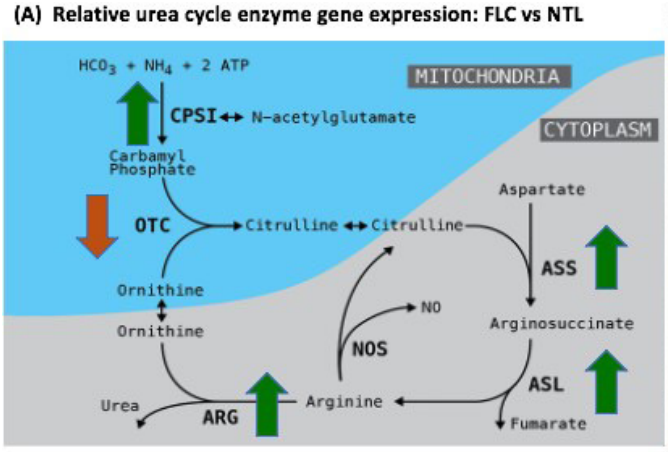
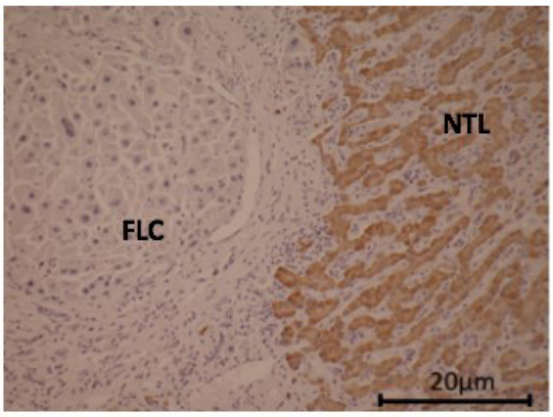
Background: Fibrolamellar carcinoma (FLC) is a primary liver cancer affecting adolescents and young adults. At diagnosis the disease has often spread outside the liver and is therefore incurable. Interestingly, some patients present with encephalopathy secondary to hyperammonemia, despite having normal hepatocellular function. It is well known that metabolic dysregulation in cancers can confer a proliferative advantage and a drug resistant phenotype, however, there is little understanding of the metabolic changes in FLC and why hyperammonemia occurs in these patients.

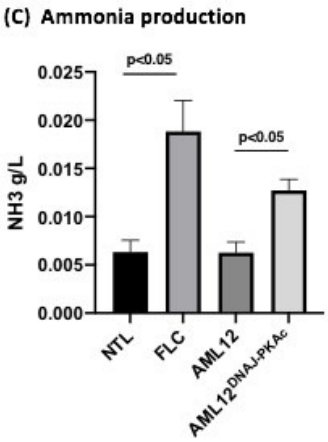
Methods: We analyzed gene and protein expression of urea cycle enzymes in human FLCs compared to paired non-tumor livers (NTL), and in a non-transformed murine hepatocytic cell line (AML12) with and without the FLC mutation (AML12$^{DNAJ\text{-}PKAc}$). Ammonia production in these models was measured, and cell growth in media with and without glutamine and/or arginine was analyzed. Metabolomic profiles in these cell lines were evaluated.

Results: Ornithine transcarbamylase (OTC) gene and protein expression is markedly downregulated in FLC compared to paired NTL (Fig1A-B). Downregulation of OTC gene expression was confirmed in the AML12$^{DNAJ\text{-}PKAc}$ cell line and thus appears to be related to the DNAJ-PKAC fusion. Additionally, AML12 and AML12$^{DNAJ\text{-}PKAc}$ show distinctive metabolic phenotypes, and without glutamine, AML12$^{DNAJ\text{-}PKAc}$ cells lost their enhanced proliferative phenotype. Ammonia production was elevated in both FLC tumor slices and the AML12DNAJ-PKAc cell line compared to paired NTL and AML12 cells, respectively (Fig 1C).

Conclusions: Urea cycle disorder, specifically down regulation of OTC, appears to be characteristic of FLC. This finding is consistent with the fact that hyperammonemia in these patients can be ameliorated by treating them similar to patients with genetic OTC deficiency. Additionally, in an FLC cell model we demonstrate an altered metabolic profile and dependency on glutamine. Further studies into altered metabolism may reveal therapeutic vulnerabilities in FLC patients.







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Research Interests
Gamma chain cytokines, tumor vasculature, tumor vaccines

IL-15 POTENTLY INDUCES PROLIFERATION OF ENDOGENOUS TUMOR INFILTRATING T CELLS AND CAR-T CELLS IN HUMAN SOLID TUMORS

Kohli K, Hsu C, Jiang X, Abbasi A, Kim TS, Zhang S, Pillarisetty V

Background: Immunosuppressive features of solid tumor microenvironments drive dysfunction of cytotoxic T cells and limit the success of immunotherapies. Regimens that reliably ensure persistence and activity of T cells, in solid tumors are therefore needed. Gamma chain cytokines (GCCs) can augment T cell-mediated anti-tumor immunity and have been tested in clinical trials for cancer. However, the precise effects of different GCCs on tumor-infiltrating lymphocytes (TILs) remains poorly understood, ultimately limiting their use.

Methods: We treated tumor slice cultures of various solid tumors, including pancreatic ductal adenocarcinoma (PDA), hepatocellular carcinoma (HCC) and colorectal cancer liver metastases (CRCLM) with GCCs (IL-2, IL-7, IL-15 and IL-21). For HCC cases, glypican-3-specific chimeric antigen receptor (CAR)-T cells were overlaid on tumor slices in separate experimental groups. Cells released into the media were analyzed by flow cytometry and intact tumor slices were fixed for multiplex immunohistochemistry.

Results: Of all tested GCCs, IL-15 was the most potent at expanding TILs (Figure 1). TILs were more responsive to IL-15 than T cells in the blood from the same patient. The effect of IL-15 on T cell proliferation was higher on antigen-experienced $CD39^{+}PD1^{+}$ T cells. IL-15 was also the most potent GCC in expanding CAR-T cells engineered to recognize Glypican-3 in HCC slices (Figure 1).

Conclusions: Our data suggest that IL-15 is effective at inducing *in situ* expansion of TILs and CAR-T cells in the solid tumor microenvironment. IL-15 should be studied as an adjunct to immunotherapeutic regimens including checkpoint inhibitors and adoptive cell therapy.

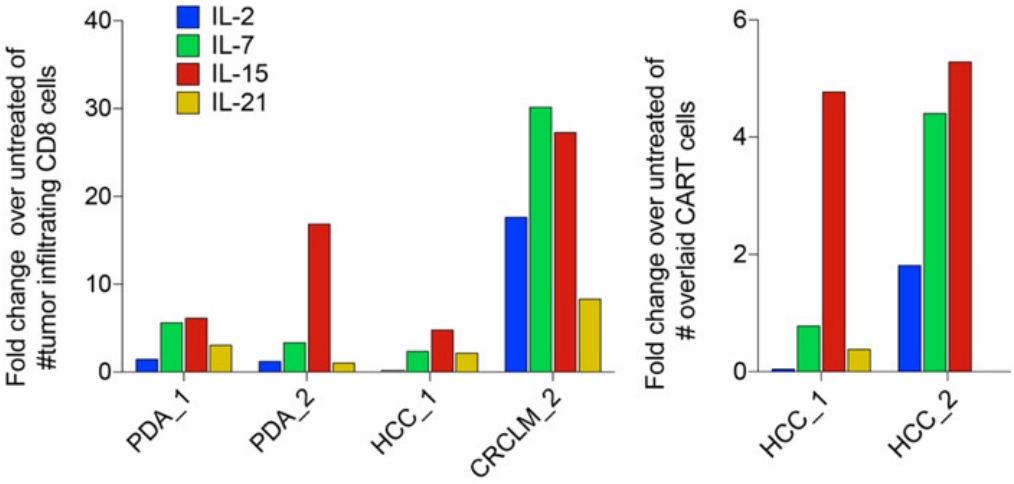

Figure 1. IL-15 expands TI-CD8 T cells and CAR-T cells. Mean fold change of number of CD8+ TILs (left) and glypican-3-specific CAR-T cells. Cells were harvested at 6-7 days (CD8 T cells) or 4 days (CAR T cells) after treatment. Each experiment had at least 3 replicates.

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Research Interests
Operational tolerance induction in solid organ transplantation

GENERATION OF MIXED CHIMERISM AND OPERATIONAL TOLERANCE IN MHC-DISPARATE RHESUS MACAQUES

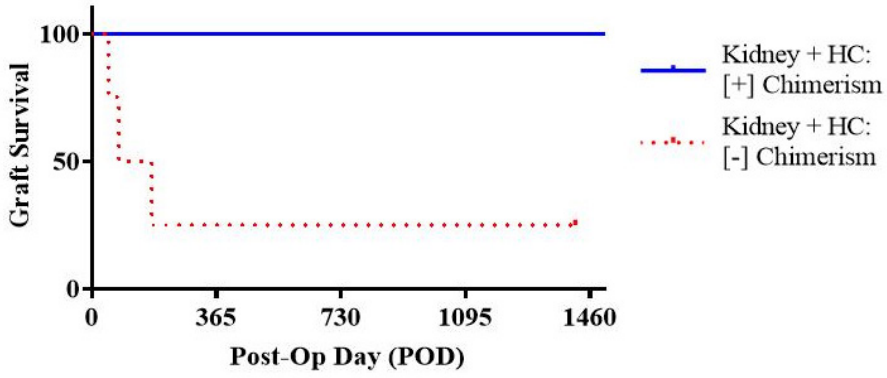
Little C, Fechner J, Post J, Hematti P, Kaufman D

Background: Transplant tolerance obviates the need for lifelong immunosuppression. A promising strategy to achieve tolerance involves establishment of immunologic chimerism in recipients via infusion of donor-derived CD34+ hematopoietic cells (HC). Persistent challenges include the infrequency of chimerism induction, and if achieved, the risk of graft-versus-host disease (GVHD). We therefore established a novel chimerism-based kidney tolerance induction protocol in a preclinical rhesus macaque model.

Methods: We utilized a post-transplant, non-myeloablative, helical tomotherapy-based total lymphoid irradiation conditioning method along with anti-lymphocyte globulin and donor-derived CD34+ HC infusion to create chimerism. Peripheral blood apheresis or bone marrow collection were the sources of donor HC. Mycophenolate mofetil and tacrolimus immunosuppression were weaned off by month 5 and 7, respectively.

Results: Outcomes of 11 MHC 1-haplotype matched kidney + HC transplants are shown in Figure 1. Transient mixed chimerism was achieved in 2 recipients. Both chimeric animals achieved tolerance with no episodes of acute rejection or GVHD for >4 years. Engraftment failed in 9 animals and was associated with early kidney loss when immunosuppression was eliminated. Failure to achieve chimerism was attributed to engraftment resistance and early development of donor-specific antibodies (DSA). These obstacles were addressed in a series of HC-only (n=4) and kidney + HC (n=1) allo-transplants with the addition of total body irradiation (TBI) and Belatacept-based T-cell costimulatory blockade, respectively. This induction regimen established chimerism and eliminated DSA production in all recipients. However, the rate of GVHD (2/5) and failure to thrive (5/5) after TBI was prohibitive. Belatacept-treated kidney + HC transplants (without TBI) are ongoing. Preliminary data (n=3) demonstrates efficient engraftment without DSA production or GVHD, with one recipient off immunosuppression and two currently tapering therapy.

Figure 1



Conclusions: Post-transplant, tomotherapy-based total lymphoid irradiation conditioning with donor-derived HC infusion represents a promising strategy for induction of chimerism and operational tolerance in MHC-disparate rhesus macaques.

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Research Interests
Austere medicine, combat casualty care, trauma critical care, burn critical care

THE RISKS OF SEDATION AND PAIN CONTROL IN THE ICU: CAN INCREASED SEDATION LEAD TO OVER-RESUSCITATION AND MORE HYPOTENSION?

McClellan JM, Sheckter C, O'Neal J, Anderson J, Mandell SP

Background: Pain control and sedation of burn patients is a complex and necessary aspect of initial care and resuscitation. Each patient's pain experience is unique. Balancing pain needs with obtundation and hemodynamic changes can be difficult, even for experienced clinicians. We hypothesize that in the first 48 hours of ICU admission, the increased use or propofol, benzodiazepines, and dexmedetomidine in burned patients will be associated with greater resuscitation and more hypotension.

Methods: A 6-year (2014-19) retrospective review of our hospital's burn database collected patients admitted to the ICU with greater than 20% TBSA burns. In the first 48 hours of admission, we compared total amounts of sedation/pain medications (morphine milligram equivalents (MME), propofol, dexmedetomidine, benzodiazepines) given with total resuscitation and hemodynamic data. A linear regression model was chosen to determine if higher amounts of sedation/pain medication could predict greater resuscitation and episodes of hypotension (MAP <65).

Results: 208 patients were included with median age, %TBSA, and resuscitation of 43 years (0-99), 31% (20-93), and 3.3 ml/kg/%TBSA (0.13-19.05), respectively. The majority of our patients were white (80%) males (68%). Patients received a combination of MMEs (99% of patients), propofol (31%), dexmedetomidine (11%), and benzodiazepines (73%). Using a multivariable linear regression model, we found associations between total MMEs given and greater resuscitation (95% CI: 0.15-0.54, p=0.01) as well as number of hypotensive events (95% CI: 1.57-2.7, p<0.001) in the first 48 hours of admission. We also found that dexmedetomidine was associated with more hypotensive episodes (95% CI: 0.36-2.2, p=0.01). No associations were noted with other sedative medications when comparing the number of hypotensive events and increased resuscitation.

Conclusions: While acute pain and sedation management is crucial in treating critically ill burn patients, it often becomes routine. We find that pain management is not without physiological consequences and should be carefully monitored during resuscitation.

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Research Interests
Surgical critical care, translational medicine, sepsis

HLA–A LOCUS IS ASSOCIATED WITH SEPSIS AND SEPTIC SHOCK AFTER TRAUMATIC INJURY

Horn D, Mindrinos M, Anderson K, Krishnakumar S, Wang C, Li M, Hollenbach J, O'Keefe GE

Background: Late phase deaths related to sepsis remain a major source of mortality following traumatic injury. Genetic characteristics may predispose patients to both infection and altered immune responses. Efforts to describe associations between genetic characteristics and the development of sepsis have identified numerous candidate variants. Until recently, large–scale genotyping of the human leukocyte antigen (HLA) complex—a highly polymorphic gene group that helps regulate the immune system—has not been practical; next–generation sequencing methods are now able to characterize this region. We sought to determine whether variation in the HLA complex was associated with the development of post–traumatic sepsis and septic shock.

Methods: Adult trauma patients requiring mechanical ventilation for more than two days underwent HLA genotyping, and were followed for the development of sepsis and septic shock according to the Sepsis–3 criteria. Case–control association analyses were performed at the amino acid, allele, and haplotype levels. Odds ratio estimates for the associations between HLA variants and either sepsis or septic shock were calculated, and a correction for multiple comparisons was applied. Significant variants were included in logistic regression models adjusting for potential confounders. A subset of patients also underwent complete genome sequencing; principal component analysis was used to analyze genome–wide single nucleotide polymorphisms, and generate principal components to adjust for residual population stratification in regression models.

Results: 1,184 patients met the inclusion and exclusion criteria. Patients were majority male (74%), middle–aged, severely injured (median ISS 33), and had long hospital and ICU stays (median 20 and 10 days, respectively). 33% of patients developed sepsis, 6% septic shock, and in–hospital mortality was 14%. A single amino acid substitution (156Q) within the HLA–A peptide–binding groove was associated with greater odds of developing sepsis (Table 1). In addition, the HLA–A*02:01 allele was associated with lower odds of septic shock (Table 1); this association remained significant after adjusting for age, sex, transfusion requirement, body–site specific AIS, and—in the subset (n=944) with genome–wide sequence data—principal components.

Conclusions: This is the first study to apply next–generation sequencing techniques to evaluate associations between immunogenetic factors and post–traumatic sepsis and septic shock. Associations with class I HLA variants are novel as they implicate adaptive immunity in post–traumatic sepsis. Mechanisms to explain these findings are not well understood; cross–presentation of exogenous peptides by class I HLA, differences in peptide binding and/or interactions with T cell receptors may play a role. Though genotyping is not currently part of the evaluation of critically ill and injured patients, this may be a step towards developing a panel of genetic markers assessing risk of adverse outcomes as we move towards more personalized medicine.

Outcome	Locus	Variant	Frequency in Controls	Frequency in Cases	OR	95% CI	*p* value	Corrected *p* value
Sepsis	A	156Q	0.142	0.197	1.50	1.18-1.89	0.0005	0.048
Septic Shock	A	02:01	0.288	0.167	0.52	0.32-0.82	0.003	0.024

Table 1: Unadjusted odds ratio estimates for HLA variants associated with the development of sepsis or septic shock after correction for multiple comparisons, and their relative frequencies in cases and controls.

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Genetic aortopathies, adminstrative data research

ADMINISTRATIVE DIAGNOSTIC CODES OVERESTIMATE MARFAN SYNDROME DIAGNOSIS

Newhall K, Benyakorn T, Shibale P, Banning S, Shalhub S

Background: Populations of interest are often identified in administrative datasets using International Classification of Diseases (ICD) discharge diagnostic codes. The objective of this study was to determine the extent of miscoding of patients with the rare disease, Marfan syndrome (MFS).

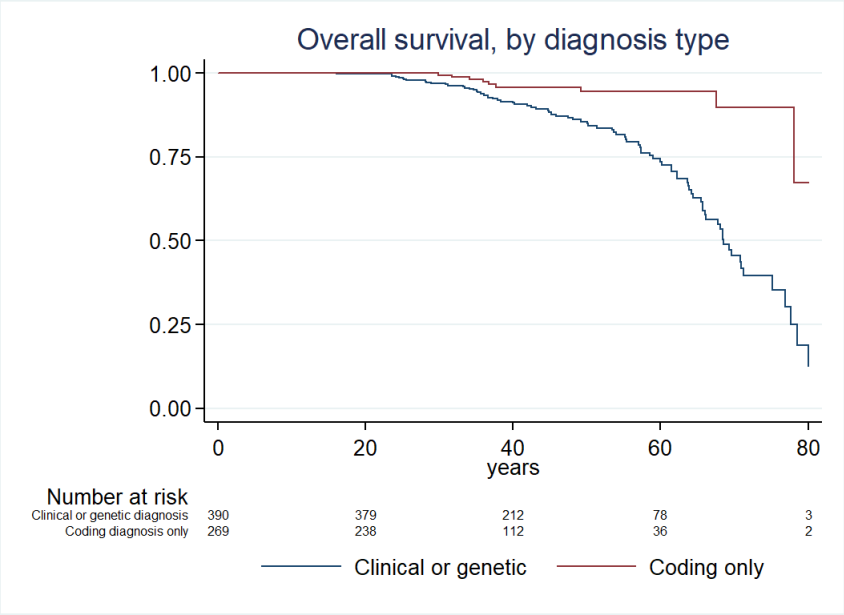
Methods: Retrospective cohort study was conducted on patients in the University of Washington hospital systems with discharge ICD code for MFS from 2002-2019. Medical records were abstracted for method of MFS diagnosis, phenotypic MFS characteristics, and aortic complications. We compared characteristic features of MFS among patients with genetic and/or clinical diagnosis of MFS versus those identified by administrative coding alone using descriptive tests.

Results: Of 723 patients identified by diagnostic coding, 390 (54%) had an additional genetic (15%) or clinical (39%) diagnosis of MFS (group 1), while 333 (46%) had only ICD coding diagnosis (group 2). Patients in group 2 included those with "suspected MFS" (19.4%), another heritable aortopathy (8.8%), or no identified aortopathy (17.8%).

Compared to patients with only administrative code of MFS, patients in group 1 had markedly higher rates of characteristic manifestations of MFS, including lens subluxation (23.8 vs 1.2%, p<0.001), skeletal manifestations (30% vs 10%, p<0.001), or family history of aortopathy (47% vs 5%, p<0.001). Incidence of cardiovascular events was markedly higher in group 1, including prophylactic aortic root repair (29.8 vs 1.7%, p<0.0001), type A aortic dissection (15.6 vs 0.9%, p<0.001), and type B aortic dissection (15.4 vs 0.4%, p<0.001%). Median survival differed markedly within these two groups (68 vs 83 years, p<0.001).

Conclusions: Nearly half of patients labeled as having MFS did not have genetic confirmation of the diagnosis or an evaluation by a trained physician. Use of administrative coding alone in large data sets will lead to inaccurate conclusions about MFS. Additional diagnostic criteria should be incorporated to accurately identify patients with MFS.

Figure 1. Overall Survival, by MFS Diagnosis



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Research Interests
Quality of life in burn survivors, health economics, surgical decision making

THE IMPACT OF BURN SURVIVOR OUT-OF-POCKET EXPENSES ON HEALTH-RELATED QUALITY OF LIFE OUTCOMES

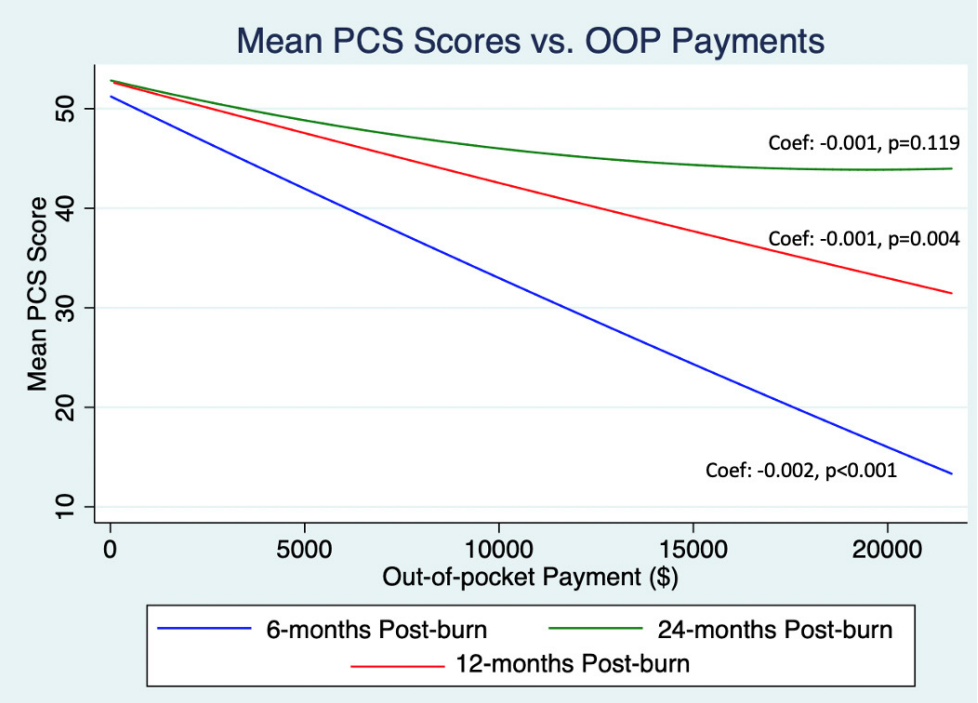
Sheckter C, Carrougher G, Gibran N, Stewart BT

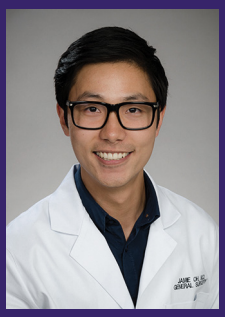
Background: The critical care, surgery, and rehabilitation required to recover patients with serious burn injuries are costly. In the US, these costs are often borne by patients. However, the relationship between out-of-pocket (OOP) costs and health-related quality of life (HRQL) of burn survivors has not been reported. We hypothesized that high OOP expenses would be associated with poorer HRQL.

Methods: Burn survivors with complete financial data from Harborview Medical Center were merged with participants from the longitudinal Burn Model Systems (BMS) database. HRQL outcomes included VA-Rand 12 (VR-12) physical component summary (PCS) and mental component summary (MCS) scores. The reference population mean is 50. Participant surveys were conducted at 6, 12, and 24 months post-injury. VR-12 scores were evaluated using linear regression and adjusted for potential confounders (age, gender, insurance/payer, self-identified race, measures of burn injury severity).

Results: 644 burn survivors were included, of which 13% (84) had OOP costs associated with their care. Parsed by payer, the percentage of participants with OOP costs was 34% for commercial/private, 22% for Medicare, 8% for other, 4% for self-pay, 0% for Worker's Compensation, and 0% for Medicaid. For those participants with OOP expenses, mean OOP costs were $1,433, SD $2,515. In addition to markers of burn severity, OOP costs were negatively associated with PCS scores at 6 and 12 months post-injury (coef-0.002, p<0.001; coef -0.001, p=0.004). There were no significant associations with PCS scores at 24 months post-injury or MCS scores at any interval.

Conclusions: Burn survivors with commercial/private payer and Medicare payer had a higher financial liability than other payers. Higher OOP expenses were negatively associated with physical markers of HRQL within the 12 months of burn injury. Providers should gain insight in their patient's socioeconomic status, financial burdens and their effects on HRQL as they coordinate recovery services.





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Trauma, burns

CAN BEHAVIORAL HEALTH CARE RESOURCES REDUCE STATE FIREARM HOMICIDE RATES?

Oh J, Arbabi S, Moren A

Background: Firearm homicide rates have risen steadily over the last decade. Policy makers have addressed two potential forms of intervention: firearm safety legislation and behavioral health resources. We sought to determine if a relationship exists between a state's behavioral health resources and firearm related homicide rate.

Methods: We conducted a time-series cross-sectional analysis using the state and year as the unit of analysis. Data from 2010 to 2018 were obtained from multiple publicly available sources. Age-adjusted firearm homicide rate served as the main outcome variable. The main explanatory variables were: number of behavioral health care workers, number of mental health treatment facilities, and mental health care expenditure. Additional covariates included socioeconomic factors, demographic factors, and firearm factors. Fixed effects linear regression was used to analyze the association between firearm homicide rate and behavioral health workforce, number of treatment facilities, and spending per capita.

Results: Unadjusted fixed effects modelling showed a small inverse relationship between behavioral workforce and firearm related homicide, demonstrating that a higher rate of behavioral workforce by 100 workers per 100,000 in the population was associated with a lower rate of firearm homicide by 0.42 per 100,000 in the population (Table 1). After adjusting for socioeconomic and demographic variables, this association remained significant showing that increasing the workforce by 100 workers per 100,000 is associated with a decrease in firearm homicide rates by 0.33 deaths per 100,000 population.

Conclusions: Behavioral health resources are associated with lower state levels of firearm homicide. This finding provides an opportunity for the public health community to lobby legislature for funding to increase behavioral health social workers, counselors, therapists, and others within the field to prevent further firearm homicide and injury.

Table 1. Adjusted fixed effect linear regression shows a significant association between behavioral health workforce and firearm homicide rates.

Explanatory Variable	Coefficient	95% Confidence Interval	P-value
Behavioral Health Workforce	-0.33	-0.59, -0.07	0.013*
Mental Health Facilities	-5.4	-15, 4.1	0.265
Mental Health Expenditure	0.2	-0.006, 0.4	0.057
Firearm Safety Legislation	-0.064	-0.089, -0.040	<0.0001*
Firearm Ownership	-0.0007	-0.03, 0.029	0.961

Adjusted for: high school graduation rate, unemployment rate, median household income, percent male, race, and prevalence of mental illness

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Basic and translational research in gastrointestinal oncology: antibody-targeted therapeutics and diagnostics; tumor immune microenvironment

GLYPICAN-3 TARGETED THORIUM-227 ALPHA THERAPY REDUCES TUMOR BURDEN IN AN ORTHOTOPIC XENOGRAFT MODEL OF HEPATOCELLULAR CARCINOMA

Labadie K, Hamlin D, Kenoyer A, Utria A, Daniel S, Ludwig A, Kenerson HL, Li L, Chen D, Orozco J, Yeung R, Orvig C, Li Y, Wilbur DS, Park J

Background: Hepatocellular carcinoma (HCC) is a major cause of morbidity and mortality worldwide with limited treatment options for advanced disease. The purpose of this study is to develop a therapeutic thorium-227 (^{227}Th) antibody radioimmunoconjugate targeting glypican-3 (GPC3) and to test its therapeutic efficacy in a HCC orthotopic xenograft model.

Methods: A GPC3 targeting antibody (αGPC3) was conjugated to bifunctional chelator *p*-SCN-Bn-H_4octapa (octapa) and its binding affinity for GPC3 was evaluated by flow cytometry. ^{227}Th radiolabeling of the conjugate was optimized, and *in vitro* stability of ^{227}Th-αGPC3-octapa was evaluated. Using an orthotopic xenograft of human HCC HepG2 cells, *in vivo* biodistribution was assessed in blood, tumor and vital organs at 1, 7 and 21 days after tail vein injection of ^{227}Th-octapa-αGPC3. To test therapeutic efficacy, tumor-bearing animals were injected with ^{227}Th- octapa-αGPC3, ^{227}Th-octapa-αBHV1 (non-targeting irrelevant control antibody) or were not treated. Tumor burden was assessed with serum alpha-fetoprotein (AFP) measurements, a validated marker of tumor burden. Toxicity to ^{227}Th-αGPC3-octapa was measured by serum comprehensive metabolic panel obtained 21 days after injection.

Results: αGPC3-octapa maintained high affinity for GPC3 after conjugation. ^{227}Th radiolabeling of αGPC3-octapa was durable with >98% of conjugate retaining ^{227}Th in the presence of scavenging agent after two weeks in solution. Significant ^{227}Th-octapa-αGPC3 accumulation in the tumor was observed within 24 hours of injection and continued to accumulate 21 days. Rapid blood clearance and minimal off-target accumulation in normal tissues was observed. Significant antitumor activity was observed after treatment with ^{227}Th- octapa-αGPC3 compared with control (Figure 1). No organ-specific toxicity was observed, and no animals died during the study period.

Conclusions: Conjugation and ^{227}Th radiolabeling of αGPC3 is durable and does not alter affinity for GPC3. ^{227}Th-octapa-αGPC3 demonstrates highly specific *in vivo* targeting and significant antitumor activity in a murine orthotopic xenograft model of hepatocellular carcinoma.

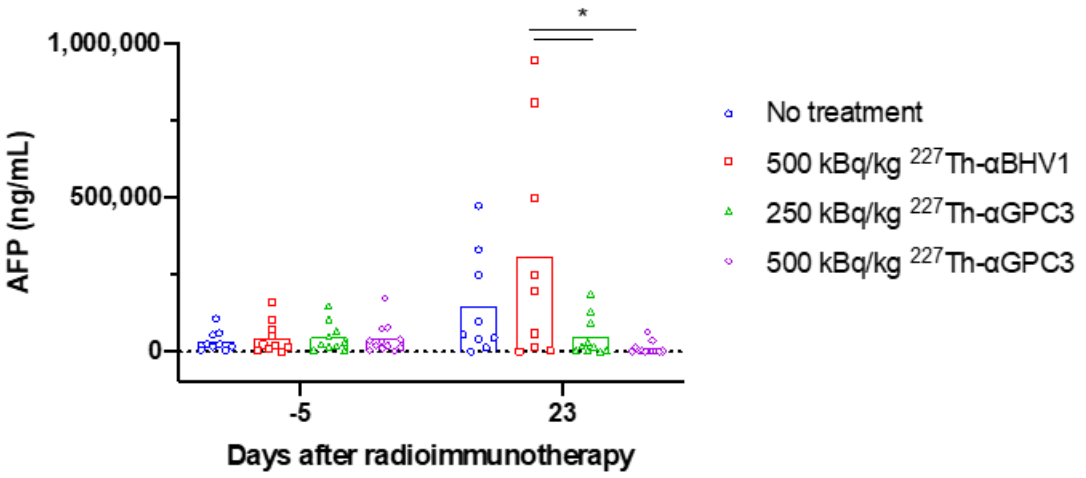
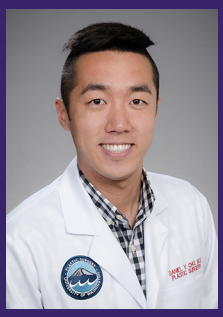


Figure 1



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Craniosynostosis, orthognathic surgery, biomaterials, tissue engineering, quality improvement

PERIORBITAL STEROIDS TO REDUCE POSTOPERATIVE SWELLING IN FRONTO-ORBITAL ADVANCEMENT

Cho DY, Kurnik N, Lee A, Susarla SM, Hopper RA, Birgfeld CB

Background: Marked facial swelling is a known consequence following fronto-orbital advancement (FOA), which can result in prolonged eye closure, patient discomfort, and post-operative hospitalization. There are limited reports on the efficacy and safety of periorbital steroids to help reduce facial swelling in craniofacial surgery. The purpose of this study is to compare outcomes with and without the use of periorbital steroids in patients undergoing FOA.

Methods: A retrospective chart review of patients who underwent FOA at Seattle Children's Hospital between January 2012 and December 2019 was completed. In the periorbital steroid group, triamcinolone was soaked in gelfoam and placed in the periorbital region on top of the frontal bandeau prior to skin closure.

Results: A total of 167 patients were included in this study (80 control, 87 periorbital steroid). The average post-operative length of stay following FOA was 4.3 ± 2.0 days. The use of periorbital steroids resulted in a statistically significant decrease in the hospital length of stay (LOS) compared to controls for isolated metopic (12.5 hours, $p = 0.031$) and unicoronal (12 hours, $p = 0.015$) craniosynostosis; there was no statistically significant difference in LOS for multisuture craniosynostosis (5.2 hours, $p = 0.329$). There was a significantly higher rate of surgical site infection in patients who received periorbital steroids compared to controls (10.2% vs 2.5%, $p = 0.041$). All of these complications represented scalp wound infections requiring operative intervention. 91% of these patients required hospital readmission with an average LOS of 17.6 days; 36% required subsequent revision cranioplasty.

Conclusions: This study demonstrates that there is a statistically significant decrease in hospital LOS with the use of periorbital steroids in isolated suture craniosynostosis. However, it is associated with a significantly higher rate of infectious complications requiring operative intervention, extended hospital readmissions, prolonged antibiotic therapy, and secondary reconstruction.

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Transplantation, outcomes, clinical decision-making

TO ACCEPT OR NOT TO ACCEPT?: DETERMINING WHICH PATIENTS UNDERGOING SIMULTANEOUS LIVER-KIDNEY TRANSPLANTATION MAY BENEFIT FROM HIGH-RISK ORGANS

Dasari M, Perkins J, Hendele J, Leca N, Biggins S, Sibulesky L

Background: Simultaneous liver-kidney transplantation (SLK) is a definitive treatment option for patients with end-stage liver disease and concomitant irreversible kidney injury. We developed an offer acceptance decision tool to predict which SLK patients have longer survival from accepting grafts with a high-risk profile compared with declining the offer and remaining on the wait-list.

Methods: We created three Markov models to determine which transplant candidates (low-, medium-, or high-risk) should accept high-risk organs or remain on the wait-list for organs with better allograft survival profile. Organ risk was characterized using KDPI (Kidney Donor Profile Index). All survival and re-transplant probabilities were calculated from Organ Procurement and Transplantation Network data collected from 2/27/2002 to 6/30/2018.

Results: Accepting high KDPI organs can lead to improved patient survival, depending on a patient's risk group and the probability of being offered other organs. The difference in survival based on KDPI for a given patient risk group was statistically significant. Our website tool models for clinicians which patients would have a survival benefit from accepting high KDPI organs for SLK.

Conclusions: Our models can be utilized by transplant institutions to determine when accepting high KDPI organs for patients being evaluated for SLK would lead to survival benefit, based on probability of receiving such organ offers.

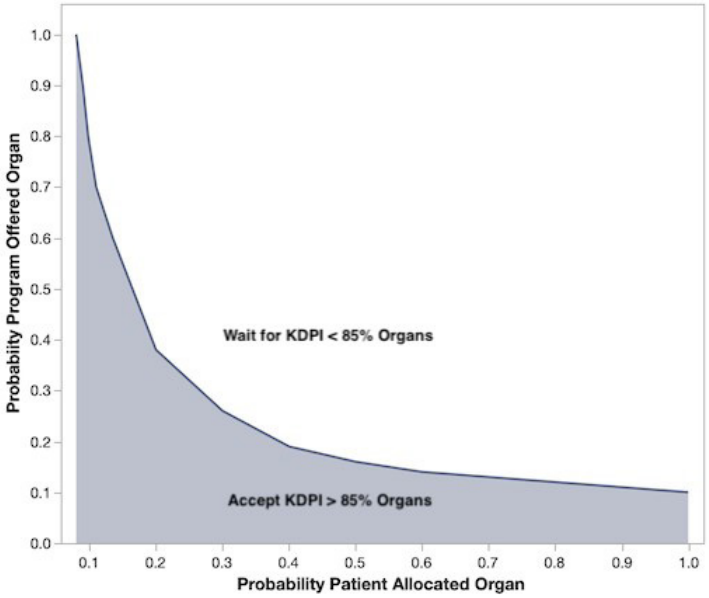
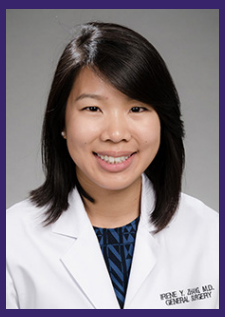


Figure: *High-risk recipient group sensitivity analysis.* High-risk patients would have a survival benefit from accepting a KDPI >85% organ if their probability of being offered an organ and their probability of receiving an organ fall under the curve.



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AMERICANS' PERSPECTIVES ON OPIOID MINIMIZATION AFTER SURGERY AND THE IMPACT OF SURGEON MESSAGING

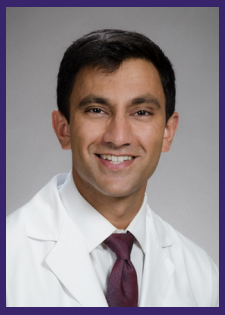
Zhang I, Flum DR, Agrawal N, Liao J

Background: Surgeons play a role in addressing the opioid crisis through judicious prescribing and engaging patients as partners in opioid minimization. Little is known about Americans' perspectives on postoperative opioid prescriptions, including if and how perspectives change with surgeons' communication. Hypothesizing that behavioral nudges – descriptive norms (peer behaviors) and informational nudges (facts, such as addiction risk) – can alter perspectives, we investigated the impact of different nudges on individuals' agreement with opioid minimization.

Methods: We conducted a three-arm randomized survey of U.S. adults (age ≥ 18) recruited from a crowdsourcing platform. Participants saw a vignette about post-appendectomy pain management, with randomization to different messages about opioids: 10 pills of opioids are commonly prescribed (*no nudge*); most people use 4 pills (*descriptive norm nudge*); or most people use 4 pills, and addiction is more likely with more pills (*informational + descriptive norm nudge*). All were told that the surgeon recommended an opioid prescription of 4 pills and asked to rate agreement (7-point Likert; 1 = Strongly Disagree, 7 = Strongly Agree). Responses between arms were compared using two-sided t-tests with alpha = 0.05.

Results: Among 300 participants, most were male (59%) and White (67%), with a mean age of 38. Most reported prior surgery (57%) or opioid experience (52%). Overall, participants weakly agreed with the opioid prescription recommendation (mean 5.3 ± 1.6). Agreement was higher in the descriptive norm arm versus no nudge (mean 5.5 versus 5.0, respectively; p = 0.042). There was no significant difference between the informational + descriptive norm arm versus no nudge (mean 5.4 versus 5.0, respectively; p = 0.12).

Conclusions: For opioid minimization, it may help surgeons to nudge patients with descriptive norms about opioid use. While more work is needed, these results also highlight the limitations of information about addiction for engaging patients on opioid minimization.



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Aneurysm, vascular surgical device development, dissection, vertebral artery injury, BCVI, stroke

MODERN OUTCOMES AND FACTORS PREDICTIVE OF SUCCESSFUL TRANSMETATARSAL AMPUTATION FROM A SINGLE CENTER LIMB PRESERVATION SERVICE

Pujari A, Hemingway J, Sims D, Fiorito J, Quiroga E, Tran N, Starnes B, Singh N

Background: Historical studies demonstrate that transmetatarsal amputations (TMAs) are associated with an approximate 50% healing rate. Predictors of TMA success and modern outcomes are unknown.

Methods: A review of all TMAs performed between 9/2013 and 12/2019 was conducted. Our limb preservation service includes a surgical podiatrist who performs all TMAs within our institution.

Results: During the study period, 111 patients underwent 122 TMAs. The mean age was 58 (range 22-81), and 79% (88) of patients were male. At 12 months, 74% of patients had successful wound healing, 9% had incompletely healed TMAs, and 17% required a major amputation (14 below knee, 7 above knee). Revisions were required in 20% (25). Patients requiring a major amputation were more likely (P<0.05) to have chronic limb threatening ischemia (CLTI), hyperlipidemia, coronary artery disease (CAD), end stage renal disease (ESRD), and a smoking history (Table I). Among 51 patients with CLTI undergoing 55 TMAs, the median Wound, Ischemia, and Foot Infection (WIFI) stage was 4, 42% (23) underwent only endovascular revascularization, 11% (6) only open, 38% (21) both, and 9% (5) neither (due to unreconstructible disease). The 12-month major amputation rate was 33% (12 below knee, 6 above knee) among CLTI patients. Higher WIFI stages (P=.66), type of revascularization (P=.87), and an endovascular-first approach (P=.15) were not associated with subsequent major amputation.

Conclusions: In the modern era, excellent healing and limb salvage rates can be achieved following TMA. A history of CLTI, CAD, and ESRD were associated with TMA failure. The SVS WIFI score did not predict TMA success among CLTI patients, and an endovascular-first approach was not associated with TMA failure.

Table I: Characteristics of all TMA patients

	No Major Amputation (N=101)	Major Amputation (N=21)	P Value
All TMA patients	101 (83%)	21 (17%)	
CLTI	37 (37%)	18 (85%)	<0.0001
Hypertension	78 (77%)	20 (95%)	0.06
Hyperlipidemia	34 (34%)	13 (62%)	0.02
Diabetes mellitus	81 (80%)	19 (90%)	0.26
CAD	26 (26%)	16 (76%)	<0.0001
Chronic kidney disease	34 (34%)	10 (48%)	0.23
ESRD	15 (15%)	8 (38%)	0.01
Preoperative medications			
Anti-hypertensive	61 (60%)	18 (86%)	0.03
Statin	50 (50%)	17 (81%)	0.01
Aspirin	42 (42%)	17 (81%)	<0.01
Plavix	15 (15%)	5 (24%)	0.31
Warfarin	30 (30%)	7 (33%)	0.74
Oral hypoglycemic	16 (16%)	2 (9.5%)	0.46
Insulin	65 (64%)	15 (71%)	0.53
Never smokers	53 (52%)	5 (24%)	0.02
TMA revision required	21 (21%)	4 19%)	0.86

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INCIDENTAL FINDINGS IN PREOPERATIVE COMPUTED TOMOGRAPHY ANGIOGRAPHY FOR ABDOMINAL-BASED FREE FLAP BREAST RECONSTRUCTION: A MULTI-INSTITUTIONAL STUDY

French M, Um G, Colakoglu S, Winocour J, Inchauste S, Kaoutzanis C, Mathes D

Background: Perforator mapping is commonly performed with CTA prior to abdominal-based free flap breast reconstruction to help with pre-operative planning and perforator selection, reducing procedure times and technical challenges intraoperatively. CTA imaging prior to reconstruction can have incidental findings that warrant further evaluation and may affect the patient's reconstructive course. In this multi-institutional study, we evaluated the frequency of incidental findings and their significance and impact on treatment course. We also aimed to identify risk factors for detecting such findings.

Methods: A retrospective review of patients who underwent perforator mapping with CTA was performed over a 5-year period from three academic institutions. Relevant sociodemographic and clinicopathologic information were reviewed. CTA findings and their impacts on reconstruction were reported. Logistic regression analysis was performed to identify risk factors for incidental findings groups with similar patient characteristics.

Results: From January 2015 to July 2020, a total of 656 patients were identified that met inclusion criteria. Overall, 259 (39.5%) incidental findings were found, out of which 78 (11.9%) required additional imaging or consultation. Of patients with findings, the liver was most commonly involved (27.7%). Based on the CTA findings, 10 (1.5%) of patients had an altered reconstruction course with 5 (0.8%) of these patients unable to proceed with reconstruction due to disease severity. Advanced age and immediate reconstruction timing were independent risk factors for incidental findings.

Conclusions: Incidental findings are commonly identified on preoperative CTA for abdominal-based free flap breast reconstruction. While many incidental findings hold no clinical significance, a small percentage of suspicious findings require further evaluation and rarely do these findings alter the reconstructive course. Understanding of high-risk groups for incidental findings can further advance patient education during initial consultation.

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Ruptured abdominal aortic aneurysms, vascular trauma, limb salvage

PRE-OPERATIVE RISK SCORE ACCURACY IS CONFIRMED IN A MODERN RUPTURED ABDOMINAL AORTIC ANEURYSM EXPERIENCE

Hemingway J, French B, Caps M, Benyakorn T, Quiroga E, Tran N, Singh N, Starnes B

Background: Various risk score calculators predicting 30-day mortality following the treatment for ruptured abdominal aortic aneurysms (rAAA) have produced mixed results with regard to usefulness and reproducibility. We sought to prospectively validate the accuracy of our preoperative scoring system in a modern cohort of rAAA patients.

Methods: A retrospective review of all rAAA patients presenting between January 2002 and December 2018 was performed. Patients were divided into 3 cohorts: the pre-endovascular (EVAR) era (1/2002-7/2007), the pre-risk score use era (8/2007-10/2013), and the modern era (11/2013-12/2018). The primary outcome measured was 30-day mortality. Our preoperative risk score assigns 1 point for each of the following: age>76, pH<7.2, Cr>2 mg/dL, and hypotension. Previously published mortality was 22% for 1 point, 69% for 2 points, 78% for 3 points, and 100% for 4 points. The goal of this study was to prospectively validate this scoring system in the modern era.

Results: During the 17-year study period, 417 patients with rAAA were treated. Of the 118 patients in the modern era, 45 (38.1%) underwent open repair (OAR), 61 (51.7%) EVAR, and 12 (10.2%) were treated with comfort measures only. There was a statistically significant linear trend between the preoperative risk score and subsequent 30-day mortality for all patients combined (P <.0001), as well as for OAR (P =.0003) and EVAR patients (P <.0001). For all repairs, 30-day mortality was 14.6% for a score of 0, 35.7% for 1, 68.4% for 2, and 100% for a score of 3 or 4.

Conclusions: Our results, representing one of the largest modern series of rAAA treated at a single institution, confirm the accuracy of a simple 4-point preoperative risk score in predicting 30-day mortality in the modern rAAA patient. Such tools should be used when discussing treatment options with referring physicians, patients, and their family.

Table I: 30-Day Mortality by Repair Type and Risk Score

HMC Risk Score	Combined Mortality	rOAR Mortality	rEVAR Mortality
0	6/41 (14.6%)	2/17 (11.8%)	4/24 (16.7%)
1	15/42 (35.7%)	11/20 (55.0%)	4/22 (18.2%)
2	13/19 (68.4%)	4/7 (57.1%)	9/12 (75.0%)
3	3/3 (100%)	1/1 (100%)	2/2 (100%)
4	1/1 (100%)	0/0 (NA)	1/1 (100%)
P-value (trend)	<.0001	.0003	<.0001

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Hand and peripheral nerve surgery

LOWER EXTREMITY BELOW-KNEE AMPUTATION DEMOGRAPHICS AND OUTCOMES AT A LEVEL I TRAUMA CENTER

Daneshgaran G, Liu K, Liechty A, Shabbir A

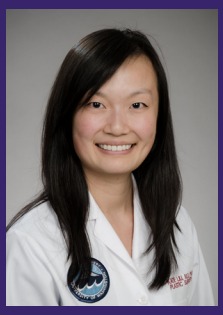
Background: An estimated two million people in the United States are living with limb loss, with prevalence projected to continue rising. Limb loss can occur as a result of traumatic, infectious, vascular or other acquired etiologies, and results in a significant impact to a patient's quality of life. Limb loss can also lead to chronic pain, phantom pain or need for further revision surgeries based on infectious or prosthetic complications. In this study, we sought to define the characteristics of limb loss as a result of below-knee amputations (BKA) at a level I trauma center in the United States.

Methods: A retrospective review of all patients undergoing BKA at a level I trauma center from January 2016 to December 2020 was performed. Indications for surgery included: trauma, infection, vascular disease, burns, dry gangrene (noninfected), tumors, chronic wounds, congenital and acquired limb deformity. Services performing the surgery included: general surgery, orthopedic surgery, vascular surgery and burn/plastic surgery.

Results: A total of 425 limbs were identified through the initial search, which included 387 patients with unilateral BKA and 19 patients with bilateral BKA. Records were excluded if there was a significant amount of missing information, if the definitive surgery was not a BKA (such as through-knee amputation, above-knee amputation, or hip disarticulation), or if death occurred prior to the definitive surgery. This resulted in 373 limbs included in the study. Demographic information is presented in Table 1 by reason for amputation. Patients with vascular disease had the highest mean age (61.4 years) while patients who underwent trauma had the lowest mean age (45.7 years). Patients with acquired limb deformities had the highest BMI (36.9%) and the highest rate of hypertension as a comorbidity (76.0%). Patients with infections were more likely to have diabetes (79.7%) while patients with dry gangrene were more likely to have CKD (37.8) and heart disease (60.0%). Patients with chronic wounds were more likely to have underlying osteomyelitis (84.1%) while patients with vascular disease were more likely to have PVD (82.1%). BKA procedures performed by general surgery had a 16.2% rate of readmission, 10.3% rate of reoperation, and 22.1% rate of revision. Procedures performed by orthopedic surgery had an 11% rate of readmission, 7.7% rate of reoperation, and 25.3% rate of revision. Procedures performed by vascular surgery had a 23.1% rate of readmission, 14.4% rate of reoperation, and 22.1% rate of revision. Finally, procedures performed by burn/plastic surgery had a 10.5% rate of readmission, 5.3% rate of reoperation, and 10.5% rate of revision.

Conclusions: Limb loss from BKA can result from multiple etiologies, which are distinguished by differing rates of comorbidities. This information, along with a further review of postoperative outcomes for BKA patients, can help us better characterize BKA patients to aid in prognostication and preoperative patient optimization in order to improve postoperative outcomes.

	Trauma	Infection	Vascular Disease	Burn	Dry Gangrene	Tumor	Chronic Wound	Congenital Condition	Acquired Limb Deformity	Purpura Fulminans	Complex Regional Pain Syndrome
Age, mean	45.7	57.4	61.4	48.9	60.7	58.6	56.4	46	55.1	53.2	48.5
Male (%)	47 (74.6)	103 (83.7)	27 (69.2)	12 (85.7)	33 (73.3)	5 (55.6)	31 (70.5)	2 (66.7)	22 (88.0)	2 (40.0)	3 (75.0)
BMI, mean	27.8	29.8	26.7	24	27.5	32.4	30.5	29.6	36.9	36	32
Race											
Caucasian (%)	53 (84.1)	81 (65.9)	30 (76.9)	8 (57.1)	26 (57.8)	8 (88.9)	38 (86.4)	3 (100)	21 (84.0)	5 (100)	4 (100)
Hispanic (%)	2 (3.2)	13 (10.6)	3 (7.7)	2 (14.3)	4 (8.9)	1 (11.1)	1 (2.3)	0 (0.0)	2 (8.0)	0 (0.0)	0 (0.0)
Black (%)	3 (4.8)	14 (11.4)	6 (15.4)	3 (21.4)	13 (28.9)	0 (0.0)	4 (9.1)	0 (0.0)	2 (8.0)	0 (0.0)	0 (0.0)
Asian (%)	1 (1.6)	6 (4.9)	0 (0.0)	0 (0.0)	1 (2.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Native Hawaiian Pacific Islander American Indian Alaska Native (%)	4 (6.3)	9 (7.3)	0 (0.0)	1 (7.1)	1 (2.2)	0 (0.0)	1 (2.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Diabetes (%)	9 (14.3)	98 (79.7)	18 (46.2)	5 (35.7)	31 (68.9)	2 (22.2)	24 (54.5)	0 (0.0)	20 (80.0)	0 (0.0)	2 (50.0)
A1c, mean	6.3	9.1	6.9	7.76	8.2	7.7	8.3	NA	7.9	NA	7.4
CKD (%)	2 (3.2)	42 (34.1)	10 (25.6)	3 (21.4)	17 (37.8)	1 (11.1)	12 (27.3)	0 (0.0)	9 (36.0)	0 (0.0)	0 (0.0)
GFR, mean	42.5	28.3	35.1	13.3	18.8	41	22.7	NA	23.7	NA	NA
Heart Disease (%)	9 (14.3)	58 (47.2)	20 (51.3)	6 (42.9)	27 (60.0)	2 (22.2)	14 (31.8)	0 (0.0)	6 (24.0)	2 (40.0)	0 (0.0)
Hypertension (%)	13 (20.6)	84 (68.3)	25 (64.1)	3 (21.4)	31 (68.9)	6 (66.7)	28 (63.6)	2 (66.7)	19 (76.0)	2 (40.0)	1 (25.0)
Stroke (%)	2 (3.2)	13 (10.6)	5 (12.8)	3 (21.4)	2 (4.4)	0 (0.0)	3 (6.8)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Osteomyelitis (%)	12 (19.0)	60 (48.8)	10 (25.6)	2 (14.3)	14 (31.1)	2 (2.2)	37 (84.1)	1 (33.3)	17 (68.0)	0 (0.0)	0 (0.0)
PVD (%)	0 (0.0)	44 (35.8)	32 (82.1)	3 (21.4)	29 (64.4)	0 (0.0)	12 (27.3)	0 (0.0)	4 (16.0)	0 (0.0)	0 (0.0)
Tobacco (%)	30 (47.6)	60 (48.8)	19 (48.7)	9 (64.3)	15 (33.3)	1 (11.1)	20 (45.5)	1 (33.3)	11 (44.0)	2 (40.0)	1 (25.0)
Alcohol (%)	25 (39.7)	36 (29.3)	15 (38.5)	6 (42.9)	11 (24.4)	4 (44.4)	11 (25.0)	2 (66.7)	4 (16.0)	5 (100)	0 (0.0)



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COMMUNICATION PREFERENCES AND LANGUAGE PATTERNS USED IN DISCUSSION OF UPPER EXTREMITY AMPUTATION

Liu Y, Basamania A, Trejo J, Friedrich J

Background: Interpersonal communication is a key component in the delivery of compassionate, patient-centered care. The language used may shape the dynamic between patient and provider, setting the tone for the therapeutic relationship. Upper extremity amputation is a life-changing procedure with significant implications for both function and self-image. The purpose of this study is to understand the impact of words used in discussing amputation.

Methods: A prospective, cross-sectional survey study was designed to assess attitudes, preferences, and experiences with communication practices related to upper extremity amputation for both patients and providers. Patients were identified by querying the electronic medical record with CPT codes for upper extremity amputations performed between July 1, 2018 and December 31, 2019. The provider survey was distributed via email to all members of a national hand surgery organization.

Results: Surveys were completed by 47 patients and 45 providers. Of the 13 specific words examined, patients and providers showed excellent concordance in attitudes for "amputation", "remove", "separate", "stump", and "disconnect". Patients found the terms "sever", "cut off", "amp", and "slice off" to be more acceptable compared to providers ($p < 0.01$). In contrast, while providers felt that "shortening" was acceptable, patients disagreed ($p = 0.003$). There were no significant differences in acceptability of specific terms when stratifying patients and providers by gender, age, or surgical specialty. Interestingly, 72% of patients recalled preoperative discussions, which included the use of specific words that were found to be generally unacceptable. Open-ended questions revealed that many patients used humor to discuss their amputation, while communication by providers focused on treatment, outcomes, and recovery.

Conclusions: Many commonly utilized terms for amputation are well-accepted by patients but discordances exist, of which providers should be aware. Communication in the provision of surgical care deserves further research to both characterize current practices and improve education efforts.

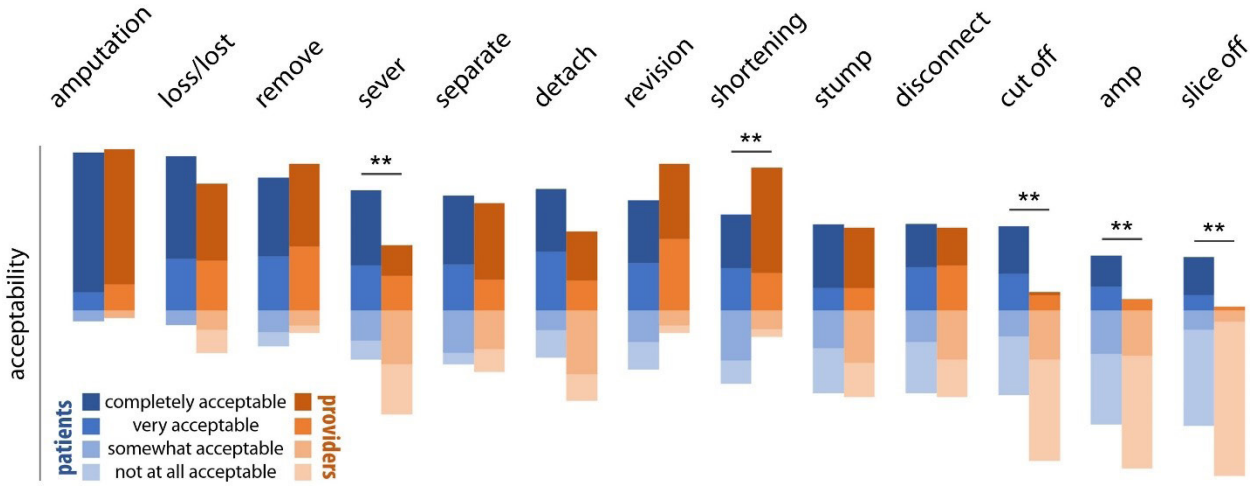

Figure 1. Acceptability of 13 specific words frequently used to discuss amputation was assessed using a four-point Likert scale. Patient (blue) and provider (orange) attitudes were similar for some terms, but significantly different for others (**$p < 0.01$).

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IDENTIFYING HOSPITALS IN NEPAL FOR ACUTE BURN CARE AND STABILIZATION CAPACITY DEVELOPMENT: LOCATION-ALLOCATION MODELING FOR STRATEGIC SERVICE DELIVERY

Mehta K, Li K, Wright A, Lee J, Yadav M, Pham T, Rai SM, Nakarmi K, Stewart BT

Background: In Nepal, preventable death and disability from burn injuries are common due to poor population-level spatial access to organized burn care. Most severe burns are referred to a single facility nationwide, often after suboptimal burn stabilization and/or significant care delay. Therefore, we aimed to identify existing general hospitals within Nepal that would optimize population-level access as "burn stabilization points" if their acute burn care capabilities are strengthened.

Methods: The 29 general hospitals that referred patients to the major burn center in Nepal were designated as candidate hospitals. The model was created with NASA's Socioeconomic Data and Application Center 2020 estimated population density grid for Nepal (population 3,0184,338) and road network and travel speed data from OpenStreetMap. Six models (A-F) were developed using cost-distance and network analyses in ArcGIS to identify the 3 versus 5 candidate hospitals at ≤ 2-, 6-, and 12-hour travel thresholds that would optimize population-level spatial access.

Results: The baseline model determined that currently 6,151,298 people (20.3% of national population) have access to organized burn care within 2 hours of travel, 11,240,957 (37.2%) within 6 hours and 21,925,928 (72.6%) within 12 hours. If acute burn stabilization capabilities were strengthened, Models A-C of 3 chosen hospitals would increase population-level burn care access to 45.2%, 89.4%, and 99.8% of the national population at ≤2, 6, and 12 travel-hours, respectively. Models D-F demonstrated that 5 chosen hospitals would increase population-level burn care access to 53.4%, 95.0%, and 99.9% of the national population at ≤2, 6, and 12 travel-hours, respectively.

Conclusions: In both the 3 and 5 hospital models, if the identified hospitals were developed as burn stabilization points, approximately 90% of the national population would have access to acute burn care within 6 travel-hours. Organized efforts to increase burn stabilization points are feasible and imperative to reduce the rates of preventable burn-related death and disability country-wide.

Table 1: Location-allocation models of additional burn stabilization points in Nepal

Models		Travel time	Number of people with access	Average travel time per person(hours)	National population with access (%)	% change in total patients with access from **baseline**
Current Baseline Access with 1 Burn Center		≤2 hours	6,151,298	0.53	**20.4%**	
		≤6 hours	11,240,957	2.25	**37.2%**	
		≤12 hours	21,925,928	5.64	**72.6%**	
Models of **3 additional hospitals** as burn stabilization points	A	≤2 hours	13,637,632	0.76	**45.2%**	121.70%
	B	≤6 hours	26,992,474	2.55	**89.4%**	140.13%
	C	≤12 hours	30,122,599	3.71	**99.8%**	37.38%
Models of **5 additional hospitals** as burn stabilization points	D	≤2 hours	16,118,334	0.84	**53.4%**	162.03%
	E	≤6 hours	28,663,234	2.22	**95.0%**	154.99%
	F	≤12 hours	30,155,229	2.85	**99.9%**	37.53%

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Outcomes of breast and extremity reconstruction, perioperative care of NSTIs, and improving resident training experiences.

CHARACTERIZATION OF UPPER AND LOWER EXTREMITY FIREARM INJURIES IN THE PEDIATRIC POPULATION

DeSanti R, Crowe C, Liu Y, Keys K, Friedrich J

Background: Firearm injuries constitute a major public health concern given increasing availability of firearms amidst heightened violence rates, and lead to upper and lower extremity traumatic injuries with long-lasting negative effects in children.

Methods: A retrospective review analyzed 128 patients less than 18 years old who sustained firearm injuries to the extremities treated at Harborview Medical Center from April 2005 to April 2020.

Results: Mean age was 15 years old and 82% were male. 41% were Black/African American, 26% Caucasian, and 9% Hispanic/Latino. The majority had Medicaid insurance, while fewer had private insurance or HMO/PPO. 33% were directly admitted to our Level 1 Trauma Center, while the remainder were transferred from an outside medical facility. 43% had upper extremity injuries, 49% lower extremity injuries, and 8% both. The majority were secondary to assault (81%), with fewer related to accidental discharge of a firearm (17%) or police (2%). 58% required surgical management of any type for their injury. Open fractures were present in 63%, vascular injury in 22%, and nerve injury in 16%. Of the definitive reconstructive surgeries, 6 involved primary closure (3 were delayed), 2 local tissue advancements, 1 Integra followed by a skin graft, and 2 free gracilis flaps and skin graft. 5% had compartment syndrome requiring fasciotomies. 22% were readmitted within 90 days of their initial injury.

Conclusions: Gunshot wounds represent a preventable cause of injury in the pediatric population, disproportionately adolescent Black/African American males. A majority of patients required bony fixation, while a smaller but sizable number required vascular or nerve repair, and over half required surgical management of their injury. Disability after firearm injury in pediatric patients is considerable and deserving of further analysis.

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OPTIMISM BIAS IN ASSESSING THE RISKS OF APPENDICITIS TREATMENT

Rosen J, Flum DR, Agarwal N, Dobal R

Background: Background: It is unclear how cognitive biases affect patients' perceptions of treatment risk. Unrealistic optimism– the belief that one is more likely than others to experience positive outcomes- is common in everyday experience but has been less studied when considering treatment risks. We aimed to test the hypothesis that optimism bias impacts patient perceptions of complication risks from treatment for appendicitis with antibiotics or appendectomy.

Methods: A series of web-based surveys of American adults recruited through MTurk. Among 200 individuals, we used qualitative descriptors of likelihood (common, uncommon) to describe appendectomy- and antibiotic-associated complications. Among 100 individuals, we described complication risks using actual quantitative reference rates (e.g. 3% average risk). Optimism bias was defined as the difference between respondent's perceived likelihood of complications for themselves (*self-risk*) and "a typical person with appendicitis" (*general-risk*).

Results: Among 298 complete responders (mean age 36 years, 50% male), 43% reported being "healthier than a typical patient with appendicitis". With risk described qualitatively as common/uncommon, respondents had widely variable risk estimates that were substantially higher than published estimates (e.g. 44.5 ± 25% for a "common" surgical site infection). Variation and over-estimation were smaller when quantitative rates were presented (9.0 ± 8.5% for a stated 7% risk of surgical site infection). Optimism bias was not consistently present when risk was qualitatively described (Table) or quantitatively referenced.

Conclusions: Optimism bias was common in assessment of general health, but not uniformly identified for appendicitis treatment complication risks. Bias may be more likely to exist for events with higher perceived control or that are more serious. Risk perception displayed less variance when numerical base rates were provided compared to qualitative descriptors. Understanding how to effectively communicate risk and the role of cognitive biases in healthcare decision making is critical to achieving more informed shared decision making.

Table:

Appendicitis Treatment	Complication	Likelihood of experiencing for Self (Self Risk) Mean % (SD)	Likelihood of experiencing for 'Typical person' (General Risk) Mean % (SD)	Risk Difference[a]	p-value[b]
Surgery:					
	Surgical Site Infection (common)	46.1 (26.0)	46.9 (26.1)	0.8	0.63
	Deep space infection (uncommon)	24.3 (22.5)	28.4 (22.3)	4.1	0.002
Antibiotics:					
	Antibiotic-associated diarrhea (common)	65.1 (22.9)	64.1 (22.5)	-1	0.37
	Antibiotic failure/need for appendectomy (somewhat common)	39.0 (22.0)	39.6 (22.2)	0.6	0.64
	Deep space infection (uncommon)	29.8 (21.8)	31.1 (21.0)	1.3	0.05

Notes: n=199, SD = Standard Deviation, [a] Difference in risk = optimism bias, [b] paired sample t-test

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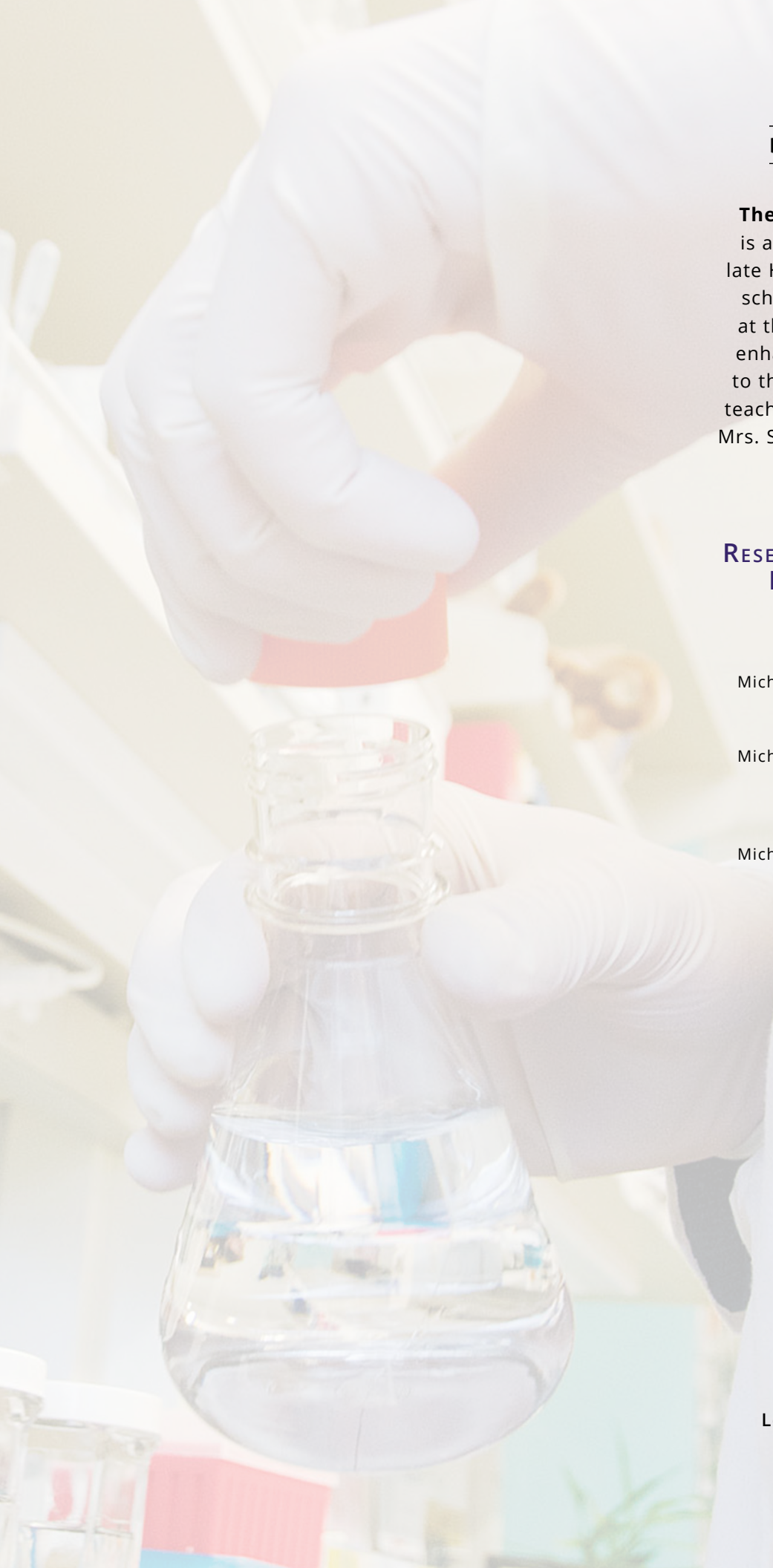

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The Helen and John Schilling Lecture is an annual lecture established by the late Helen Schilling to bring distinguished scholars to the Department of Surgery at the University of Washington, and to enhance the Department's commitment to the highest standards of patient care, teaching, research and scholarship. It was Mrs. Schilling's wish that the lectureship be in honor of her husband, John.

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