

Resident Research Day

June 8, 2023

7:00 - 8:30 am

Location: Foerderer Auditorium, College Building 2nd Floor

Moderator: Hien Dang, PhD



Presented by the
Department of Surgery
Division of Surgical Research

Itinerary

7:00 – 7:03	Opening Remarks, Charles J. Yeo, MD Samuel D. Gross Professor and Chair of Surgery Senior Vice President and Chair, Enterprise Surgery
7:03 – 7:10	Impact and Durability of the Affordable Care Act Medicaid Expansion on Lung Cancer Treatment by Darshak Thosani, MD
7:10 – 7:12	Discussion
7:12 – 7:19	Is Wedge a Dirty Word? Demographic and Facility-Level Variables Associated with High Quality Wedge Resection by Micaela Collins, MD MPH
7:19 – 7:21	Discussion
7:21 – 7:28	How Does Integrating Surgeons into the Anatomy Curriculum Impact Medical Students' Perception of the Field of Surgery? by Sunjay Kumar, MD
7:28 – 7:30	Discussion
7:30 – 7:37	Disparities in Treatment Trends and Outcomes in Females Diagnosed with Non-Metastatic Inflammatory Breast Cancer by Kirsten Lung, MD
7:37 – 7:39	Discussion
7:39 – 7:46	Perfect Storm? COVID-19, Area Deprivation, and Their Association with Pediatric Trauma by Devon Pace, MD, MPH
7:46 – 7:48	Discussion
7:48 – 7:55	A Contemporary Analysis of Hemorrhage After Pancreaticoduodenectomy: From the GDA and Beyond by William Preston, MD
7:55 – 7:57	Discussion
7:57 – 8:04	Procedure Matters in Gender-Associated Outcomes following Bariatric Surgery: 5-year North American Matched Cohort Analysis by Tina Bharani, MD
8:04 – 8:06	Discussion
8:06 – 8:13	CAR-T Cells as a Potential Treatment for Pancreatic Cancer by Lindsay Weil, MD
8:13 – 8:15	Discussion
8:24 – 8:30	Closing Remarks

Research Abstracts



Darshak Thosani, MD

Mentor:

Tyler Grenda, MD, MS

Division of Thoracic & Esophageal Surgery, TJUH

Awards:

- Saligman Family Surgery Pilot Grant
- International Association for the Study of Lung Cancer – 9th edition Staging Grant

Impact and Durability of the Affordable Care Act Medicaid Expansion on Lung Cancer Treatment

Background: Medicaid expansion following passage of the Affordable Care Act (ACA) of 2014 has been associated with increased utilization of lung cancer resection. The impact on other procedural care related to the treatment of lung cancer and non-operative therapeutics remains poorly defined, as does durability of differences in lung cancer resection beyond the immediate post-expansion period.

Methods: Healthcare Cost and Utilization Project's (HCUP) State Inpatient (SID) and State Ambulatory Surgery and Services Databases (SASD) were analyzed for North Carolina, Florida (non-expansion states), Maryland, and New Jersey (expansion states) for 2012-2013 (pre-expansion) and 2014-2016 (immediate post-expansion) and 2019 (delayed post-expansion). A difference-in-difference (DID) analysis was utilized. Rates of utilization were compared across per 100,000 persons.

Results: In the immediate post-expansion period, Medicaid expansion was associated with increased

utilization of lung resection, with a DID coefficient: 0.50 ($P=0.002$) and lung biopsy (DID: 0.76, $P=0.001$), but no differences were observed in utilization of stereotactic body radiation therapy (SBRT) or chemotherapy. In the delayed post-expansion period, Medicaid expansion remained associated with increased utilization of lung resection (DID: 0.51, $P=0.040$) and biopsy (DID: 0.84, $P=0.021$) and no difference was observed for SBRT or chemotherapy

Conclusions: In both the immediate post-expansion and the delayed-expansion periods, Medicaid expansion was associated with increased utilization of procedural care for the management of lung cancer including percutaneous biopsies and surgical resection. No difference in rates of utilization of SBRT or chemotherapy were found in either period of analysis



Micaela Collins, MD, MPH

Mentor:

Olugbenga Okusanya, MD
Division of Thoracic & Esophageal Surgery, TJUH

Awards:

Saligman Family Surgery Pilot Grant (2022, 2023)

Is Wedge a Dirty Word? Demographic and Facility-Level Variables Associated with High Quality Wedge Resection

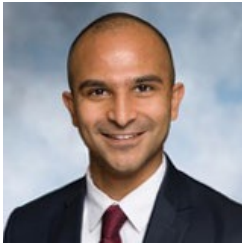
Background: Though sublobar resections have gained traction, wedge resections vary widely in quality. We seek to characterize demographic and facility-level variables associated with high-quality wedge resections.

Methods: The National Cancer Database was queried from 2010-2018. Patients with T1/T2 N0 M0 nonsmall cell lung cancer who underwent wedge resection without neoadjuvant therapy were included. A wedge resection with no nodes sampled or with positive margins was categorized as a low-quality wedge (LQW). A wedge resection with one or more nodes sampled and negative margins was categorized as a high-quality wedge (HQW). Facility-specific variables were investigated via quartile analysis based on overall volume and proportion of HQW or LQW performed.

Results: 30,170 patients met inclusion criteria, 17,824 (59.1%) of whom received a HQW. Demographics between HQW and LQW groups were

similar. Factors associated with HQW included treatment at an academic center (7,999 [44.9%] vs. 4,470 [36.2%]; $p < 0.001$). Patients who received a HQW had improved 5-year survival (12,760 [71.6%] vs 7,697 [62.3%]; $p < 0.001$). Facilities in the top quartile by volume of HQW performed 71% (12,652) of all HQW, and facilities in the top quartile for LQW performed 66% (8,153) of all LQW. 151 facilities (14%) were in the top quartile by volume for both HQW and LQW.

Conclusions: HQW are associated with improved 5-year survival when compared to LQW. By volume, HQW and LQW resections cluster to a minority of facilities, many of which overlap. There is discordance between best practice guidelines & current practice patterns that warrants additional study.



Sunjay Kumar, MD

Mentors:

Barbie Klein, PhD / Gerald Isenberg, MD
Department of Cell & Tissue Biology, UCSF / Department of Surgery, TJUH

Awards:

Saligman Family Surgery Pilot Grant

How Does Integrating Surgeons into the Anatomy Curriculum Impact Medical Students' Perception of the Field of Surgery?

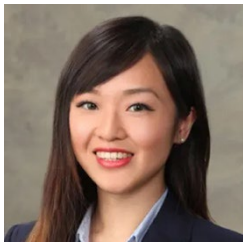
Background: Many medical students have significantly negative perceptions of the field of surgery and surgeons, even prior to entering medical school. There is evidence that exposure to surgeons in the preclinical curriculum can favorably impact medical students' perception of the field. However, surgeons are hardly involved in the preclinical curriculum at most schools. The existing literature on this subject has several limitations: the group exposed to the intervention is often a self-selected group rather than the full medical school class, the outcomes were often measured shortly after the intervention, and none of the studies followed their cohort long term. We hypothesize that longitudinal surgeon involvement in the anatomy portion of the preclinical curriculum will favorably influence medical students' perception of the field of surgery and that these effects will be sustained over time.

Methods: This prospective cohort study sampled 16 anatomy lab groups of first-year medical students at Sidney Kimmel Medical College. Medical students'

perceptions of the field of surgery were assessed using a Likert scale survey prior to interacting with a general surgery resident in the anatomy laboratory. Following this, a general surgery resident was present as a teaching assistant for all abdominal and pelvic dissections. The same survey will be administered again at the conclusion of the anatomy curriculum, just prior to 3rd year clerkships, and at the end of the 3rd year clerkships to assess durability of any changes.

Results: 39 students completed the initial survey. These preliminary results suggest that race and gender have an impact on students' perception of surgeons and surgery residents.

Conclusions: Medical students enter medical school with negative perceptions of surgery. This study will investigate whether these can be improved by early exposure to surgeons and surgery residents.



Kirsten Lung, MD

Mentor:

Alliric Willis, MD

Division of General Surgery, Thomas Jefferson University Hospital

Disparities in Treatment Trends and Outcomes in Females Diagnosed with Non-Metastatic Inflammatory Breast Cancer

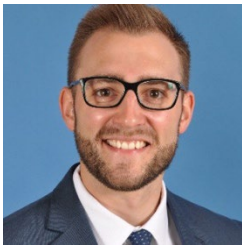
Background: Inflammatory breast cancer (IBC) is an uncommon, aggressive disease with a poor prognosis. National treatment guidelines recommend neoadjuvant chemotherapy followed by modified radical mastectomy (MRM) and radiation. Disparities in treatment may contribute to survival differences, and few studies have assessed factors contributing to such variation. We aimed to identify demographic and facility differences in treatment and survival among females with non-metastatic IBC.

Methods: Retrospective review of the National Cancer Database (2012-2016) on females diagnosed with non-metastatic IBC was performed. Demographics, treatment, and facility data were collected. Statistical analysis was performed with SAS.

Results: A total of 5,438 patients met the inclusion criteria. Receiving surgical intervention was associated with age ($p < 0.0001$), race ($p < 0.0001$), and facility ($p = 0.03$), with increased odds of surgery for younger, white, and comprehensive community

cancer program patients. Receiving radiation therapy was associated with age ($p < 0.0001$) and race ($p < 0.0001$), with decreased odds of radiation for older, Black, and Hispanic patients. Receiving chemotherapy was associated with age ($p < 0.0001$), with increased odds of chemotherapy for younger patients. Days from diagnosis to treatment initiation was associated with race ($p < 0.0001$) and facility ($p = 0.0089$), with increased time for Black, Hispanic, and academic facility patients. Survival time was associated with age ($p < 0.0001$), race ($p < 0.0001$), facility ($p = 0.0002$), Charlson-Deyo (CD) score ($p < 0.0001$), and surgery ($p < 0.0001$), with decreased survival for older, Black, non-academic facility, higher CD score, and non-surgery patients.

Conclusions: Treatment trends and survival of IBC patients are impacted by sociodemographic and facility-level variation, which, when addressed, may help to improve patient outcomes.



Devon Pace, MD, MPH

Mentor:

Loren Berman, MD

Division of Pediatric Surgery

Thomas Jefferson University Hospital

Perfect Storm? COVID-19, Area Deprivation, and Their Association with Pediatric Trauma

Background: Disparities among social determinants of health (SDOH), including income, education, and neighborhood-level community distress, increase the risk of pediatric traumatic injuries. Similarly, events that increase stress on the economy also increase this risk, as noted among firearm injury and child abuse rates during the economic recession in the late 2000s. This study evaluates the association of the COVID-19 pandemic and neighborhood-level area deprivation with pediatric traumatic injuries using the Area Deprivation Index (ADI), which is a marker of the amount of disadvantage an individual experiences based on the neighborhood where they live. It is hypothesized that children living in more deprived regions will have disproportionate traumatic injury rates and patterns.

Methods: Institutional level I pediatric trauma encounters were retrospectively evaluated from January 2018 through June 2022. Patients were assessed relative to the U.S. pandemic declaration date (3/11/2020): pre-COVID (1/1/2018-3/10/2020), early COVID (3/11/2020-3/11/2021), and late COVID (3/12/2021-6/30/2022). The ADI measured SDOH-related risk at a census block tract group level. Associations between ADI and COVID-19 and injury mechanism and outcomes (intensive care unit [ICU]/ventilator duration, hospital length of stay, and mortality) were assessed using chi-square for categorical and Spearman's rank correlation for continuous variables.

Results: 4,055 patients were included in the study. There was variability in injury patterns relative to the level of deprivation (Figure 1) and the timing of presentation relative to the COVID-19 pandemic.

Motor vehicle accidents (MVAs) (12.7% pre vs. 14.3% early vs. 18.6% late, $p<0.0001$) and gunshot wounds (GSWs) (1.2% pre vs. 2.6% early vs. 2.0% late, $p=0.018$) were more common after COVID-19 and more frequently experienced by children with higher deprivation indices. Children with higher ADI were 5.2 times more likely to experience a GSW and 1.8 times more likely to experience non-accidental trauma (NAT) following the COVID-19 pandemic. Higher ADI was also associated with worse outcomes where ICU length of stay ($r=0.049$, $p=0.006$) and ventilator duration ($r=0.035$, $p=0.047$) were longer.

Conclusions: Children with vulnerable SDOH status appear to have been disproportionately affected by pediatric traumatic injuries following the COVID-19 pandemic. National-level stressors (COVID-19) impact behaviors on a population level and shift exposure risk to different injury mechanisms. Multi-level public health initiatives that focus on factors that amplify injury mechanisms are needed to address disparate injury patterns based on SDOH exposure. These interventions may include more aggressive policing of speeding to decrease MVA risk, educational initiatives focused on expanding child abuse reporting when children have limited exposure to mandated reporters, and policy strategies that attempt to decrease firearm injuries. Further studies assessing individual patient-level factors and injury-specific regional variations in traumatic injuries are needed to better delineate which interventions might be the most successful.



William Preston, MD

Mentor:

William Jarnagin, MD

Division of HPB Surgery

Memorial Sloan Kettering Cancer Center

A Contemporary Analysis of Hemorrhage After Pancreaticoduodenectomy: From the GDA and Beyond

Background: Post-pancreatectomy hemorrhage (PPH) is an uncommon but highly morbid complication of pancreaticoduodenectomy (PD). Clinical evidence of PPH often draws suspicion to the gastroduodenal artery stump (GDA), even in the absence of a clearly defined source. This study represents a contemporary analysis of PPH at two high volume centers, specifically analyzing the frequency of GDA compared to other sites of PPH and the results of GDA mitigation strategies.

Methods: Consecutive patients submitted to PD without concomitant major procedures at Memorial Sloan Kettering Cancer (MSKCC) and Thomas Jefferson University Hospital (TJUH) between 1/1/2011 and 12/31/2021 were included in this retrospective analysis. Demographic, perioperative, and disease-related variables were recorded. The incidence, location, treatment, and outcomes of primary (initial) and secondary (recurrent) PPH requiring invasive intervention (early Grade B, Grade C) were analyzed. Imaging studies were re-reviewed by interventional radiologists to confirm the sites of PPH.

Results: Inclusion criteria were met by 3,035 patients (n=1,756 MSKCC, n=1,279 TJUH). Primary PPH occurred in 90 patients (3.0%) (n=63, 3.6% MSKCC, n=27, 2.1% TJUH) and was initially evaluated with angiography (n=59), laparotomy (n=17), or upper endoscopy (n=14); 28 (31.1%) patients underwent multiple procedures. Seven (7.8%) PPH events were classified as early (<24 hours). An associated anastomotic leak was present in 46 patients (51.1%). Sources of primary PPH were GDA in 15 (16.7%), Unidentified in 24 (26.7%) and Non-

GDA in 51 (56.7%). Secondary bleeding events occurred in 23 patients (25.6%), of which 15 were different than the primary (65.2%) and 4 were from the GDA (17.4%). In patients with documented GDA hemorrhage, 8 (42.1%) bled from additional sites. In the Unidentified group, 14 underwent empiric GDA embolization/common hepatic artery stent, 3 (21.4%) of whom subsequently experienced secondary PPH (1 from the GDA). Overall, 23 patients underwent empiric GDA embolization/stent, 7 (30.4%) of whom experienced subsequent PPH. A total of 117 bleeding events were identified, of which the GDA was the source in 19 (16.2%) for an incidence of 0.63% in all PD cases. Twenty percent of all GDA embolizations/stents (8/40), including 13% (3/13) of empiric GDA treatments, were associated with significant morbidity (hepatic infarction [7], biliary stricture [4]), with a 90-day mortality rate of 38.5% for those suffering from these complications vs. 7.8% without (p=0.008). A pedicled GDA/hepatic artery tissue wrap during PD had been performed in 3 patients with PPH, 2 of whom bled from the GDA. The 90-day mortality was 12.2% for all patients with PPH (20.0% for primary GDA vs. 10.7% for all others).

Conclusion: in this bi-institutional, retrospective analysis, PPH was uncommon (3.0%) but highly morbid. The spectrum of PPH was broad, and the GDA was responsible for a minority of all bleeding events. Empiric GDA embolization/stent was associated with significant morbidity and a 30% rebleeding rate, and, therefore, should not be routine practice. Successful treatment of PPH requires careful consideration and assessment of all potential sources, even after GDA mitigation.



Tina Bharani, MD

Mentor: Malcolm Robinson, MD

Department of GI Surgery, Brigham and Women's Hospital

Procedure Matters in Gender-Associated Outcomes following Bariatric Surgery: 5 year North American Matched Cohort Analysis

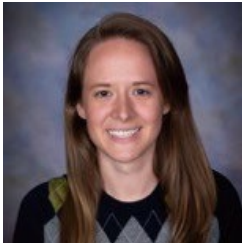
Background: Despite the safety of bariatric surgery, there are gender disparities in its rate of utilization as over 80% of patients choosing such surgery are self-identified females. Previous studies have reported worse post-operative outcomes of bariatric surgery for men compared to women. The purpose of this study was to characterize the impact of gender on outcomes of bariatric surgery using the most recent MBSAQIP data registry from 2017-2021.

Methods: Patients undergoing primary bariatric surgery were identified from MBSAQIP registry from 2017-2021. Self-identified males and females undergoing primary bariatric surgery were matched 1:1 using multiple pre-operative demographics and comorbidities. The primary outcomes included postoperative clinical outcomes within 30 days from the surgical intervention. Secondary outcomes examined included comparison of major complications between males and females by type of weight-loss surgery performed.

Results: A total of 807,257 (81.4%) females and 184,064 (18.6%) males who had primary bariatric surgery procedures between 2017-2021 were identified in the MBSAQIP registry. Matching resulted in a well-balanced cohort of males and

females (n= 339,276; 169,638 in each group), with standardized mean difference less than 0.05 and a comparable distribution of baseline characteristics. No significant difference was observed in anastomotic leak, wound complications and bleeding between males and females. Males were at 0.15% ($p<0.01$) higher risk of major complications (encompassing unplanned ICU admission, deep organ space infection, unplanned intubation, bleeding, anastomotic leak, sepsis, pneumonia, myocardial infarction, cardiac arrest, cerebrovascular accident, pulmonary embolism, reoperation, and death) compared to females. Perioperative outcomes that were worse for females as compared to males included readmission (3.8% vs 3.4%, $p<0.01$), emergency department visits (7.8% vs 5.4%, $p<0.01$), dehydration requiring treatment (4.2% vs 2.2%, $p<0.01$), and infections (0.17% vs 0.10%, $p<0.01$). While men had higher major complications compared to women for SG (RR: 1.06, $p<0.01$) and SADI-S (RR: 1.11, $p=0.04$), there was no significant difference between the two cohorts for RYGB, BPD and gastric band.

Conclusion: Male gender should not be considered a high-risk factor for all bariatric procedures and the benefits of bariatric surgery should be offered to more eligible men.



Lindsay Weil, MD

Mentor:

Scott Waldman, MD, PhD

Department of Pharmacology & Experimental Therapeutics, TJU

Awards:

National Institutes of Health institutional training grant T32GM008562

CAR-T Cells as a Potential Treatment for Pancreatic Cancer

Background: Pancreatic cancer is a devastating disease with an overall five-year survival rate of 10.8%. Survival improves to ~25-30% in patients after surgical resection but only 15-20% of cases are resectable at presentation. Given the low overall survival of pancreatic adenocarcinoma and the small percentage of patients eligible for curative surgery, additional targeted therapies for pancreatic cancer need to be identified. One example of a potential targeted therapy is chimeric antigen receptor T cell therapy (CAR-T cell). Identification of a specific and safe target in pancreatic cancer that could be used for CAR-T cell therapy would aid in the treatment of pancreatic cancer patients across the spectrum.

Methods: AsPC-1 pancreatic cells were virally transduced with a luciferase-expressing reporter and surgically implanted into pancreas tail of NSG-immunodeficient mice. Wounds were closed, and animal health and tumor burden via surrogate bioluminescence measurements were monitored prior to treatment. Once tumors reached an appropriate size, 1×10^7 DSG2/GUCY2C-directed treatment and CD19-directed control CAR-T cells were administered systemically via tail vein injection. Tumor growth was monitored via In Vivo Imaging System. Animals were sacrificed according to >20%

body-weight loss, body-score criteria, and additional terminal endpoints.

Results: Patient-derived pancreatic tumor xenografts were surgically implanted via small incision in the scruff of NSG-immunodeficient mice. Wounds were closed, and subcutaneous tumors were measured via caliper. Once tumors achieved an average size of 150-200mm³, 1×10^7 DSG2/GUCY2C-directed treatment and CD19-directed control CAR-T cells were administered systemically via tail vein injection. Animals were sacrificed when tumors achieved a cumulative size of >2000mm³, >20% body-weight loss, or additional terminal endpoints.

Conclusion: DSG2-directed CAR-T cells are able to eradicate AsPC-1 pancreatic tumors in vivo while GCC-directed CAR-T cells have been unsuccessful. The levels of GCC expression in AsPC-1 cells may account for these findings. Similarly, DSG2-directed CAR-T cells are able to eradicate patient-derived pancreatic tumor xenografts, while GCC-directed CAR-T cells are able to slow tumor growth but unable to eradicate these tumors.