

### A Bioelectrical Sensing-Based Device for Post-Parathyroidectomy Blood Calcium Monitoring

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**Introduction:** The parathyroid glands play a crucial role in the regulation of calcium ions in the body. After parathyroidectomy, it is vital to monitor blood calcium levels quickly and effectively. In this study, we have designed a bioelectrical sensing-based method that allows for minimally invasive and precise monitoring of blood calcium levels with high efficiency.

**Methods:** Patient blood samples were collected using a fixed array of silver-plated microneedles. The rate of glutamate increase was determined by the reaction between glutamine solution and TCA (trichloroacetic acid) solution. The activity of glutaminase and the coloring with indantrione powder were used to indirectly reflect the blood calcium content.

**Results:** The new bioelectrical sensing-based method for blood calcium measurement demonstrated higher accuracy and stability, with a coefficient of variation (CV) within 2% and an accuracy exceeding 95.71%. This allows for earlier and more efficient at-home blood calcium monitoring.

**Conclusion:** The bioelectrical sensing-based device for post-parathyroidectomy blood calcium monitoring holds significant potential for clinical application. It promises to bring a new dawn in the early warning and monitoring of blood calcium levels for patients.

### A Decision Analysis of Total Abdominal Colectomy with End-Ileostomy vs Diverting Loop Ileostomy and Colonic Lavage for Fulminant *Clostridioides difficile* Colitis

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**Introduction:** Fulminant *Clostridioides difficile* colitis (FCDC) poses significant morbidity, mortality, and healthcare cost. This study compares the cost-effectiveness of diverting loop ileostomy (DLI) and intraoperative colonic lavage vs total abdominal colectomy (TAC) with end-ileostomy (EI) for FCDC treatment.

**Methods:** A decision analytic model incorporating mortality, life expectancy, ostomy reversal, recurrence rate, and cost from a societal perspective was constructed. Parameters were sourced from published data. Quality-adjusted life years (QALY), total cost, incremental cost-effectiveness ratio (ICER), and net monetary benefits (NMB) were analyzed using a willingness-to-pay (WTP) threshold of \$100,000 per QALY. Cost was adjusted to 2023 levels, and sensitivity analyses varying perioperative mortality and life expectancy were performed.

**Results:** After 5 years, patients undergoing DLI and lavage yielded 3.48 QALYs at a total cost of \$306,013, compared with 3.11 QALYs and \$253,738 with TAC and EI. The ICER of \$139,638 for DLI and lavage exceeded the WTP threshold. The NMB for performing a TAC with EI was \$56,979 compared with \$42,141 for DLI and lavage. Therefore, TAC and EI was the preferred strategy compared with DLI and lavage for the operative treatment of FCDC. When estimated life expectancy was greater than 6 years, DLI and lavage became the preferred treatment strategy (Figure 1).

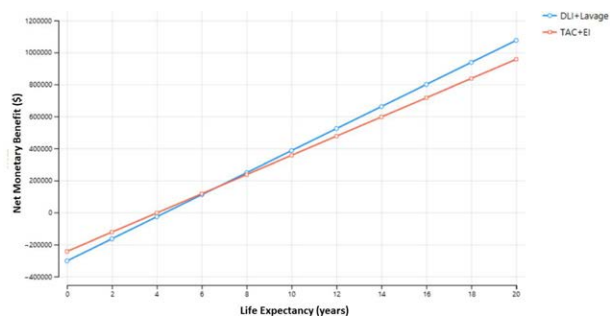


Figure 1.

**Conclusion:** DLI with lavage is a marginally more effective treatment, but TAC and EI is the cost-effective treatment. However, for patients who develop FCDC and may be expected to live longer than 6 years, DLI and lavage provides more QALYs and becomes the more cost-effective treatment strategy.

### A Familiar Working Environment Influences Surgeon Stress in the Operating Room

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**Introduction:** Regulating surgeon stress may improve performance and patient safety. Here, we evaluated how team member and operating room familiarity influence surgeon stress at the start of operation.

**Methods:** Attending surgeons from 7 specialties within 4 university hospitals in France were enrolled from 01/11/21 to 12/23/21. Stress during the first 5 minutes of operation was assessed using root mean square of successive differences (RMSSD) from heart rate variability, measured via Polar monitors, with higher RMSSD indicating lower stress. Team familiarity was quantified as the cumulative time the attending and assisting surgeons operated together in the past, and operating rooms in which the attending surgeon conducted >10% of their operations were termed familiar. The effect of each on the logarithm of RMSSD was assessed via a linear mixed model adjusting for the random effect of the surgeon and possible confounders related to the surgeon, patient, and procedure.

**Results:** Overall, 643 operations performed by 37 surgeons were included. Median surgeon age was 47 years, 29 (78.4%) of the sur-

geons were men, and 22 (59.5%) were professors. Surgeons spent an average (SD) of 21.2 (30.4) hours with the assisting surgeon before operation and 585 (91.0%) of the operations were performed in a familiar operating room. For every 10 additional hours spent

operating together, logRMSSD significantly increased 0.018 (95% CI: 0.003-0.033,  $p = 0.016$ ). Familiar operating rooms tended to increase surgeon logRMSSD [0.098 (95% CI: -0.007-0.203,  $p = 0.068$ )] (Table 1).

**Table 1.** Summary of Linear Mixed Model Displaying Beta Coefficients for the Change in logRMSSD

Predictor	Estimate (95% CI)	p Value
Shared Operating Time with Assistant Surgeon (+10 Hours)	0.018 (0.003, 0.033)	0.016
Familiar Operating Room	0.098 (-0.007, 0.203)	0.068
Primary Surgeon Age (+1 Year)	0.001 (-0.017, 0.019)	0.88
Primary Surgeon Professional Status (Professor vs Non-Professor)	-0.516 (-0.835, -0.198)	0.002
Incision Time (+1 Hour)	-0.023 (-0.034, -0.012)	<0.001
Operating Time (High vs Low)	-0.241 (-0.546, 0.063)	0.12
Surgeon Gender – Male	-0.270 (-0.658, 0.119)	0.17

**Conclusion:** Familiar assisting surgeons and operating rooms reduced intraoperative surgeon stress. Maintaining a stable operating room environment may improve surgeon well-being and patient care.

### A Little Goes a Long Way: A Comparison of Enterolithotomy vs Single-Stage Cholecystectomy in the Management of Gallstone Ileus

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**Introduction:** Gallstone ileus (GI) is an infrequent complication of cholelithiasis with no specific guidelines for its management. This study aims to compare the outcomes of patients with GI managed with both enterolithotomy and cholecystectomy (EL+CCY) vs those managed with enterolithotomy (EL) only.

**Methods:** In this retrospective analysis of 2011-2017 Nationwide Readmissions Database, all patients with an index admission diagnosis of GI were included and stratified based on management into those who underwent EL+CCY, and those who underwent only EL and compared. Outcomes were complication (surgical site infection, sepsis, pneumonia, cardiac arrest, deep vein thrombosis, intestinal obstruction), hospital cost, all-cause readmission, and mortality.

**Results:** A total of 1,960 patients were identified. Mean age was 67 years and 67% were women. 289 (14.7%) patients were managed with both EL+CCY, whereas 1,671 (85.3%) patients had EL only. Overall, the readmission rate was 5%, whereas mortality was 4.2%. There was no significant difference between groups in terms of index-admission complication (EL+CCY 24.8% vs EL 21.7%,  $p = 0.415$ ), rate of readmission (EL+CCY 3.5% vs EL 5.1%,  $p = 0.22$ ), and mortality (EL+CCY 6.2% vs EL 3.9%,  $p = 0.07$ ). EL+CCY group had significantly longer hospital LOS (EL+CCY 11 vs EL 8 days,  $p < 0.001$ ) and median hospital cost (EL+CCY \$70,959 vs EL \$52,147,  $p < 0.001$ ).

**Conclusion:** Our findings suggest no difference between EL compared with EL+CCY in terms of complication, readmission, and mortality. However, patients managed with EL+CCY had a longer hospital stay, and higher hospitalization cost compared with EL. Further prospective studies are needed to confirm these findings and develop management protocols for GI.

### A Nationwide Observational Study of Acute Cholecystitis in Older Adults with Multimorbidity

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**Introduction:** Acute cholecystitis in older, multimorbid patients presents a challenge. Debate exists regarding the most appropriate treatment, operative or nonoperative. We performed a comparative effectiveness study of operative treatment to provide data to inform decision-making.

**Methods:** We identified multimorbid Medicare beneficiaries with continuous enrollment, ages  $\geq 65.5$  years, emergently hospitalized for acute cholecystitis (2016-2018). Multimorbidity was defined using qualifying comorbidity sets. Using a preference-based instrumental variable approach with balancing weights on 47 covariates including physical frailty, sepsis, and dual-eligibility, the effectiveness of operative compared with nonoperative treatment of acute cholecystitis was examined.

**Results:** Of the 41,735 included patients, 62.7% underwent cholecystectomy. Of the 15,574 patients who received nonoperative treatment, 29.6% received a percutaneous cholecystostomy tube. Unadjusted 30- and 90-day mortality rate was significantly lower in the operative compared with nonoperative treatment groups (30-d: 4.0% vs 11.1%,  $p < 0.001$ ; 90-d: 6.8% vs 17.9%,  $p < 0.001$ ). The average cost of the index admission was \$12,973 (CI: 12,693, 12,894) in the operative compared with \$9,232 (CI: 9,218, 9,427) in the nonoperative group ( $p < 0.001$ ). After adjustment for potential confounders and controlling for selection bias, rate of 30- and 90- day mortality was similar in the operative and

nonoperative groups (1% vs 2%,  $p < NS$ ). See significant results for secondary outcomes in Figure 1.

Figure 1. Forrest plot of adjusted outcomes of operative compared to non-operative treatment by Ordinary Least Squares Regression and Instrumental Variable Estimation. Negative values indicate that operative treatment is preferred.

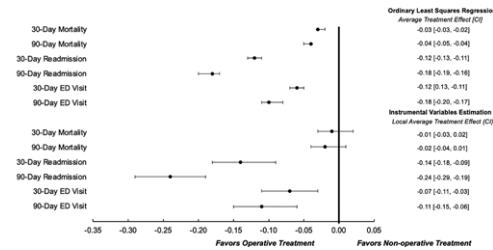


Figure 1.

**Conclusion:** Risk-adjusted operative treatment of acute cholecystitis in older, multimorbid patients is associated with similar 30-day and 90-day mortality, and lower 30- and 90-day emergency department visits and readmission. When uncertainty exists regarding management in this challenging population, strong consideration should be given to operative treatment.

**A Novel Force Feedback Technology Improves Suturing Performance in Robotic-Assisted Surgery: Findings of a Preclinical Study**

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**Introduction:** The inability to sense force applied to tissue is suggested as a limitation to robotic-assisted surgery (RAS). This pre-clinical study evaluated the impact of a novel force feedback (FFB) technology, integrated on a next generation robotic system that allows surgeons to sense forces exerted at the instrument tips, on suturing performance by novice surgeons during RAS.

**Methods:** Twenty-nine novice surgeons (<50 RAS cases in the last 5 years) were randomized into 2 groups with (n = 15) or without (n = 14) FFB sensing. Participants performed interrupted stitches on ex-vivo porcine bladder and running stitches on porcine aorta (Figure 1A) over 4 runs. Average forces applied, number of errors, time for exercise completion, and Robotic Anastomosis Competence Evaluation (RACE) technical skill ratings were compared using a 3-way mixed model ANOVA and applicable post-hoc tests.

**Results:** FFB sensing significantly lowered the mean force applied (bladder, 1.71 N vs 2.40 N,  $p < 0.006$ ; aorta, 1.80 N vs 2.53 N,  $p < 0.006$ ), average number of errors (bladder, 0.59 vs 1.76,  $p < 0.001$ ; aorta, 0.38 vs 1.14,  $p < 0.001$ ), and the time to completion (bladder, 659 s vs 781 s,  $p = 0.002$ ; aorta, 460 s vs 570 s,  $p = 0.001$ ) (Figure 1C). The FFB group applied less tissue trauma with a higher RACE skill score (3.75 vs 3.03,  $p = 0.012$ ).

**Conclusion:** This study showed that novice surgeons using FFB-enabled instruments completed suturing tasks using less force, with fewer errors, taking less time, and less tissue trauma during RAS. Future studies are required to better understand the impact of FFB technology on surgical performance and potential patient benefits.

**A Novel Scoring Method for CD8+ Tumor-Infiltrating Lymphocytes Suppresses Tumor Progression in Gastric Cancer**

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**Introduction:** Tumor-infiltrating lymphocytes (TILs) are thought to reflect local tumor immunity in various cancers. However, the evaluation method for TILs in gastric cancer (GC) has not been established and its clinical significance has been unclear in GC.

**Methods:** We retrospectively analyzed 103 advanced GC patients who underwent curative resection. The TILs at the invasive margin and the center of the tumor were scored using immunohistochemical staining of CD8+ T cells from resected primary tumors. Based on the sum of each score, GC patients were divided into high TILs group and low TILs group. Furthermore, we confirmed the tumor suppressive effect due to CD8+ T cells co-cultured in GC cell lines in vitro.

**Results:** Sixty-nine of the 103 patients were in the low TILs group. Patients in low TILs group had significantly poorer recurrence-free survival than those in high TILs group ( $p = 0.048$ ). Low TILs were significantly associated with large tumor diameter, deep tumor invasion and lymph node metastasis ( $p = 0.019, 0.001, 0.015$ , respectively). In addition, deep tumor invasion was an independent risk factor for low TILs ( $p = 0.006$ ). In vitro, activated CD8+ T cells induced the apoptosis of GC cell lines in the CD8+ T cells concentration-dependent manner and the proliferative capacity in GC cell lines was significantly suppressed. Furthermore, the migration and invasive capacity were also significantly suppressed.

**Conclusion:** We proposed a novel scoring method of TILs in GC using immunostaining CD8+ T cells. CD8+ TILs can be a sensitive prognostic marker in GC, suppressing tumor progression.

**A Quality Improvement Initiative Reduced Adult Inpatient Gastrostomy Tube Dislodgement**

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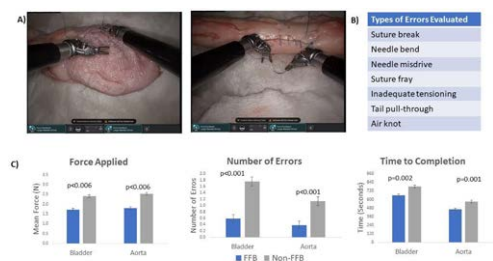


Figure 1. (A) Interrupted suture on ex-vivo porcine bladder (left) and running suture on ex-vivo porcine aorta (right). (B) Types of errors evaluated (C) Comparison of mean forces applied, number of errors and time to exercise completion.

Figure 1.

**Introduction:** Unintended dislodgement remains a major complication in patients who undergo gastrostomy tube (g-tube) placement. Our objective was to examine the success of a quality improvement (QI) initiative that aimed to reduce inpatient g-tube dislodgement and identify factors associated with dislodgement.

**Methods:** A multidisciplinary team examined g-tube dislodgement and implemented a new inpatient nursing order set in September 2022, specifying g-tube care instructions and requiring assessments every shift. The incidence of adult inpatient g-tube dislodgment was compared pre- (September 2021-August 2022) and post-intervention (September 2022-September 2023). Patient and procedural characteristics were compared between dislodged and non-dislodged g-tubes.

**Results:** After implementation, overall inpatient g-tube dislodgement decreased from 14.2% to 11.3%; a 20% decline, along with an 80% compliance rate with the intervention 1 year later. Patients with dislodged g-tubes more often had percutaneous endoscopic tubes (37.5% vs 31.6%,  $p = 0.042$ ) and more frequently experienced delirium during their admission (55.8% vs 45.7%,  $p = 0.051$ ) compared with those who did not have dislodgement. Multivariable analysis showed that the application of restraints was associated with dislodgement (odds ratio [OR] 2.30, 95% CI 1.12-4.76,  $p = 0.024$ ), and g-tubes placed by surgeons were less frequently associated with dislodgement (OR 0.17, 95% CI 0.04-0.75,  $p = 0.019$ ) (Figure 1).

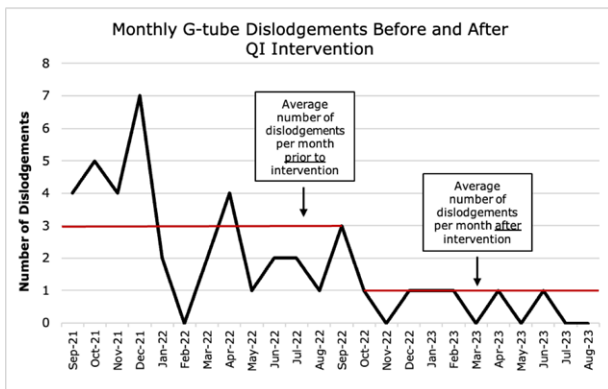


Figure 1.

**Conclusion:** A multidisciplinary QI initiative achieved acceptance with high compliance and reduced the incidence of g-tube dislodgement. G-tubes placed by surgeons were less frequently associated with dislodgement. Initiatives that engage stakeholders from various departments have the opportunity to reduce the likelihood of complication and improve patient outcomes.

**A Socioecological Perspective on Surgical Access in Rural Alabama: A Qualitative Study**

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**Introduction:** Inequity in surgical outcomes persists among rural populations, though there is a lack of understanding of how socioecological determinants of health drive this disparity. Using the socioecological model, this study aimed to identify barriers and facilitators to surgical care across rural Alabama from a diverse group of key stakeholders.

**Methods:** An interdisciplinary group of healthcare providers were recruited from 3 racially diverse, rural communities in Alabama. Interview guides were developed to elucidate barriers and facilitators to surgical care during the preoperative, interoperative, and postoperative phase. Interviews were recorded, transcribed, and analyzed by 3 co-authors (BS, IH, NE) using inductive thematic and content analysis qualitative techniques with Nvivo 12.6-Plus software. Inter-coder agreement was reached at 90%.

**Results:** The 21 stakeholders interviewed included clinicians (n = 5); a caregiver (n = 1); and leaders in the community (n = 4), organizational (n = 5), and policy domain (n = 6). Of these, the majority (90.5%) were White, and 47.6% were women. Barrier and facilitator themes were identified across socioecological domains and influenced multiple aspects of the surgical journey (Figure 1). Specifically, individual/interpersonal: understanding the surgical process (low health literacy vs physician trust); community: accessing surgical services (lack of transportation vs social support); organizational: receiving quality surgery (staff shortages vs comprehensive follow-up care); and policy: patient advocacy (lack of patient-centered policies vs lobbying with local government) were all identified.

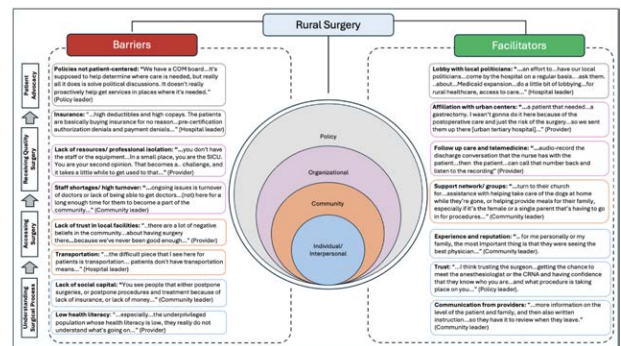


Figure 1.

**Conclusion:** Across rural Alabama, barriers and facilitators to surgery exist along the entire continuum of care. These suggest multi-level targets to address disparity, including providing health literacy-sensitive care, equitable resource allocation, and patient-centered policy lobbying.

**An External Validation of the Ramathibodi Appendicitis Score in the Diagnosis of Acute Appendicitis**

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**Introduction:** Acute appendicitis is a common surgical emergency. It remains a challenge to diagnose, due to variable clinical presentations. Clinicians often rely on CT scans; however, CT scans are expensive, not widely available, and expose patients to ionizing radiation. This has led to the creation of multiple scoring systems. Scoring systems are prognostic models. It is recommended that prognostic models be derived from rigorous statistical methods. Previous studies showed performance reduction when scores derived in certain populations are used with other populations. There was no score derived from rigorous statistical methods specifically made for the Asian population. We created the Ramathibodi Appendicitis Score (RAMA-AS) through multivariate regression specifically for our Asian population. Here, we externally validate our score to confirm its usefulness.

**Methods:** A retrospective cohort study was conducted at Ramathibodi hospital from January 2019 to December 2023. A total of 376 eligible patients participated. Symptoms, physical examination, and laboratory results were collected. The diagnosis was confirmed by histopathology for surgical patients and follow-up for non-surgical patients.

**Results:** The RAMA-AS score shows good performance in external validation. The receiver operating characteristic curve is shown in Figure 1. The score has a C-statistic of 0.70 (0.69, 0.70) with an estimated observed/expected ratio of 1.05 (0.87, 1.23). The specificity for high-risk appendicitis is 92.7% (86.2%, 98.0%).

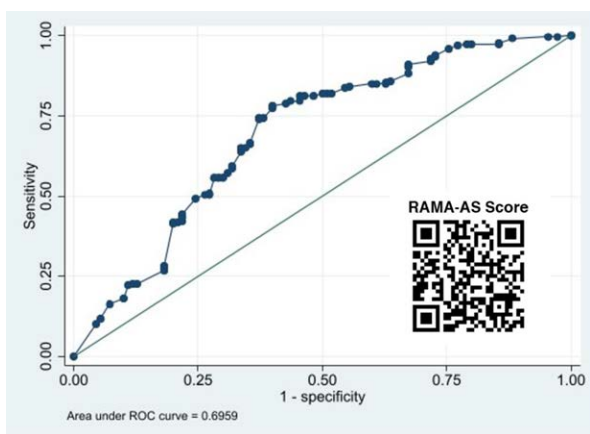


Figure 1: ROC curve for this RAMA-AS external validation with QR code for score access.

Figure 1.

**Conclusion:** The RAMA-AS score performed well. It exhibits good discrimination and is highly specific in detecting acute appendicitis. The score should be useful as a diagnostic aid for possible acute appendicitis with potential to reduce CT scan.

### Anterior to Posterior Abdominal Thickness: An Improved Predictor for Recurrence after Ventral Hernia Repair Compared with BMI

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**Introduction:** Obesity is a known risk factor for recurrence after ventral hernia repair. BMI is often used to define obesity. In 2023, American Medical Association policy highlighted BMI as an imperfect measurement and recommended limitations to its use. This study's objective was to evaluate the association of anterior-to-posterior abdominal wall depth (APDepth) from CT measurement with hernia recurrence as an alternative to BMI.

**Methods:** Data was retrospectively collected for patients from a multicenter county healthcare system undergoing elective ventral hernia repair from 2014 to 2020 with fascial defects >4 cm and pre-operative CT scan. Classification and regression tree analysis was performed to determine APDepth threshold for recurrence. Receiver operating characteristic (ROC) curve analysis was performed to compare APDepth and BMI as predictors of recurrence. Kaplan-Meier graph was used to depict the recurrence-free time period.

**Results:** A total of 267 patients met inclusion criteria. Mean APDepth at the L4 vertebral body was 27.67 cm. APDepth of 29.7 cm was determined as the threshold for recurrence. Area under the curve for AP Depth >29.7 cm and BMI > 33.6 was 0.617 ( $p = 0.046$ ) and 0.577 ( $p = .189$ ) respectively. Five-year recurrence free survival was 70% for APDepth <29.7 cm and 37% for APDepth >29.7 cm (Figure 1).

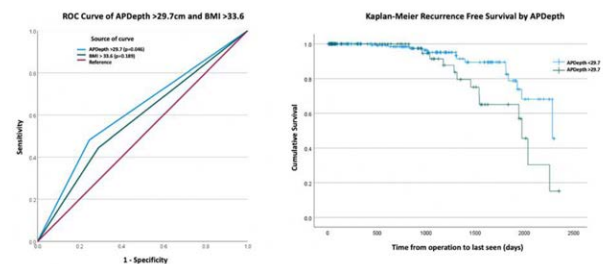


Figure 1.

**Conclusion:** In our study, CT measurement of abdominal obesity was superior to BMI for predicting risk of hernia recurrence with an APDepth >29.7 cm associated with decreased recurrence-free survival. Our results suggest that APDepth at the L4 vertebral body may be a novel and improved alternative measure of obesity that could be useful to identify elective hernia repair patients who are at higher risk for recurrence.

### Assessment of the Clinical Utility of Routine Postoperative Labs

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**Introduction:** Morning postoperative labs are often obtained for emergency general surgery (EGS) patients. Studies in other specialties indicate that routine postoperative day 1 (0) labs are, in some cases, being performed excessively and do not require intervention. The purpose of this study is to create a model to determine whether POD1 labs are needed for EGS patients based on likelihood of intervention.

**Methods:** This is a retrospective review of non-critically ill EGS patients who received POD1 labs. The odds of having an abnormal lab and the likelihood for it requiring intervention were measured through multivariate logistic regression accounting for patient characteristics and procedure performed. LASSO regression analysis was performed to determine the most significant predictors of an abnormal lab and intervention.

**Results:** A total of 500 patients were included. Independent predictors for any abnormal lab were procedure duration, fever, lysis of adhesions, systolic blood pressure <90 mmHg, older age, heart failure, operative blood loss, chronic kidney disease, and anticoagulation use (area under curve = 0.785). Independent predictors of intervention were duration of procedure, older age, higher operative blood loss, anticoagulant use, and lysis of adhesions (area under curve = 0.704). Procedures > 400 minutes carried an 84.3% chance of an abnormal lab requiring intervention. Estimated blood loss (EBL) > 200 mL carried a 75.5% chance of an abnormal lab requiring intervention (Figure 1).

Figure 1

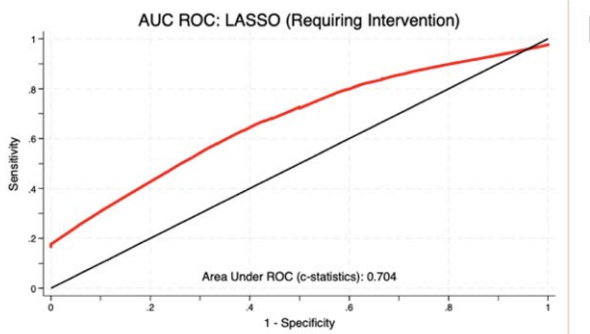


Figure 1.

**Conclusion:** Generally, POD1 labs for non-critically ill EGS patient rarely require intervention and can be safely omitted. Labs should be considered for longer procedures, higher EBL, older patients, those on anticoagulation, or after lysis of adhesions.

**Association of Mesh Weight with Adverse Outcomes: Analysis of 126,757 Inguinal Hernia Repairs**

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**Introduction:** We sought to compare different mesh weight classes by evaluating risk for recurrence, reoperation, and groin pain after inguinal hernia repair.

**Methods:** We conducted a cohort study including 126,757 adults who underwent first elective mesh-based inguinal hernia repair within a US integrated healthcare system (1/1/2010-6/23/2023). Mesh weight was categorized into lightweight (LW, <50 g), medium weight (MW, 50-90 g), and heavyweight (HW, >90 g); mesh material was not considered. Recurrence and reoperation during follow-up were primary outcomes, while 5-year postoperative groin pain (excluding first 6-month postoperative acute recovery period) was a secondary outcome. Cox regression was used to evaluate risk of primary outcomes, while multiple logistic regression was used to evaluate the secondary outcome; models included covariate adjustment for potential confounders (age, sex, race, BMI, diabetes, smokers, liver disease, American Society of Anesthesiologists score, surgeon volume, polypropylene vs polyester, plug vs flat mesh) and stratified by operation type.

**Results:** LW, MW, and HW mesh was used in 45.7% (n = 22,291), 5.6% (n = 2,728), and 48.7% (n = 23,743) of minimally invasive (MIS) procedures, respectively; and was used in 45.8% (n = 35,693), 17.2% (n = 13,406), and 37.0% (n = 28,896) of open procedures respectively. Among MIS repairs, LW mesh demonstrated a statistically lower rate of recurrence, reoperation, and groin pain compared with HW, and lower rate of recurrence and reoperation compared with MW. Among open repairs, no statistically significant difference between weight classes was identified in terms of reoperation, and results were mixed in terms of groin pain and recurrence (Table 1).

Table 1. Results

Outcomes	Mesh Weight	Minimally Invasive Repair Adjusted HR/OR (95% CI)   P	Open Repair Adjusted HR/OR (95% CI)   P
Ipsilateral reoperation	Lightweight	Reference	Reference
Ipsilateral reoperation	Medium-weight	1.97 (1.27-3.07)   0.003	1.10 (0.91-1.33)   0.327
Ipsilateral reoperation	Heavyweight	2.64 (2.11-3.31)   <0.001	1.04 (0.90-1.19)   0.610
Recurrence	Lightweight	Reference	Reference
Recurrence	Medium-weight	1.98 (1.41-2.78)   <0.001	1.26 (1.06-1.51)   0.010
Recurrence	Heavyweight	2.20 (1.85-2.62)   <0.001	1.03 (0.90-1.17)   0.683
Groin pain	Lightweight	Reference	Reference
Groin pain	Medium-weight	0.99 (0.78-1.25)   0.918	0.84 (0.76-0.93)   <0.001
Groin pain	Heavyweight	1.63 (1.49-1.79)   <0.001	1.08 (1.00-1.17)   0.042

HR = hazard ratio. OR = odds ratio.

**Conclusion:** Lightweight mesh demonstrates a long-term advantage in postoperative complication, particularly during MIS repair.

### Autologous Blood Clot as Natural Biomaterials to Accelerate Skin Wound Healing

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**Introduction:** Autologous blood clot (ABC) presents as a novel biomaterial in regenerative medicine, addressing the need for a universally effective wound dressing. This study investigates the efficacy of ABC composited with antibiotics and mesenchymal stem cells (MSC) in the healing of skin wound. We hypothesize that the integration of ABC with MSC and antibiotics will not only prevent infection, but also accelerate the skin wound healing process.

**Methods:** In vitro-engineered murine and porcine ABC were conjugated with murine- and porcine-derived MSC and gentamicin (5 µg/mL). Vascular endothelial growth factor (VEGF) release was assessed via ELISA. In murine (C57BL/6J, n = 6) and porcine (Domestic Yorkshire, n = 2) models, skin wounds underwent treatment of 4 groups: control, ABC, ABC+MSC, ABC+gentamicin, over 7 and 10 days, respectively. Wound healing was evaluated through H&E staining, wound closure, and perfusion via laser speckle contrast imaging.

**Results:** Conjugated ABC showed sustained VEGF release and improved wound healing across all treatment groups compared with controls. Notably, MSC-conjugated ABC demonstrated the highest wound closure rate and increased perfusion. Histological analyses revealed significant regeneration of the dermis and epithelial layers in all 3 treatments compared with the control, with the integration of ABC and MSC exhibiting the most regenerative effects.

**Conclusion:** ABC offers significant translational potential due to its fibrin framework, mechanical stability, and growth factor release. Moreover, its simple production, cost-efficiency, and compliance with federal regulatory standards enhances its practicality. These characteristics position ABC as a potential 'gold standard' in skin wound management, aiming to accelerate wound recovery.

### Beyond the Blue Ridge: How Do Surgical Departments Innovate and Lead in Academic Productivity?

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**Introduction:** Intellectual property is essential for translating scientific discoveries into innovations that can advance healthcare. However, innovation metrics have traditionally been evaluated outside the realm of academic productivity assessments in surgery. Here we evaluated innovation productivity across clinical departments at a major academic institution.

**Methods:** Innovation outputs between 2019 and 2023 were evaluated, and were defined as invention disclosures, patents, and

licensing agreements. NIH RePORTER was also queried for annual funding and volume of publications per clinical department during the same period. \$/innovation was calculated by NIH grant funding divided by innovation output. \$/publication was calculated by NIH funding divided by the number of publications. Linear regression was used to analyze association between NIH funding and innovation outputs.

**Results:** A total of 498 invention disclosures were analyzed, with the top 3 contributing departments being radiology (78), neurology (72), and surgery (58) (Figure 1A). Out of the 13 departments included, surgery ranked 4th in innovation metrics, 6th in NIH funding, and 4th in publications. Cumulative NIH funding correlated strongly with number of publications generated ( $R^2 = 0.94$ , Figure 1B). However, linear regression revealed poor correlation between innovation metrics and NIH grant funding ( $R^2 = 0.11$ , Figure 1C). Surgery ranked 2nd in \$/publication (\$83,557), but 9th in \$/innovation (\$878,447).

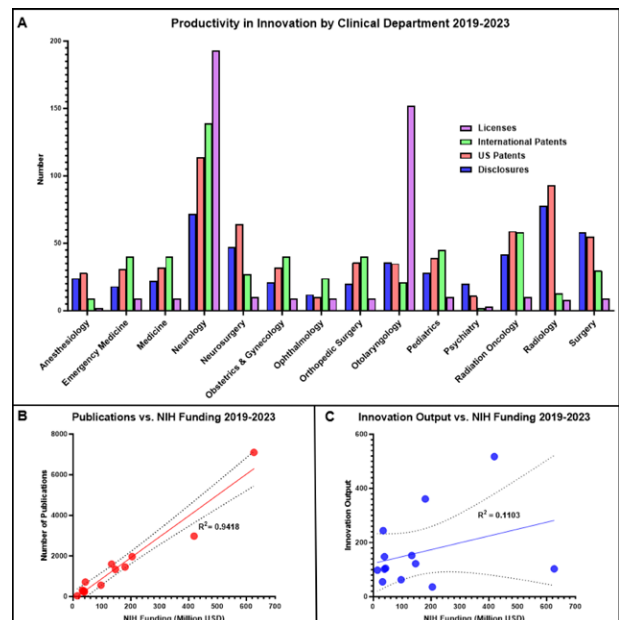


Figure 1.

**Conclusion:** Surgery ranked among the most efficient for generating publications from NIH grant funding, but currently lags in translating funding into innovation. Identifying factors that hinder translation of academic surgical discoveries into innovation output is a significant opportunity for growth and impact.

### Cardiovascular Symptoms in Biliary Infection: A Multivariate Analysis of the Association with Severe Biliary Infection and Comparison with Classic Biliary Septic Manifestation

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**Introduction:** Recognized biliary septic manifestation (Reynolds Pentad) includes hypotension and altered mental status (AltMent-Stat). We previously reported that cardiac symptoms (CardSxs) can

occur with biliary disease. We hypothesized that CardSxs represent a severe response to biliary infection, possibly septic manifestation.

**Methods:** A total of 1152 cases with gallstone disease (89% men, average age 64 years) were studied (1990-2024). Clinical data were analyzed, illness severity was classified [no infection, systemic inflammatory response syndrome (SIRS) (leukocytosis/fever/tachycardia), severe (abscess/empyema/cholangitis), Sepsis-multiple organ dysfunction syndrome (MODS) (hypotension/AltMentStat/organ-failure/bacteremia)]. Cases with new-onset CardSx [chest pain, dyspnea, arrhythmia, MI/non-ST-elevation MI (nSTEMI), code/near code/rapid response (RR)] were identified. Multivariate analysis (SPSSv21) was performed to identify factors associated with severe infection.

**Results:** A total of 152 cases had CardSx: (49% chest pain/dyspnea, 36% arrhythmia, 42% MI/nSTEMI, 11% code/near code/RR, 3% died). CardSx timeline: 84% preoperative/pre-procedure, 7% intraoperative/intraprocedure, 13% postoperative/postprocedure. 35% with CardSx had no cardiac disease. Among cases with ≥SIRS findings, CardSx-cases more often manifested sepsis-MODS (75% vs 30%, CardSx vs none,  $p < 0.001$ , chi-square) and metabolic acidosis (63% vs 45%, CardSx vs none,  $p < 0.001$ ). Even among cases with hypotension ( $n = 120$ ) and/or AltMentStat ( $n = 59$ ): CardSx cases had significantly worse metabolic acidosis [hypotension: HCO<sub>3</sub> 20 vs 22 mmol/L, AltMentStat: HCO<sub>3</sub> 26 vs 31 mmol/L (CardSx vs none, all  $p < 0.001$ )]. On multivariate analysis, factors independently associated with sepsis were advanced age, Charleston Comorbidity Index (CCI), biliary bacteria, choledocholithiasis, HCO<sub>3</sub> (acidosis), and CardSx. Factors independently associated with metabolic acidosis were biliary bacteria, CCI, severe or sepsis MODS manifestation, and CardSx.

**Conclusion:** This study demonstrated that CardSx were independently associated with sepsis-MODS and metabolic acidosis, they could occur in patients without cardiac disease, and likely represent biliary sepsis. The striking metabolic acidosis seen with CardSx (more severe than with hypotension/AltMetnStat), demonstrates the physiologic severity associated with CardSx. Recognition of this association is key, patients with CardSx and right upper quadrant pain should be evaluated for biliary infection and both conditions actively treated to improve outcomes.

**Cholecystectomy Leads to Proximal Colorectal Cancer: A Multicenter Retrospective Study and First Evidence in Mexico**

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**Introduction:** Several publications have investigated the relationship between cholecystectomy and the development of colorectal

cancer (CRC), with contradictory results. As for the Mexican literature, there is no report of an association between both entities. This research aims to confirm whether cholecystectomy increases the risk for developing proximal colon cancer and establish their relationship in Mexico.

**Methods:** We performed a multicenter retrospective cohort study where the 2018-2023 clinical records of patients with CRC were reviewed. Data was collected regarding segment of colon affected (cecum, ascending, transverse, descending, sigmoid or rectum, also combined into proximal and distal colon), history of cholecystectomy, and how long ago operation was done. Univariate and multivariate analysis were performed, adjusting for age, smoking, BMI, sex and family history of cancer. Logistic regression for statistical analysis was used to estimate the odds ratio (OR) for the association between cholecystectomy and tumor location.

**Results:** A total of 404 cases were recorded, of which 52 had a history of cholecystectomy. Date of cholecystectomy was noted in 43 patients, with a 5-year median and interquartile range of 1.5-14 years before the diagnosis of CRC. Both crude and adjusted OR (2.86  $p = 0.001$  and 2.42  $p = 0.007$ , respectively) showed an increased risk for developing cancer in all individual and combined segments of the proximal colon (Table 1).

**Table 1.**

Affected colon segment	History of cholecystectomy		Calculated OR	
	YES	NO	OR per individual segment	OR by combined segments
Cecum	3 (6.7%)	14 (3.98%)	1.45 (CI 95, range 40-5.32, $P = 0.05$ )	Proximal/right Colon: Crude: 2.86 (CI 95, range 1.53-5.33, $P = 0.001$ ) Adjusted: 2.42 (range 1.27-4.59, $p = 0.007$ )
Ascending Colon	14 (26.92%)	37 (10.51%)	3.13 (CI 95, range 1.35-6.32, $P = 0.001$ )	
Transverse Colon	3 (5.77%)	12 (3.41%)	1.73 (CI 95, range 0.47-6.36, $P = 0.05$ )	Distal/left Colon: Crude: 0.34 (CI 95, range 0.18-0.64, $P = 0.001$ ) Adjusted: 1.00 (ref.)
Descending Colon	2 (3.85%)	22 (6.25%)	0.06 (CI 95, range 0.13-2.62, $P = 0.05$ )	
Sigmoid Colon	12 (23.08%)	112 (31.82%)	0.64 (CI 95, range 0.32-1.22, $P = 0.02$ )	
Rectum	18 (34.62%)	155 (44.03%)	0.67 (CI 95, range 0.36-1.23, $P = 0.02$ )	
Totals	52 (100%)	352 (100%)		

**Conclusion:** Patients who underwent cholecystectomy showed an increased risk of developing proximal CRC. These results are also the first association between both in Mexican literature. Patients undergoing cholecystectomy should have more frequent surveillance.

**Clinical Outcomes of Umbilical Hernia Repair in Patients with Ascites**

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**Introduction:** Drainage during umbilical hernia repair (UHR) in cirrhotic patients is thought to control postoperative ascites. This study examined outcomes in patients with or without intraperitoneal drainage at the time of UHR.

**Methods:** This study used TriNetX to compare outcomes of patients ≥18 years with ascites who underwent UHR with or without intraperitoneal drainage, by any drain of the abdomen



or by aspiration. The analytics subset contained 539 patients with drainage and 17,148 without. Propensity matching was conducted using age, Model for End-Stage Liver Disease (MELD) value, BMI, and comorbidity (COPD, tobacco use, diabetes). Outcomes were hernia recurrence, prolonged hospital course, ascites leak, surgical site infection (SSI), and postoperative complication.

**Results:** A total of 536 patients were identified after matching. Cohort 1 contained patients with ascites who underwent UHR with drainage, and Cohort 2 contained those without. Cohort 1 had a hernia recurrence rate of 4.3% vs 3.1% in Cohort 2 (odds ratio [OR] = 1.37, CI [0.72, 2.59]). Prolonged hospital stay occurred in 3.9% of Cohort 1 vs 3.7% (OR = 1.05, CI [0.56, 1.96]). Continued ascites leak was 7.7% of Cohort 1 vs 7.1% of Cohort 2 (OR = 1.09, CI [0.69, 1.72]). SSI affected 9.9% in Cohort 1 vs 7.5% (OR = 1.36, CI [0.89, 2.09]). 42.9% from Cohort 1 vs 36.9% from Cohort 2 had postoperative complication (OR = 1.28, CI [1.004, 1.64]).

**Conclusion:** Matched patients with ascites who underwent intraperitoneal drainage after UHR had no improvement in hernia recurrence, ascites leak, SSI, or length of stay, and had a statistically significant increase in postoperative complication, indicating a lack of benefit to intraperitoneal drainage for UHR.

### Communicating Risk to Surgical Patients: A Randomized Controlled Trial of Verbal vs Numerical Descriptors

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**Introduction:** Surgeons regularly communicate risk to patients, but the form of communication may impact risk perception and willingness to have operation. Aimed at ultimately developing a decision aid, we compared the use of words vs numbers related to the risk of a novel surgical strategy - opportunistic salpingectomy (OS) concurrent with general surgery procedures to reduce the risk of ovarian cancer (OC) - and their impact on risk perception and acceptability of OS.

**Methods:** A total of 1385 female respondents were recruited using an online survey platform. Participants were provided with vignettes describing OC and OS and randomized to 3 communication formats: verbal (words), numerical (numbers), and verbal+numerical. Outcomes were the respondent's perception of 4 risk estimates (OC incidence, risk of spread, 5-year survival, and OS risk reduction), and acceptability of OS.

**Results:** Verbal descriptors resulted in more inaccurate risk estimates (3 of 4 estimates) and greater variance in responses (4 of 4 estimates). Verbal+numerical descriptors were not better than numerical alone. Acceptability of OS was 61.5% and did not vary by form of risk communication. Personal history of cancer was positively associated with acceptability of OS. Concerns about OS risk

and planning to have future children were negatively associated with acceptability (Figure 1).

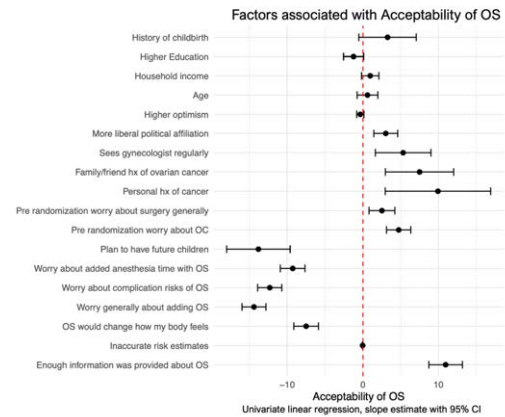


Figure 1.

**Conclusion:** Numerical descriptors improved accuracy of risk perception but did not impact acceptability of OS. Patient history and characteristics influenced acceptability of OS. Understanding these patient factors and how patients interpret risk information in the context of cancer and operation can help with designing patient centered communication strategies and decision support tools.

### Comparison of Long-Term Outcomes Between Conversion to Open and Laparoscopic Subtotal Cholecystectomy in the Difficult Gallbladder: A Single-Center Retrospective Study

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**Introduction:** Difficult laparoscopic cholecystectomy (LC) confers increased risk of bile duct injury. Traditionally, surgeons convert to open cholecystectomy (OC) for safer dissection. Laparoscopic subtotal cholecystectomy (LSC) has recently gained favor with comparable short-term complication rates, but differences in long-term outcomes are unknown. We sought to compare long-term biliary outcomes between OC and LSC.

**Methods:** We performed a single-center retrospective cohort study of adults who underwent non-elective LC converted to OC or LSC due to difficult dissection (1/1/2015-12/31/2019). The primary outcome was a composite measure of postoperative biliary events. Time-to-event analysis comparing biliary events between the 2 groups was performed. Secondary outcomes were evaluated using chi-square or independent *t*-tests as appropriate.

**Results:** Of 1,089 patients who underwent non-elective LC, 68 (6%) underwent bailout procedure (30 OC vs 38 LSC). There was no difference in demographics or comorbidity between the groups. Most patients (84%) had acute cholecystitis. Average follow-up times were  $40.1 \pm 28.9$  months in OC and  $54 \pm 20.7$  months in

LSC. Biliary events occurred in 13 patients (19%) with OC most commonly suffering bile leak (17%), and LSC most commonly having choledocholithiasis (11%). Kaplan-Meier analysis demonstrated no significant difference in biliary events between the groups ( $p = 0.71$ ). Secondary outcomes were all similar between groups except LOS, which was significantly shorter in LSC ( $2.9 \pm 2.3$  vs  $5.1 \pm 3.6$  days,  $p = 0.002$ ) (Table 1).

**Table 1.**

Outcome	Open (n=30)	LSC (n=38)	P-Value
Hospital Length of Stay (days)	5.1 ± 3.6	2.9 ± 2.3	0.002
Surgical Site Occurrence	2 (6.7)	3 (7.9)	1.000*
Respiratory Compromise	4 (13.3)	2 (5.3)	0.394*
Non-home Discharge**	3 (10.3)	4 (10.5)	1.000*
90-Day Readmission	7 (23.3)	10 (26.3)	0.778
Biliary Event	6 (20.0)	7 (18.4)	0.869
Bile leak	5 (16.7)	2 (5.3)	0.227*
Symptomatic cholecystitis	0 (0.0)	0 (0.0)	n/a
Recurrent cholecystitis	0 (0.0)	0 (0.0)	n/a
Choledocholithiasis	0 (0.0)	4 (10.5)	0.124*
Gallstone pancreatitis	0 (0.0)	0 (0.0)	n/a
ERCP	3 (10.0)	6 (15.8)	0.721*
Percutaneous Drain	1 (3.3)	1 (2.6)	1.000*
Reoperation for biliary disease	0	1 (2.6)	1.000*
Hernia/Incisional event	3 (10.0)	4 (10.5)	1.000*
Deceased	3 (10.0)	1 (2.6)	0.314
Follow Up Time (months)	40.7 ± 28.9	54.0 ± 20.7	0.038

P-Values <0.05 in bold  
 Data presented as average ± standard deviation or n (%)  
 \*Fisher's Exact test  
 \*\*67/68 (98.5%) patients initially presented from home making non-home d/c representative of d/c to a higher level of care

**Conclusion:** OC and LSC demonstrated comparable long-term biliary outcomes. In difficult LC, surgeons may perform either bail-out procedure to safely manage the gallbladder.

**Complex Ventral Hernia Repair in Contaminated Fields: A Propensity-Score Matched Analysis of Long-Term Quality-of-Life and Outcomes Between Different Prostheses**

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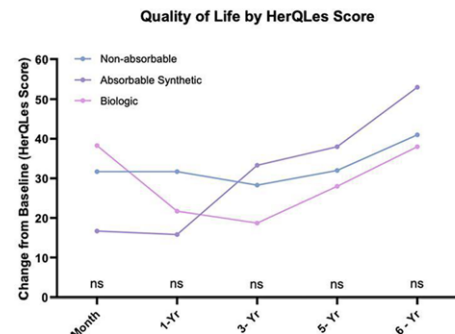
**Introduction:** Randomized studies conducted by abdominal wall specialists support the use of non-absorbable prosthetics in contaminated hernia operation. Still, whether those outcomes are broadly generalizable remains debatable. Here, we evaluated the long-term outcomes of contaminated ventral hernia operation using real-world data from a multi-centric cohort focusing on quality of life (QoL) and postoperative pain.

**Methods:** The Abdominal Core Health Quality Collaborative database was queried for patients undergoing contaminated (CDC II-IV) ventral hernia operation (2013-2023). After propensity-matching, we compared long-term differences in patient reported QoL and pain scores (by HerQLes and PROMIS questionnaires) among those who underwent repair with non-absorbable (NA), absorbable-synthetic (AS), and biologic mesh (B).

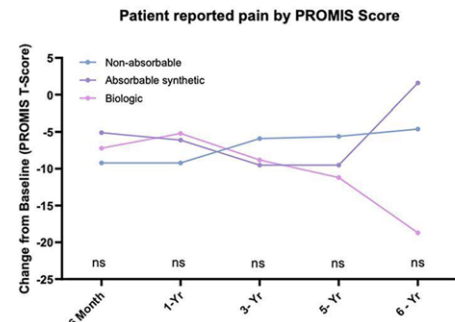
**Results:** A total of 1,073 patients were included of whom 920 (86%), 56 (5%) and 97 (9%) underwent repair with NA, AS, and

B mesh, respectively. Among them, median age was 62 years (interquartile range [IQR] 53-70) and 523 (49%) were women. The median length and width of the defect were 20 cm (IQR: 12-25) and 13 cm (IQR: 8-16). A transversus abdominis release was performed in 716 (67%) of the patients. In most cases, mesh was positioned in the retro-rectus (85%) and/or the preperitoneal space (45%). After propensity matching ( $n = 280$ ), the change from baseline in HerQLes and PROMIS scores at 6 months, 1, 3, 5 and 6 years was comparable among groups (Figure 1A). There was no difference in readmission, surgical site infection or surgical site occurrence at 30 days. Recurrence at 1 year was lower for NA mesh (Figure 1B).

**Figure 1A:** Quality of life by HerQLes score and postoperative pain by PROMIS T-score.



\*HerQLes score range 0-100 with higher scores representing higher quality of life. Statistical comparisons performed with non-parametric test at specific time-points. NS: non-significant.



\*PROMIS T-score 0-100 with higher scores representing increased pain. A change of -10 represents one standard deviation from the median (50). Statistical comparisons performed with non-parametric test at specific time-points. NS: non-significant.

**Figure 1B:** Comparison of other postoperative outcomes

	Non-absorbable (N=168)	Absorbable Synthetic* (N=56)	Biologic (N=56)	p-value
30-day readmission, N(%)	15 (9)	6 (11)	9 (16)	0.33
30-day SSI, N (%)	15 (9)	3 (5)	7 (12)	0.41
30-day SSO, N (%)	23 (14)	5 (9)	8 (14)	0.61
1-Yr Recurrence, N (%) (N=63)	13 (16)	7 (35)	13 (45)	0.006

\*Only slowly absorbable synthetic mesh was included. SSI: Surgical Site infection. SSO: Surgical site occurrence.

**Figure 1.**

**Conclusion:** In the long-term, there was no difference in QoL or pain score with the use of non-absorbable, absorbable synthetic or biologic mesh for ventral hernia repair in contaminated fields.

### Cut to the Chase: Choledocholithiasis and Gallstone Pancreatitis Should Be Admitted to a Surgical Service

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**Introduction:** Current management guidelines recommend same admission cholecystectomy for choledocholithiasis and gallstone pancreatitis due to high recurrence rate associated with increased morbidity. We hypothesized that adherence to this standard is affected by both the admitting service and social determinants of health.

**Methods:** A previously validated electronic health record (HER) linked patient capture tool was queried to identify all patients admitted with a primary diagnosis of choledocholithiasis or gallstone pancreas between 1/2019 and 9/2023. Abstracted data include demographics, comorbidity, Area Deprivation Index (ADI), admitting service, operations and gastrointestinal procedures, and imaging studies.

**Results:** There were 88 patients admitted over the study period. The cohort was 64% women, 49% Hispanic, and 39% Spanish-speaking, with median age of 51 years (interquartile range [IQR] 34-69). Of the 70% admitted to the surgical service, 74% underwent cholecystectomy before discharge vs only 23% of those admitted to a medical service. On multivariate logistic regression accounting for age, sex, race, ethnicity, language, Charlson Comorbidity Index, ADI, and insurance, admission to a medical service was associated with decreased odds of same-admission cholecystectomy (odds ratio [OR] 0.02, CI 0.003-0.31,  $p = 0.021$ ) and increased odds of CT imaging (OR 30.00, CI 1.83-2170,  $p = 0.048$ ). Time to endoscopic retrograde cholangiopancreatography (ERCP), overall hospital length of stay, and total hospital charges were not different.

**Conclusion:** Patients with choledocholithiasis and gallstone pancreatitis should be admitted to a surgical service to ensure they undergo cholecystectomy during their index admission.

### Design of Artificial Intelligence-Based Surgical Image Recognition and Navigation System

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**Introduction:** Imaging data assumes an important role in assisting doctors' diagnosis and operation in performing minimally invasive surgery, and is an important assistant in performing precise minimally invasive intervention, and surgical navigation based on imaging data is the core of realizing precise and safe minimally invasive surgery.

**Methods:** This project develops a real-time AI medical assistant system for image segmentation in minimally invasive surgery such as

hepatobiliary, pancreatic, etc, which brings together AI pre-training models of large-scale relevant clinical intraoperative image data, and transform-based AI image segmentation algorithm for image picture processing. The project was ethically approved and 432 laparoscopic cholecystectomy (LC) operations were recorded and screened. A total of 100 frames from each laparoscopic video were screened and automatically extracted from each surgical video, totaling 43,200 frames. After manual screening, 21,439 CVS images were annotated and included in the CVS dataset. The AI semantic segmentation algorithm was used to classify individual pixels in the intraoperative image pictures, so as to accomplish multiple types of clinical intraoperative data analysis and application tasks.

**Results:** After segmentation and recognition, the recognition rate of gallbladder reached  $88.5 \pm 0.9\%$ , cystic duct  $78.5 \pm 1.6\%$ , cystic artery  $83.1 \pm 6.3\%$ , cystic plate  $75.5 \pm 5.7\%$ , background  $95.7 \pm 0.4\%$ , and surgical appliances  $90.2 \pm 1.2\%$ .

**Conclusion:** The AI-based surgical image recognition and navigation system can effectively help doctors perform minimally invasive surgery with the advantages of high precision and high recognition rate, which can play a significant role in reducing patient complication and improving the cure rate.

### Determining the Efficacy of Closed Suction Drain after Hydrocelectomy: An Open-Label Randomized Control Trial (END Trial)

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**Introduction:** Scrotal hydrocele is characterized by fluid accumulation between the layers of the tunica vaginalis. Surgical treatment options include hydrocelectomy, Jaboulay's eversion of the sac, and Lord's plication. However, the role of closed suction drain (CSD) placement after hydrocelectomy in reducing postoperative complication remains unclear and is used selectively by surgeons. This randomized study [clinicaltrials.gov ID: NCT04653402] evaluated the necessity of CSD placement after hydrocelectomy.

**Methods:** An open-label study enrolled 100 patients with idiopathic hydroceles scheduled for elective operation in a tertiary teaching hospital under one expert consultant. Patients were randomly assigned to the experimental (CSD placement) or the control arm (no drain placement). The primary outcomes included the incidence of scrotal wall edema, hematoma, and surgical site infection (SSI) within 1 month postoperatively. Secondary outcomes focused on the rate of testalgia assessed using a visual analogue scale (VAS).

**Results:** Ninety-five patients completed the study. The experimental arm showed a significant reduction in skin edema (12% vs 34%,  $p = 0.04$ ), hematoma (4% vs 20%,  $p = 0.03$ ), and hematoma requiring drainage (0% vs 6%,  $p = 0.00$ ) compared with the control arm especially in moderate and large size hydroceles. Scrotal pain

assessed by the VAS at 1 month was significantly lower in the experimental arm (0.60 vs 1.36,  $p = 0.01$ ) (Figure 1).

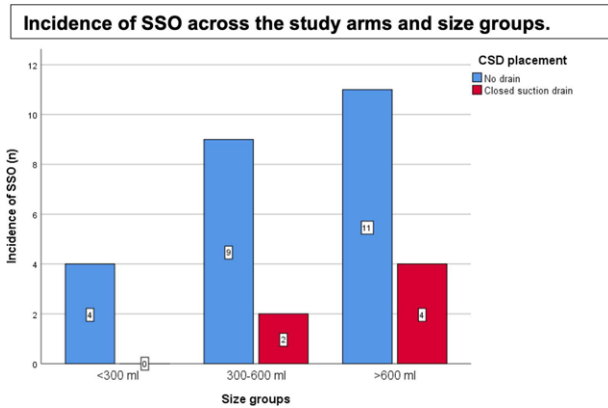


Figure 1.

**Conclusion:** The placement of a closed suction drain after hydrocelectomy significantly reduced postoperative complication, including scrotal edema, hematoma, and testalgia, especially in moderate and large hydroceles. Further randomized controlled trials with large sample sizes are warranted to validate these findings and determine the optimal indications for drain placement in hydrocelectomy.

**Development of a Clinically Generalizable Predictive Model to Communicate Risk for Complication of Abdominal Wall Hernia Repair**

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**Introduction:** Predictive models can guide surgeons in identifying higher-risk patients and communicate risk to patients. Current models are built on small patient panels ( $n < 150$ ) or single-site cohorts, lack nuanced operative and hernia specific data, and are not designed for integration into patient-facing shared decision-making tools.

**Methods:** Using the Michigan Surgical Quality Collaborative-Core Optimization Hernia Registry (MSQC-COHR), a representative, random sample of patients from 70 hospitals across the State of Michigan, we identified 11,011 adults (18+ years of age) undergoing elective abdominal wall hernia repair (2021-2023). To ensure construct validity, we created 3 predictive models for risk of 30-day postoperative complication using explainable boosting machine (EBM), random forest (RF), and logistic generalized additive model (GAM) incorporating patient demographics, comorbidity, hernia characteristics, and modifiable risk factors (smoking status and BMI). Area under the receiver operating characteristic curve (AUC-ROC) score, k- and concavity check (GAM), and visual diagnostics plots were generated to assess model quality. Models were also evaluated for clinical generalizability.

**Results:** A total of 2.3% of patients experienced 30-day complication. Similar AUC-ROC scores (~76%) confirmed construct validity. We determined that EBM and RF models were unsuitably sensitive in capturing non-linear relationships between the outcome and predictors, yielding non-generalizable clinically non-verifiable results. Predicted risk of 30-day complication from GAM ranged from 0.3%-6.6% (95<sup>th</sup> percentile) (Figure 1).

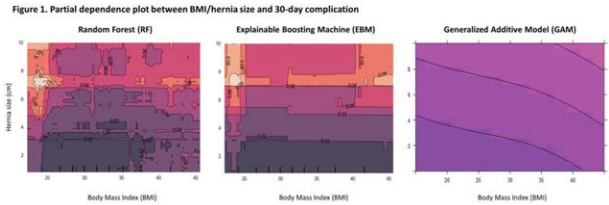


Figure 1. Partial dependence plots between BMI/hernia size and 30-day complication

Figure 1.

**Conclusion:** GAM provides a robust predictive and clinically generalizable model for 30-day complication. Built on a state-wide registry of over 10,000 patients, it can be incorporated into shared-decision making tools to counsel patients about their risk before elective operation and expanded to predict patient-reported and long-term outcomes.

**Dissecting Disparity: The Impact of Race and Ethnicity on Robotic Surgery Outcomes for General Surgery Procedures**

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**Introduction:** With robotic surgery gaining widespread adoption for common general surgery procedures, questions regarding equitable outcomes between historically marginalized groups have emerged.

**Methods:** Using American College of Surgeons NSQIP data, we analyzed the outcomes of the 15 most common elective robotic operations performed by general surgeons. We stratified the data by patient reported race and ethnicity, adjusting for preoperative confounders. Hispanic, Black, and Asian patients were matched with White controls in a 3:1 ratio using propensity score matching, ensuring balance in demographics and comorbidity including age, BMI, diabetes, hypertension, American Society of Anesthesiologists class and smoking status. Post-matching, covariate differences were minimal. We then compared 30-day operative outcomes.

**Results:** A total of 38,221 patients were evaluated. 4,497 Hispanic patients were matched with 13,115 White patients, 4,103 Black patients with 12,185 White patients, and 1,081 Asian patients with 3,240 White patients. Hispanic patients had longer hospital stay (1.5 vs 1.3 days,  $p = 0.03$ ) and fewer surgical site infections (0.7% vs 1%,  $p = 0.01$ ). Black patients experienced longer operative time (149 vs 143 min,  $p = 0.001$ ), more unplanned conversion to open operation (0.8% vs 0.5%,  $p = 0.03$ ), and higher rate of compli-

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cation, particularly cardiocirculatory and infectious. Asian patients also had longer operative time ( $p < 0.01$ ) and hospital stay ( $p <$

0.01), along with increased rate of complication, including surgical site infection and wound complication ( $p < 0.01$ ) (Table 1).

**Table 1.** Surgical Outcomes by Race/Ethnicity

Variable	Hispanic vs Control (4497 vs 13115)	Black vs Control (4103 vs 12185)	Asian vs Control (1081 vs 3240)	Difference with control
Age (median, years)	51 vs 52, $p = .004$	55 vs 55, $p = .3$	60 vs 60, $p = .3$	-
Female	49% vs 43%, $p < .05$	54% vs 42%, $p < .05$	40% vs 39%, $p = .5$	-
Length of hospital stay (median, days)	1.5 vs 1.3, $p = .03$	1.5 vs 1.4, $p = .44$	2.3 vs 1.3, $p < .01$	Hispanic and Asian groups worse
Operative time (min)	140 vs 139, $p = .4$	149 vs 143, $p = .01$	174 vs 140, $p < .01$	Black and Asian groups worse
Conversion to open	0.58% vs 0.54% $p = .864$	0.88% vs 0.56%, $p = .03$	0.28% vs 0.49%, $p = .4$	Black group worse
Wound complications	2.5% vs 2.7%, $p = .4$	2.4% vs 3.1%, $p = .06$	5% vs 2.4%, $p < .01$	Black and Asian groups worse
Cardiocirculatory Complications	2.5% vs 2.6%, $p = .66$	4% vs 3%, $p < .01$	4% vs 2.5%, $p < .01$	Black and Asian groups worse
Major complications	4.7% vs 4.3%, $p = .34$	6.2% vs 5.3%, $p = .02$	7% vs 4.3%, $p < .01$	Black and Asian groups worse
Death	0.04% vs 0.13%, $p = .18$	0.2% vs 0.1%, $p = .2$	0.19% vs 0.09%, $p = .6$	No difference

**Conclusion:** Despite adjusting for preoperative factors, significant difference in outcomes persists among patients undergoing elective robotic surgery, with outcomes varying by race and ethnicity. Further research is essential to understand and address this disparity, ensuring equitable care for all patients.

### Do Not Judge a Patient by Their Preoperative Model for End-Stage Liver Disease Score: Identifying Predictors of In-Hospital Mortality after Emergency Abdominal Surgery in Patients with Cirrhosis

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**Introduction:** As surgical outcomes in cirrhotic patients improve, evaluating candidacy for emergency general surgery (EGS) intervention becomes more complex.

**Methods:** This was a retrospective review of cirrhotic patients who underwent EGS at a single tertiary care center between 2016

and 2023. Data regarding baseline demographics, cirrhosis-specific characteristics, operative management, and hospital course were collected. A multivariable logistic regression model was performed to identify independent predictors of in-hospital mortality.

**Results:** Of the 94 patients included, 79.8% were men, average age was  $57 \pm 11$  years, and average admission Model for End-Stage Liver Disease (MELD) score was  $18.4 \pm 8.5$ . The most common operative indication was incarcerated hernia (18.1%), and the most common procedure was exploratory laparotomy (74.5%). Average MELD on discharge/death was  $17.9 \pm 10.9$ . Overall in-hospital mortality was 30.9%. Of the 65 patients who survived, 48 had no change or a decrease in MELD by discharge. Of the 29 patients who died, 21 had an increase in MELD (Table 1). After adjusting for confounders, preoperative vasopressor requirement (odds ratio [OR] 19.1,  $p = 0.009$ ), total intraoperative red blood cell transfusion (OR 1.48,  $p = 0.012$ ), and MELD on discharge/death (OR 1.41,  $p = 0.002$ ) were associated with increased risk of mortality.

**Table 1.** Changes in Model for End-Stage Liver Disease Score Between Admission and Discharge/Death

Variable	Overall	Survived	Died	p Value
Total, n	94	65	29	
MELD Score on Admission, mean (SD)	18.4 (8.5)	15.5 (7.3)	24.7 (8.9)	<0.001
MELD Score on Discharge/Death, mean (SD)	17.9 (10.9)	12.6 (5.6)	29.6 (10.8)	<0.001
Patients with same or decreased MELD between admission and discharge/death, n (%)	56 (59.6%)	48 (73.8%)	8 (27.6%)	<0.001
Patients with increased MELD between admission and discharge/death, n (%)	38 (40.4%)	17 (26.2%)	21 (72.4%)	

**Conclusion:** Admission MELD alone is not a reliable predictor of mortality, as it is confounded by overall severity of illness and may improve after indicated EGS intervention. Progressive hepatic dys-

function better predicts mortality risk. When assessing candidacy for EGS, there should be less emphasis on initial cirrhosis severity scores and more on medical optimization in the perioperative period.

**Do Treatment Approach and Outcomes of Older Adults with Acute Cholecystitis Differ Based on the Availability of Percutaneous Cholecystostomy? A Nationwide Cohort Study**

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**Introduction:** Medically complex patients with acute cholecystitis can be treated with cholecystectomy or percutaneous cholecystostomy (PC). Optimal management is not always clear. As such, we sought to examine the association between treatment approach and outcomes for patients based on PC tube placement availability.

**Methods:** Using logistic regression modeling at the hospital level to adjust for potential confounding and permit honest estimates of standard error, this national, retrospective observational cohort study of multimorbidity Medicare beneficiaries emergently hospitalized for acute cholecystitis (2016-2018) examines the association between access to PC services and treatment approach and outcomes. Multimorbidity is defined using qualifying comorbidity sets.

**Results:** Of 3041 hospitals, 1419 (46%) had access to PC. PC hospitals were more frequently affiliated with a medical school (44% vs 19%,  $p < 0.001$ ) and designated trauma hospitals (42% vs 25%,  $p < 0.001$ ). Patient characteristics and imaging approach differed by hospital type (Table 1). A smaller proportion of patients at PC hospitals underwent cholecystectomy than non-PC hospitals (60 vs 67%,  $p < 0.001$ ) with a lower likelihood of cholecystectomy at PC hospitals ( $B = -0.08$  95% CI (-0.11- -0.06)). Thirty-day mortality was similar between PC and non-PC hospitals. A smaller proportion of PC hospital patients were readmitted within 30 days than non-PC hospitals (23 vs 29%,  $p < 0.001$ ), with a lower likelihood of adjusted 30-day readmission at PC hospitals ( $B = -0.03$  95% CI (-0.05- -0.01)).

**Conclusion:** PC hospitals treat sicker patients and use operative approaches less frequently than non-PC hospitals. Despite this, adjusted 30-day mortality is similar between hospital types and PC hospitals have a lower 30-day readmission rate.

**Does Surgical Performance Decline with Increasing Age?**

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**Introduction:** With increasing life expectancy and the growing shortage of surgeons, there is an observed significant increase in older surgeons still practicing. Concerns about cognitive and physical decline might be compensated for by the benefits of experience. A standardized assessment could help to assess the maintained surgical performance.

**Methods:** The Swiss Surgical Society has developed a voluntary assessment tool for surgeons aged 55 years and over. The assessment consists of 3 parts: Interview: State of health, current surgical activity and future career plans are discussed with the expert. Surgery: A surgical procedure in the presence of the expert and interviews with the surgical staff are performed. Feedback & recommendation: A final expert’s discussion regarding the continuation of the surgical activity, giving clear recommendations for further professional life. The assessment is recommended to be repeated starting at the age of 55 years.

**Results:** Six surgeons aged between 56 and 70 years were assessed in a pilot project. The specialties were visceral, trauma, vascular, and thoracic. The expert team consisted of 5 surgeons aged between 40 and 54 years. The 6 candidates were all assessed suitable (“unconditional”) to continue their surgical practice. The tool was judged by the experts as adequate and well usable.

**Conclusion:** Given the increase of the number of older surgeons worldwide together with the potential of different age-related changes, it seems appropriate to assess the performance of aging surgeons. The assessment tool developed by the Swiss Surgical Society had a successful proof of concept in a pilot study.

**Dynamic Frailty: Trajectory to Postoperative Mortality**

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**Introduction:** Frailty is a heightened vulnerability to stress due to decreased physical and mental abilities. Preoperative frailty is associated with poorer outcomes. However, in-patient frailty changes have

**Table 1.** Hospital-Level Patient Demographics and Imaging Use by Hospital Type

Demographic	All Hospitals	Hospitals with PC	Hospitals without PC	p Value
Mean patient age, y (SD)	79.2 (4.30)	79.2 (2.70)	79.2 (5.40)	0.06
Mean physical frailty index (SD)	0.18 (0.03)	0.19 (0.02)	0.18 (0.04)	<0.001
Mean angus sepsis score (SD)	0.13 (0.17)	0.14 (0.11)	0.13 (0.21)	<0.001
Mean acute cholecystitis rate with CBD stone (SD)	0.16 (0.25)	0.19 (0.19)	0.14 (0.30)	<0.001
Mean CT utilization rate (SD)	0.64 (0.27)	0.65 (0.17)	0.62 (0.33)	0.25
Mean ultrasound use rate (SD)	0.69 (0.27)	0.72 (0.18)	0.66 (0.33)	0.52
Mean MRI use rate (SD)	0.13 (0.16)	0.16 (0.13)	0.10 (0.18)	<0.001

CBD= common bile duct.

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**Table 1.** Comparison of Pre- and Postoperative Modified Frailty Index, and Modified Frailty Index Difference of Patients Surviving and Dying

	Preoperative mFI	Postoperative mFI	Pre-Post mFI Difference
Alive	0.115 (0.083 - 0.177)	0.143 (0.089 - 0.185)	-0.01 (-0.061 - +0.013)
Dead	0.178 (0.121 - 0.221)	0.240 (0.195 - 0.302)	-0.06 (-0.098 - -0.024)
p-value	0.00009	<0.00001	0.00019

yet to be investigated. Our hypothesis is in-patient, postoperative changes in frailty after major operation, as measured by the modified frailty index (mFI), predict the trajectory postoperative discharge alive or in-hospital mortality.

**Methods:** The accumulating deficit model of frailty was used. Data from the medical records of patients who have undergone major operation from 2013 to 2022 were used to determine preoperative mFI and postoperative day 1 mFI. Of the 1063 patients who met inclusion criteria, 50 patients in the in-hospital mortality group and 50 patients who were discharged alive were randomly selected. Statistical analysis was done using the Mann-Whitney U test.

**Results:** Patients in the in-hospital mortality group had significantly greater median preoperative mFI scores than those in the discharged alive group (0.178 vs 0.115  $p = 0.00009$ ). This significant difference was present on postoperative day 1, while also increasing in margin (0.240 vs 0.143,  $p < 0.00001$ ). Median pre-post-mFI differences were also significant between the 2 groups, with operation leading to in-hospital mortality experiencing a greater increase in mFI (-0.06 vs -0.01  $p = 0.00019$ ) (Table 1).

**Conclusion:** Our data supports previous literature proposing that higher preoperative mFI is a useful predictor of postoperative mortality. Moreover, these data show that significant worsening mFI score as early as day 1 is associated with a postoperative trajectory toward mortality and is associated with the magnitude of the worsening frailty.

### Effect of Transfer Status on Emergency General Surgery Patients Using the NSQIP Database

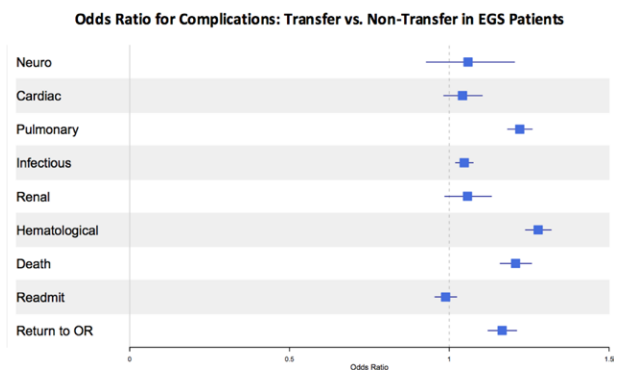
Sourav Podder, MD, Tina Bharani, MD, Scott H Koeneman, PhD, Christine Schleider, BS, Kathleen Shindle, BS, George J Koenig Jr, DO, FACS, Joshua A Marks, MD, FACS, Scott W Cowan, MD, FACS  
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**Introduction:** Inter-hospital transfer for emergency general surgery (EGS) is often necessary to access a higher level of care. Compared with EGS patients admitted at the operating institution (non-transfer patients), EGS transfer patients represent a higher-risk population. This study sought to evaluate the impact of transfer status on postoperative complication.

**Methods:** Using the 2010-2022 American College of Surgeons NSQIP database, we identified patients aged  $\geq 18$  years who

underwent an EGS operation. Logistic regression models were used to analyze the impact of transfer status on postoperative outcomes while accounting for preoperative risk factors.

**Results:** We identified 78,513 transferred EGS patients and 560,273 non-transferred EGS patients over 13 years. The median duration of hospital length of stay was twice as long for transfer patients compared with non-transfer patients (4 days vs 2 days). Transfer patients also had higher odds of pulmonary complication (odds ratio [OR] 1.22, 95% CI [1.18, 1.26]), infectious complication (1.05 [1.02, 1.07]), and hematological complication (1.28 [1.24, 1.31]) compared with non-transfer patients. Furthermore, transfer patients had higher odds of unplanned return to the operating room (1.17 [1.12, 1.21]) and mortality within 30 days (1.21 [1.15, 1.26]) (Figure 1).

**Figure 1.**

**Conclusion:** Transferred EGS patients are at higher risk of postoperative complication and mortality. Understanding the heightened risk among this patient cohort should encourage development of transfer and treatment algorithms aimed at anticipating and managing known complication within this high-risk population.

### Effects of Postoperative Music Therapy on Patient Outcomes: A Systematic Review and Meta-Analysis

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**Introduction:** This review endeavors to systematically review the effect of postoperative music therapy on patient outcomes after different types of operation.

**Methods:** We conducted a systematic review of 3 databases according to guidelines established by PRISMA using the terms “music,” “noise,” “postoperative,” “surgery,” “outcome,” and “recovery.” Collected data included study characteristics, patient outcomes (pain, anxiety, physiologic markers, etc), measurement methods, type of operation, and statistical data.

**Results:** Our search yielded 3736 studies, of which 35 met the inclusion criteria for data analysis. The included studies largely consisted of therapeutic evidence levels I. A total of 19 of 27 studies reporting pain showed a significant reduction, 4 of 7 showed a reduction in anxiety scores, 6 of 10 showed a reduction in heart rate, and 2 of 5 showed a reduction in opioid use. An exploratory software for confidence intervals (ESCI) random effects model analysis showed a mean reduction of 0.775 ( $p < 0.0001$ ) for Visual Analogue Scale pain scores, 1.896 ( $p < 0.0001$ ) for Numerical Rating Scale pain scores, 2.508 ( $p = 0.0436$ ) for State-Trait Anxiety Inventory scores, 4.565 ( $p < 0.0001$ ) for heart rate, and 0.961 ( $p = 0.0409$ ) for opioid use. For this analysis, operation types (orthopaedic, cardiac, ENT, etc) were grouped and reported values were standardized to the first day postoperation whenever applicable.

**Conclusion:** Postoperative music therapy appears to significantly improve postoperative patient outcomes, including subjective markers (pain and anxiety) and physiologic markers (heart rate and opioid consumption), after a variety of operation types.

**Epidemiology and Outcomes Associated with New Persistent Opioid Use after Transabdominal Operation**

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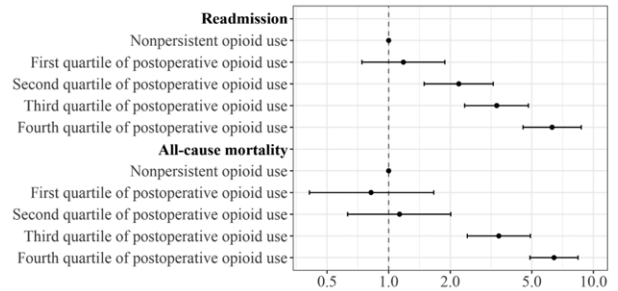
**Introduction:** Overall, 3-10% of opioid-naïve patients develop persistent opioid use after operation, but it is unclear whether persistent opioid use after operation is associated with adverse operative outcomes. We tested if new persistent opioid use after transabdominal operation is associated with increased long-term mortality and readmission rates.

**Methods:** Opioid-naïve patients >18 years of age undergoing transabdominal operation at our tertiary center from 2008-2018 were included. Persistent opioid use was defined as opioid use for >3 months postoperatively. Inverse probability weighting (IPW) was used to yield balanced study groups accounting for baseline characteristics. Long-term mortality (during median follow-up of 5.2 years) was compared using propensity-weighted Cox regression and 180-day readmission rate using propensity-weighted logistic regression.

**Results:** Overall, 3923 patients were included (laparoscopy-2680, laparotomy-1243). The rate of new persistent opioid use was 13.0%. Rate was higher after laparotomy than laparoscopy in the crude analysis (16.2% vs 11.6%, odds ratio [OR] 1.47,

95% CI 1.22-1.79) but not after using IPW (adjusted OR 1.06, 95% CI 0.96-1.17). New persistent opioid use was associated with higher long-term mortality (adjusted hazard ratio [HR] 1.90, 95% CI 1.45-2.48) and 180-day readmission rate (adjusted OR 2.73, 95% CI 2.42-3.07). This was consistent for both patients undergoing laparoscopy and laparotomy. Moreover, there were signs of dose-response relationship, with patients in higher quartiles of postoperative opioid consumption having higher mortality and readmission rate (Figure 1).

**Outcomes Stratified by Quartiles of Postoperative Opioid Use**



**Figure 1.**

**Conclusion:** New persistent opioid use after transabdominal operation was associated with higher rate of mortality and readmission. This calls for increased postoperative support for patients at risk and increased support during transitions of care of these patients.

**Failure to Rescue or Failure to Measure? Analyzing the Relevance of Failure to Rescue in Emergency General Surgery**

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**Introduction:** Failure to Rescue (FTR), the risk of death after a postoperative complication, has been increasingly adopted for institutional quality measurement in surgery. However, its application in emergency general surgery (EGS) has been minimal compared with elective practices. We evaluated FTR cases in EGS to determine whether its current use captures actual failure in timely management of complication.

**Methods:** Patients who underwent EGS over a 45-month period were included. The overall proportion of patients with a 30-day mortality after a complication (FTR group) to all patients with complication was calculated. Procedure type and incidence of complication were compared between the FTR and non-FTR groups (patients who survived after a complication). Sub-group analysis of FTR patients was performed to evaluate indication for operation, disposition before and after operation, and cause of mortality.



**Results:** Of 205 patients with postoperative complication, 40 had died (19.5%). Procedures and complications were compared (Table 1). The most frequent indications for operation in FTR patients were perforated viscus (27.5%) and bowel ischemia (25.0%). Patients were most often in the critical care unit before (32.5%) and after (72.5%) operation. Primary causes of mortality included mixed shock (47.5%) and respiratory failure (20.0%). Most patients transitioned to end-of-life care before death (77.5%).

**Table 1.** Comparison of Common Procedure Type and Complication between FTR and Non-FTR Patients

Variable	FTR (n = 40)	Non-FTR (n = 165)	p Value
<b>Procedure type</b>			
Colon/Rectum Resection	40.0%	34.5%	0.52
Small Bowel Resection	30.0%	29.7%	0.97
Laparotomy	25.0%	10.9%	0.02
<b>Complication</b>			
Respiratory Failure	62.5%	18.4%	<0.01
Pneumonia	75.0%	34.5%	<0.01
Renal Failure	31.3%	6.1%	<0.01
Septic Shock	67.5%	26.1%	<0.01
Organ Space Infection	22.5%	27.3%	0.54

**Conclusion:** EGS patients are often critically ill before and after operation. Emergency surgery in FTR cases likely reflect heroic measures for otherwise life-threatening diagnoses. More nuanced definitions of FTR, such as one that includes adverse events (eg unplanned reoperation), may be better suited to capture true failure.

### Feasibility Experiment of a Novel Deformable Self-Assembled Magnetic Anastomosis Ring for Gastrointestinal Anastomosis Through Natural Orifice

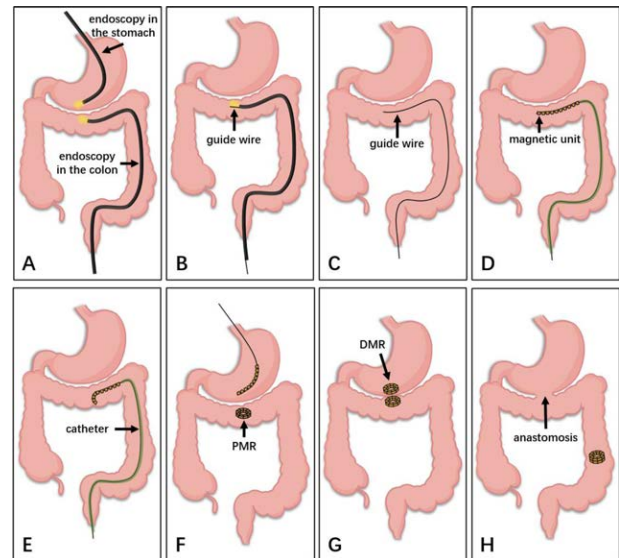
Miaomiao Zhang, PhD, Shuqin Xu, PhD, Lei Wang, PhD, Jianqi Mao, MD, Yi Lyu, MD, PhD, Xiaopeng Yan, MD, PhD  
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**Introduction:** Although the application of magnetic compression anastomosis is becoming increasingly widespread, the magnets used in previous studies were mostly in the shape of a whole ring. Hence, a deformable self-assembled magnetic anastomosis ring (DSAMAR) was designed in this study for gastrointestinal anastomosis. Furthermore, its feasibility was examined using a beagle model.

**Methods:** The designed DSAMAR comprised 10 trapezoidal magnetic units. Twelve beagles were used as animal models, and DSAMARs were inserted into the stomach and colon through the mouth and anus, respectively, via endoscopy to achieve gastrocolic magna-

stomosis. One month later, specimens of the anastomosis were obtained and observed with the naked eye as well as microscopically.

**Results:** In gastrocolic anastomosis in 12 beagles, the procedure took 65–120 minutes. Although a deformation failure occurred during the operation in 1 of the beagles, it was successful after repositioning. The anastomosis was formed after the magnet fell off 12–18 days after the operation. Naked eye and microscopic observations revealed that the anastomotic specimens obtained 1 month later were well formed, smooth, and flat (Figure 1).



**Figure 1.**

**Conclusion:** DSAMAR is feasible for gastrointestinal anastomosis under full endoscopy via the natural orifice.

### Gender Differences in Electronic Health Record Burden for Attending Surgeons

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**Introduction:** The electronic health record (EHR) has been integral to modern patient care. However, existing literature links EHR usage to physician burnout. Previous research shows female surgeons experience a higher rate of burnout. Increased EHR burden among female physicians has been documented in multiple nonsurgical studies. This study assessed differences in EHR use between male and female attending surgeons at a large academic institution.

**Methods:** EHR activity log data was analyzed for 593 attending surgeons from May 2022 to May 2023. Demographic information was collected, including sex, practice years, clinical workload (FTE), and specialty. Outcomes included time spent in notes, orders, clinical review, and inbasket, time spent outside of scheduled clinical

responsibilities, and volume of inbasket messages. Multivariable linear regression assessed the association between each outcome and gender.

**Results:** After controlling for physician characteristics, clinic workload, and volume of practice, women spent 35% longer in the EHR daily than men ( $p < 0.001$ ), including in notes, clinical review, and inbasket ( $p < 0.001$ ,  $p = 0.04$ , and  $p < 0.001$ , respectively). Women received more patient and staff messages ( $p = 0.002$ ). Women spent 51% longer in the EHR outside scheduled hours and 44% longer on unscheduled days (both  $p < 0.001$ ) (Figure 1).

Figure 1: Regression-Adjusted Outcomes by Gender

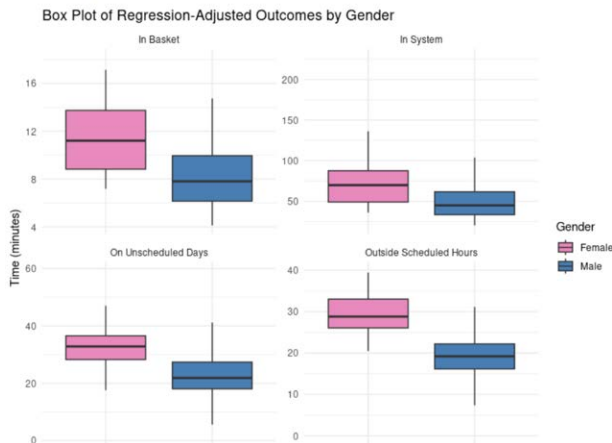


Figure 1.

**Conclusion:** This study identified significant differences in EHR workload and time expenditure between male and female surgeons. These findings contribute to the growing body of research on the disparity in EHR use between male and female providers. Continued investigation into the potential role of the EHR in increased female surgeon burnout is warranted.

**Hospital Variation in Opioid Prescribing for Emergency General Surgery Patients**

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**Introduction:** Guidelines have been established for postoperative opioid prescribing for many elective surgical procedures. However,

Table 1. Opioid Prescribing by Procedure Type

Operation	Received Discharge Opioid Prescription	MME Total (mean ± SD)	Rate of Opioid Prescriptions Meeting Guidelines	Interfacility Variation (p value)
All Patients (N = 8,976)	71.2%	60.9 ± 126.7	87.0%	0.004
Appendectomy (N = 3,015)	73.1%	47.9 ± 34	94.3%	0.2
Cholecystectomy (N = 5,051)	74.2%	61.7 ± 109	85.8%	0.2
Hernia Repair (N = 324)	54.6%	69.4 ± 60.2	76.8%	0.2
Colectomy (N = 586)	44.7%	152.5 ± 447	50.4%	0.2

there is limited data regarding opioid prescribing among individuals undergoing these procedures in the emergency general surgery (EGS) setting. Calibrating opioid prescribing to potentially different pain requirements and risk factors specific to EGS is critical to optimize postoperative pain management and identify opportunities for improved opioid stewardship.

**Methods:** Using an EGS collaborative database, we selected patients undergoing EGS procedures across 10 hospitals from 1/2022 to 12/2023. Operations included cholecystectomy, appendectomy, hernia repair, and colectomy. We performed descriptive and risk-adjusted analyses of postoperative discharge opioid prescriptions benchmarked against published guidelines for elective procedures. The primary outcome was hospital variation in opioid prescription exceeding maximum recommend total morphine mg equivalents (MME). Multivariable regression was used to evaluate for patient-specific factors associated with non-adherent prescriptions.

**Results:** We identified 8,976 EGS patients undergoing these operations. Mean age was 59 years, 59.7% were women, 18.6% were non-White, and 93% were opioid-naïve. Among opioid-naïve patients, 13.0% of patients received prescriptions non-adherent to guidelines, and there was significant variation by procedure type ( $p < 0.001$ ) and treatment hospital ( $p = 0.004$ ). Insurance status ( $p = 0.01$ ), tobacco use ( $p < 0.001$ ), and comorbidity burden ( $p = 0.001$ ) were also associated with non-adherent opioid discharge prescription (Table 1).

**Conclusion:** There is wide variation in postoperative opioid prescribing practice in EGS between hospitals and by procedure type. Patients with more complex medical comorbidities and non-commercial insurance are less likely to receive guideline-appropriate prescription.

**Identifying a Futility Threshold for Emergency General Surgery in Post-Cardiac Surgery Cardiovascular ICU Patients**

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**Introduction:** Emergency general surgery (EGS) in post-cardiac surgery ICU (CVICU) patients presents unique challenges due to complex concomitant conditions and compromised physiology.

Determining futility thresholds for EGS procedures in this population is important to optimize patient care and resource allocation. Our aim was to identify predictors of futile care for post-cardiac surgery CVICU patients undergoing EGS operation.

**Methods:** We conducted a retrospective, 10-year assessment of patients aged 18-90 years who underwent cardiac surgery, initiation of extra-corporeal membrane oxygenation (ECMO), or thoracic transplantation, and subsequently required EGS while in the CVICU. Demographic data, surgical indications, intraoperative and postoperative outcomes, and survival rate were analyzed to identify factors associated with interventions and outcomes. Critical illness severity was assessed using Sequential Organ Failure Assessment (SOFA) and Acute Physiology and Chronic Health Evaluation (APACHE) scores. The primary outcome was in-hospital mortality to help establish futility thresholds.

**Results:** Eighty-three patients underwent an EGS procedure while in the CVICU after their cardiac procedure. Median patient age was 61 (interquartile range: 50-69) years and 53 (64%) were men. Fifty-two (62.6%) patients died while hospitalized with a median time to death of 6 days (range: 0-211 days). No significant association was found with index cardiac procedure performed. BMI  $>30 \text{ kg/m}^2$  (adjusted odds ratio [aOR]: 6.5;  $p = 0.048$ ) and SOFA score (aOR = 1.46;  $p = 0.001$ ) were independent risk factors for in-hospital mortality. With a SOFA score threshold of 11.5, 90% of patients died ( $p = 0.000003$ , area under the curve 0.81) (Figure 1).

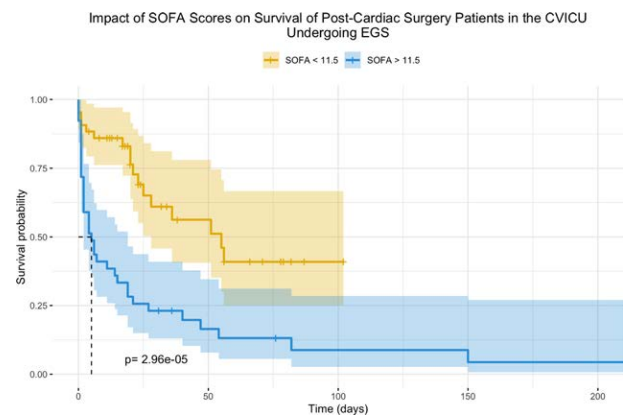


Figure 1.

**Conclusion:** Among post-cardiac surgery patients in the CVICU requiring EGS procedures, SOFA score  $>11.5$  indicated a mortality rate of nearly 90%, suggesting a futility threshold.

### Impact of Frailty on Decision Regret after Ventral Hernia Repair

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**Introduction:** Decision regret after elective ventral hernia repair (VHR) is common, particularly for patients who experience complication. Prior work has demonstrated frailty as a risk factor for complication, but whether frailty is independently associated with decision regret is unknown.

**Methods:** We retrospectively reviewed the Michigan Surgical Quality Collaborative Core Optimization Hernia Registry, a representative sample of adult patients from over 70 hospitals. We included patients who underwent elective VHR from 2020 to 2021 and completed a validated survey measuring decision regret. Frailty was quantified using the validated 5-factor modified frailty index (mFI5): no (mFI5 = 0), moderate (mFI5 = 1), and severe frailty (mFI5  $\geq 2$ ). The primary outcome was decision regret at 90 days. A multivariable regression model evaluated the association of frailty with decision regret.

**Results:** Among 795 patients, 294 (37.0%) were moderately frail, and 127 (16.0%) were severely frail. Severely frail patients were older, more often men, more comorbid, had higher BMI, and had larger hernia defect (all  $p < 0.05$ ). Decision regret was demonstrated in 88 patients (11.1%): 13.9% without frailty, 8.2% with moderate frailty, and 9.4% with severe frailty ( $p = 0.053$ ). Neither moderate nor severe frailty was associated with decision regret ( $p > 0.05$ ). Female sex was the only factor associated with decision regret (odds ratio [OR] = 2.11, CI 1.29-3.43,  $p = 0.003$ ).

**Conclusion:** Despite their overall higher risk, persons with frailty are not more likely to express decision regret after elective VHR. Decision regret is an important metric for evaluating quality-of-life operations and should be incorporated into shared decision-making conversations, but it should not be used alone to predict risk of decision regret.

### Impact of Routine Preoperative Risk Assessment on Patients Undergoing Emergency Major Abdominal Surgery in a Regional Australian Hospital

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**Introduction:** Routine preoperative risk assessment (RPRA) using objective risk prediction tools may improve outcomes after emergency major abdominal surgery (EMAS). This project aims to identify whether the introduction of RPRA with the National Emergency Laparotomy Audit (NELA) Calculator as standard of care for EMAS at a regional hospital in Victoria, Australia has improved postoperative outcomes, improved postoperative critical care unit (CCU) use, and impacted preoperative palliative decision making.

**Methods:** A retrospective audit was performed of all adult general surgery patients who required EMAS at a regional hospital in Victoria, Australia between September 2017 and August 2022, including patients planned for surgery who were palliated up-front due to high perioperative risk. Patients requiring operation for appendici-

tis, cholecystitis, trauma, and diagnostic laparoscopy were excluded. Outcomes were compared between patients undergoing operation before and after the introduction of RPRA.

**Results:** A total of 691 patients were included in the analysis. The median NELA score was 5. 2.6% of patients were palliated up-front and did not proceed to operation. Among the 673 operative patients, 30-day mortality was 5.2%. After introduction of RPRA, the operative subgroup saw a significant reduction in unplanned CCU admission, from 9.14% to 3.48% ( $p = 0.044$ ). There was no significant change in rate of postoperative mortality, severe complication, or planned CCU admission.

**Conclusion:** Mortality and complication rate was not significantly reduced after introduction of RPRA. RPRA reduced rate of unplanned CCU admission. RPRA appears useful in guidance of preoperative palliative decision-making, however larger, prospective auditing is required to fully assess its utility in this context.

**Improved Ergonomics in Laparoscopic Surgery by Using Monitor-Less Augmented Reality with 360° Visualization: A Single-Center Study in a Tertiary Hospital**

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**Introduction:** Laparoscopic surgery remains challenging for surgeons and contributes to musculoskeletal problems. Placement of monitor during laparoscopy is one of the most important ergonomic factors in the operating room (OR). Neck, back, and shoulder discomfort were the most prominent problems among surgeons, presumably due to extended duration of posture during laparoscopic surgery that includes bending their necks forward. The “Endo-Lap AR Sight 360°” concept simulated in this study is an innovative visualization concept using augmented reality. The aim of this study is to develop a visualization system for laparoscopic surgery, make it more ergonomic for surgeons, and make it more accessible and compact.

**Methods:** This study was conducted within St Luke’s Medical Center - Quezon City, in which 28 participants used the simulation then answered questionnaires to evaluate the simulation in comparison with the traditional laparoscopic visualization.

**Results:** The overall resulting median of the participating surgeons was 5.00. All resulting means for each attribute and overall mean were significantly higher than the rating of 3.0, implying that the participant rating is significantly higher than a rating of “Fair”. The Endo-Lap AR Sight 360° was preferred significantly higher than the traditional laparoscopy in terms of attributes 1, 2, 4 and 5. On the other hand, attribute 3 has a  $p$  value of 0.1072, implying that the difference in 53.6% and 32.1% is not significant.

**Conclusion:** In conclusion, this landmark study revealed that monitor-less laparoscopy using augmented reality can provide less musculoskeletal strain, less fatigue, and improved ergonomics compared with traditional laparoscopy.

**Improving Surgical Outcomes Through Surgeon-Specific Reporting: A Quality Improvement Initiative**

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**Introduction:** The aim of this study was to determine whether a quality improvement program using surgeon-specific reporting will improve key performance indicators consisting of the readmission rate, mortality, and length of stay index.

**Methods:** Using an administrative database, individual reports were generated and provided to surgeons on a quarterly basis. Surgeons were divided into groups based on the type of operation performed. A designated leader in each group was responsible for developing a quality improvement program. The group data were presented monthly, and group leaders presented details of their quality improvement projects either annually or semi-annually. We compared the performance indicators over the past 3 years.

**Results:** In the study period, there were 2760 operations in 2021, 2841 operations in 2022, and 2607 operations in 2023, conducted by 32 surgeons divided into 8 groups. This 3-year program was associated with a significant decrease in the mortality rate of 0.64 in 2021, to 0.40 in 2022, and further down to 0.17 in 2023 (2021 vs 2023,  $p = 0.003$ ), and a diminished length of stay index from 0.97 in 2021, to 0.96 in 2022, to 0.90 in 2023 (2021 vs 2023,  $p = 0.032$ ). There was also significant decrease in all 30-day readmission rates from 9.89% in 2021, to 8.52% in 2022, and 8.84% in 2023 (2021 vs 2022,  $p = 0.039$ ) (Table 1).

**Table 1.** Surgeon Groups

Groups	No. of Surgeons	Inpatient Cases 2023
Acute Care Surgery	5	521
Bariatrics	2	324
MIS	2	231
Surgical Oncology	7	456
General Surgery	3	91
Colorectal - A	4	383
Colorectal - B	6	201
Thoracic	3	400

**Conclusion:** The introduction of surgeon-specific reporting combined with group-based strategy development was associated with a significant improvement in surgical outcomes. This program highlights the importance of data-driven strategies and collaborative efforts to enhance health care quality and patient care.

## Indocyanine Green for Acute Cholecystitis: A Systematic Review and Meta-Analysis

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**Introduction:** Indocyanine green (ICG) has been shown to improve operative outcomes in elective cholecystectomy. However, its benefit is uncertain in the setting of acute cholecystitis, due to local inflammation. We aimed to perform a systematic review with meta-analysis to assess the efficacy of ICG in acute cholecystitis.

**Methods:** We systematically reviewed PubMed, Embase, Cochrane, and Web of Science databases to identify studies assessing ICG during cholecystectomy for acute cholecystitis. Statistical analysis was performed using RStudio 4.1.2 using a random-effects model. We used  $I^2$  statistics to evaluate heterogeneity.

**Results:** We screened 2,218 articles and fully reviewed 64 of them. Three retrospective studies and 1 randomized controlled trial were included, encompassing 595 patients. Among them, 314 (52.8%) received ICG before cholecystectomy. A majority of the sample was composed of women (68, 9%) with a mean age varying from 40 to 64 years, and a mean BMI ranging from 23 to 38 kg/m<sup>2</sup>. ICG was associated with a reduction in postoperative complication (odds ratio [OR] 0.41; 95% CI 0.18 to 0.93;  $p = 0.0032$ ;  $I^2 = 0\%$ ). Moreover, no differences were found regarding biliary injury (OR 0.32; 95% CI 0.09 to 1.14;  $p = 0.079$ ;  $I^2 = 0\%$ ), length of hospital stay (MD -1.43 days; 95% CI -3.00 to 0.13;  $p = 0.072$ ;  $I^2 = 16\%$ ), operative time (MD -19.08 minutes; 95% CI -40.31 to 2.15;  $p = 0.079$ ;  $I^2 = 85\%$ ), or conversion to open operation (OR 0.46; 95% CI 0.09 to 2.32;  $p = 0.347$ ;  $I^2 = 57\%$ ).

**Conclusion:** ICG during cholecystectomy for acute cholecystitis cases was associated with a reduction in postoperative complication. Further studies are necessary to confirm our findings.

## Interplay Between Epigenetics and Immune Modulation in Pancreatic Neuroendocrine Tumor

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**Introduction:** The role of epigenetic dysregulation in pancreatic neuroendocrine tumor (PNET) is emerging; however, the impact of the epigenetic landscape on the immune microenvironment is largely unknown. We aim to investigate the tumor microenvironment in PNET to determine if epigenetic modulation is associated with immune infiltration.

**Methods:** A total of 12 paraffin-embedded PNET specimens with adjacent benign pancreatic tissue (controls) were obtained from

Cooper Pathology (IRB 23-130). Scoring was performed using Image J software under the review of a board-certified pathologist.

**Results:** DNMT1 was upregulated in PNET and was directly associated with higher grade tumor (mean density  $37 \pm 21$  in grade 1 vs  $71 \pm 23$  in grade 2 ( $p < 0.05$ )). Intratumoral CD3 expression was present in all specimens ( $20.75 \pm 10.59$  vs  $5.39 \pm 4.02$  ( $p < 0.001$ )). CD8 was over-expressed in Grade 1 tumor ( $28.75 \pm 11.06$  vs  $14.33 \pm 7.4$  ( $p < 0.001$ )) but was found to have decreased expression in Grade 2 ( $9.50 \pm 6.72$  vs  $21.08 \pm 15.08$  ( $p < 0.05$ )). CCL5 demonstrated increased infiltration in tumor ( $20.36 \pm 12.4$  vs  $5.3 \pm 4.8$  ( $p < 0.001$ )), and was directly associated with higher grade (mean  $35.58 \pm 10.9$  in grade 2 vs  $18.45 \pm 11.17$  in grade 1). No PD-L1 expression was observed. PD-L2 infiltration was present in tumor ( $21.23 \pm 11.13$  vs  $3.08 \pm 3.54$  ( $p < 0.001$ )). FOXP3 only showed overexpression in 25% of tumors ( $6.75 \pm 4.77$  vs  $1.29 \pm 1$  ( $p < 0.05$ )). CD3 and CCL5 infiltration was positively correlated to DNMT1 ( $R2 = 0.39$ ,  $R2 = 0.77$ ) (Figure 1).

Figure 1: PNET Epigenetic and Immune Profile

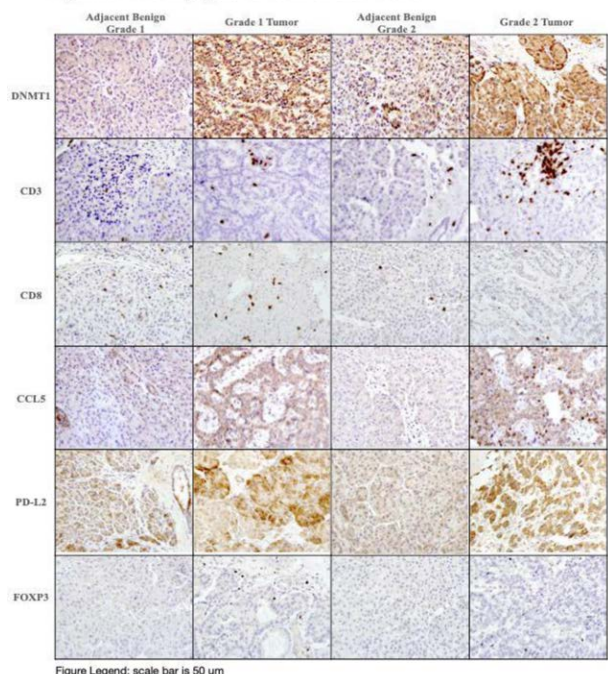


Figure 1.

**Conclusion:** Epigenetic dysregulation associated with higher tumor immune microenvironment warrants further investigation of immunomodulation with epigenetic therapy targeting DNMT1.

## Language Serving Hospitals May Provide Better Access to Appendectomy for Patients with Non-English Primary Language

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**Introduction:** Enhancing language services improves healthcare access and quality for surgical patients with non-English primary language (NEPL). This study assesses the odds of complicated appendicitis for patients with NEPL at language serving hospitals (LSH) vs non-LSH.

**Methods:** A retrospective cohort study of patients who underwent appendectomy between 2010 and 2019 using the New Jersey (NJ) State Inpatient Database was conducted. Patients were dichotomized into NEPL and English primary language (EPL). Hospitals were categorized as LSH if more than 12.4% (NJ state average for NEPL) of their patients had NEPL. The primary outcome was the initial diagnosis of complicated appendicitis. Multivariable analysis was performed, adjusting for age, sex, comorbidity, insurance, and ZIP code-based median household income (MHI) stratified into quartiles.

**Results:** A total of 75 hospitals were identified: 15 were LSH and 60 non-LSH. 8,253 patients with NEPL underwent appendectomy with 54% at LSH. Patients were men (56%), commercially insured (39%), and without comorbidity (69%). LSH had fewer patients of the highest MHI quartile (18% vs 37%,  $p < 0.0001$ ), and fewer patients with NEPL and complicated appendicitis (18.9% vs 22.2%,  $p < 0.001$ ) compared with non-LSH. On adjusted analysis, patients with NEPL at non-LSH had 20% higher odds of presenting with complicated appendicitis compared with patients at LSH (adjusted odds ratio [aOR] 1.2, CI 1.1-1.4).

**Conclusion:** Patients with NEPL presenting to LSH were less likely to present with complicated appendicitis than those presenting to non-LSH. Serving a larger NEPL population, LSH might have greater language resources, which may lead to increased access to surgical care.

### Light and Shadow of Watch-and-Wait Strategy in Rectal Cancer: Oncological Result, Clinical Outcomes, and Cost-Effectiveness Analysis

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**Introduction:** The watch-and-wait (WW) strategy is a potential option for patients with rectal cancer who obtain a complete clinic response after neoadjuvant therapy. The aim of this study is to analyze the long-term oncological outcomes and perform a cost-effectiveness analysis of inpatients undergoing this strategy for rectal cancer.

**Methods:** The data of patients treated with the WW strategy were prospectively collected from January 2015 to January 2020. A control group was created, matched 1:1 from a pool of 480 patients

undergoing total mesorectal excision. Clinical and oncological outcomes were analyzed in both groups. Outcomes parameters included operative and follow-up cost, quality-adjusted life years (QALYs) and the incremental cost per QALY gained or the incremental cost-effectiveness ratio (ICER).

**Results:** Forty patients were included in the WW group, and 40 patients in the surgical group. During a median follow-up period of 36 months, metastasis-free survival (MFS) and overall survival (OS) were similar in the 2 groups. In the WW group, 9 (22%) local regrowths were detected in the first 2 years. The permanent stoma rate was slightly higher after salvage operation in the WW group compared with the surgical (48.5% vs 20%,  $p < 0.01$ ). The cost-effectiveness analysis was slightly better for the WW group, especially for low rectal cancer compared with medium-high rectal cancer (ICER = -108642.1 vs ICER = -42423).

**Conclusion:** The WW strategy in locally advanced rectal cancer offers similar oncological outcomes with respect to the surgical group, and excellent results in quality of life and cost outcomes, especially for low rectal cancer. Nonetheless, the complex surgical field during salvage operation can lead to a high permanent stoma rate, therefore the careful selection of patients is mandatory.

### Local Application of Tranexamic Acid to Reduce the Seroma after Modified Radical Mastectomy

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**Introduction:** This study investigates the effect of local tranexamic acid (TA) as an anti-fibrinolytic agent in reducing axillary drain output after modified radical mastectomy (MRM).

**Methods:** Sixty-two female patients (estimated sample size of 78) planned for MRM were randomized into TA and non-tranexamic acid (NTA) group. TA (20 mL solution of 500 mg) was infiltrated in the axilla and flaps, just before the closure. The drain was kept clamped for 20 minutes. The daily drain output was measured until the drain removal, once it remains under 30 mL for 2 consecutive days. Cumulative drain output, day of drain removal, and day of seroconversion of drain fluid character were assessed. Patients were followed up at 1 month for surgical site infection, flap integrity, and seroma occurrence.

**Results:** Statistically significant reduction in cumulative drain output ( $p = 0.001$ ), day of drain removal ( $p = 0.03$ ) and day of seroconversion ( $p = 0.016$ ) was observed in TA group in comparison to NTA group. Seroma was observed more frequently in the NTA arm ( $p = 0.04$ ). There was no surgical site infection or flap-related complication in the either arm (Table 1).

**Table 1.** Outcomes Measures Between Tranexamic Acid Group and Non-Tranexamic Acid Group

Outcomes	TA group (n = 30)	NTA Group (n = 32)	p Value
Age (years)	50.5 (11.7)	50.25 (10.17)	0.92
BMI (kg/m <sup>2</sup> )	23.50 (2.77)	23.91 (3.56)	0.61
Stage	0- 9 I- 4 II- 12 III- 5	0- 6 I- 6 II- 8 III- 12	
Neoadjuvant therapy	29	30	1.00
Mean Cumulative drain Output.(ml)	353.00 (63.5)	481.72 (73.1)	0.001
Day of Sero-conversion of drain fluid character.	2.1 (0.8)	3.00 (0.5)	0.016
Day of Drain removal	7.13 (0.8)	8.59 (1.0)	0.03
Complications (seroma)	2	9	0.04

**Conclusion:** The prospect of injecting tranexamic acid into the flap and axilla post-MRM for minimizing seroma occurrence shows promise. Nevertheless, it is advisable to conduct a comprehensive study with a sizable sample and extended follow-up to ascertain the oncological outcomes.

### Look Beyond the Admission: Exploring Difference in Days Alive and Outside of the Hospital after Hartmann's Procedure vs Primary Anastomosis and Proximal Diversion for Diverticulitis

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**Introduction:** Choosing Hartmann's procedure (HP) or primary anastomosis and proximal diversion (PAPD) for diverticulitis is challenging given limited research, especially among older adults. Days alive and at home (DAAH) quantifies surgical recovery in claims and aligns with older-adult preferences. Here, we compare 6-month DAAH between HP vs PAPD.

**Methods:** Participants  $\geq 65$  years of age treated with HP or PAPD in 2017-2019 were identified from a 20% Medicare sample. Six-month DAAH were calculated by subtracting days spent in institutional settings and mortality days from 180. To reduce confounding by indication, propensity scores were calculated using greedy matching, allowing each PAPD recipient to be matched with  $\leq 4$  similar HPs (caliper distance  $\leq 0.20$ ) by demographic, patient, illness severity, and hospital factors. Generalized estimating equations, weighted by propensity scores, were used to calculate relative difference in 6-month DAAH.

**Results:** A total of 1368 individuals were eligible in the cohort (81.9% HP). 553 HP were matched with 215 similar PAPD patients. Sex (63.8% female HP vs 68.4% PAPD) and mean age [SD] (74.6 [6.5] years HP vs 74.0 [5.9] years PAPD) were

similar between matched groups. Unweighted DAAH were similar between matched groups (Figure 1). In regression analysis, HP recipients spent a nonsignificant 3.7% more days at home vs PAPD (relative risk [RR] = 1.04, 95% CI 0.99-1.08)—an approximately 4 DAAH difference. Results were similar when limited to urgent or emergent admission (RR = 1.00, 95% CI 0.94 - 1.05).

Unadjusted Days Alive and at Home (DAAH) Following Surgical Management of Diverticulitis

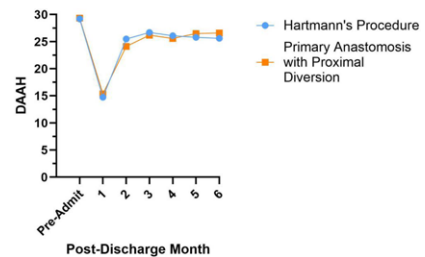


Figure 1.

**Conclusion:** Comparable older adults undergoing HP vs PAPD for diverticulitis spend similar DAAH after operation, suggesting both may be appropriate when indicated, even under emergent circumstances.

### Management and Outcomes of Primary vs Recurrent Abdominal Wall Hernia in the Emergency Setting

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**Introduction:** Little data exists regarding the management of ventral/incisional hernia repair (VIHR) in the emergency setting, particularly with respect to emergent recurrent VIHR. As elective recurrent hernia repair is generally more complex and morbid, understanding whether these trends extend to emergent repair is critical for improving overall management.

**Methods:** We leveraged the Michigan Surgical Quality Collaborative Core Optimization Hernia Registry (MSQC-COHR), a random sample of adult patients from over 70 hospitals across Michigan. We included persons undergoing emergent primary or recurrent VIHR from January 1, 2020 to August 31, 2023. Univariate statistics were employed to compare cohorts. Multivariate logistic regression evaluated the composite risk-adjusted occurrence of any 30-day complication after emergent primary vs recurrent VIHR.

**Results:** Among 1083 emergent VIHRs, 866 (80.0%) were primary repair, and 217 (20.0%) were recurrent repair. There was no significant difference in demographics or surgical approach between groups. BMI and median hernia width were greater in

recurrent VIHR. Recurrent VIHR more commonly included mesh (72% vs 56%,  $p < 0.001$ ) and myofascial release (8% vs 2%,  $p < 0.001$ ). Bowel resection was performed in 10% of primary and 7% of recurrent VIHR ( $p = 0.23$ ), and it was associated with increased odds of risk-adjusted complication rate (adjusted odds ratio [aOR] = 3.68, 95% CI [2.23, 6.05],  $p < 0.001$ ). There was no difference in risk-adjusted composite complication rate after emergent recurrent vs primary repair (aOR = 1.04, 95% CI [0.997, 1.09],  $p = 0.066$ ).

**Conclusion:** Nearly 1 in 10 emergent VIHR included a bowel resection. Persons undergoing emergent recurrent VIHR had higher BMI and larger hernia requiring more complex repair, yet risk-adjusted complication rate did not differ between groups.

**Medicare-Linked Long-Term Rate of Reoperation after Intraperitoneal Onlay Mesh Ventral Hernia Repair**

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**Introduction:** While mesh is essential for ventral hernia repair (VHR), obtaining long-term follow-up is notoriously difficult. Thus, controversy remains regarding whether intraperitoneal mesh is associated with more major complications than mesh in the retromuscular/preperitoneal position. We aimed to obtain extended follow-up by using Medicare claims linked to a nationwide hernia registry to compare long-term reoperative complication associated with mesh location.

**Methods:** The Abdominal Core Health Quality Collaborative registry was queried for Medicare patients undergoing VHR between 2014 and 2019. A sequential linkage algorithm was applied to link registry patients to their Medicare fee-for-service claims. Reoperation for any indication up to 5 years postoperatively was identified using procedure codes. The primary outcome was the reoperation rate in patients with mesh placed in the intraperitoneal position (IP) compared with mesh placed in the retromuscular and/or preperitoneal position (RM).

**Results:** Medicare claims data were successfully linked for 2714 patients; 1783 (65.7%) patients in the RM group and 931 (34.3%) in the IP group. A total of 133 patients underwent reoperation within 5 years. The rate of reoperation within 5 years was similar in the RM group (7.8% [95% CI 5.8%, 9.7%]) compared with the IP group (7.5% [95% CI 4.7%, 10.2%],  $p = 0.56$ ) (Figure 1). In a multivariable analysis, mesh position (RM vs IP) was not associated with risk of reoperation (hazard ratio [HR] 1.35 [95% CI 0.73, 2.49],  $p = 0.3$ ).

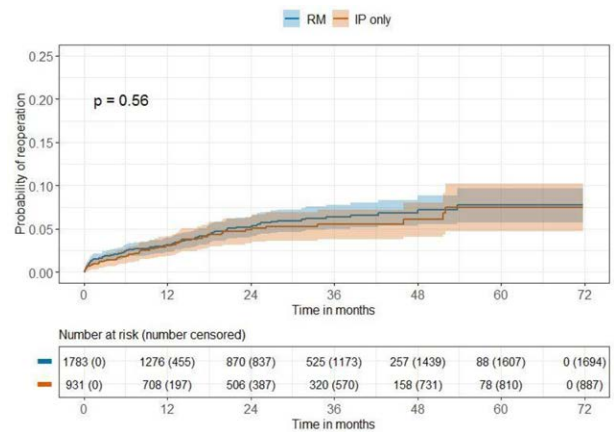


Figure 1.

**Conclusion:** Medicare-linked long-term follow up of patients undergoing VHR does not demonstrate an increased risk of reoperation associated with intraperitoneal mesh compared with mesh placed in the retromuscular and/or preperitoneal positions.

**Mesh Use and Patient-Reported Outcomes after Elective Ventral Hernia Repair**

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**Introduction:** Mesh use at the time of ventral hernia repair (VHR) is associated with lower recurrence and low complication rate, but data on long-term patient-reported outcomes is lacking. These data are crucial for shared decision-making, as many patients are hesitant to receive mesh for fear of long-term negative outcomes.

**Methods:** We used data from the Michigan Surgical Quality Collaborative Core Optimization Hernia Registry (MSQC COHR), a representative sample of adult patients from 70 hospitals across Michigan. We included patients with a ventral hernia <6 cm in size who underwent an elective VHR from Jan 1, 2020 to April 31, 2023. The primary outcome was patient-reported symptoms of recurrence and/or pain using the Ventral Hernia Recurrence Index. We used multivariable logistic regression to estimate the relative risk of each outcome.

**Results:** Among 925 patients, the majority had mesh placed ( $n = 739$ , 80%). Patients who had mesh were older (57 vs 48 years,  $p < 0.01$ ), had higher BMI (32 vs 29 kg/m<sup>2</sup>,  $p < 0.01$ ), and had more comorbid conditions. Mesh was associated with larger hernia (2.5 cm vs 1.3 cm,  $p < 0.01$ ) and minimally invasive technique. At 1 year, patients who had mesh were significantly less likely to report symptoms of hernia recurrence (aRRR 0.88,  $p < 0.01$ ), and this was true for both hernia <2 cm and hernia ≥2 cm. There was no difference in pain.



**Conclusion:** Despite being used in higher-risk patients with larger hernia, mesh is associated with a lower risk of patient-reported hernia recurrence at 1 year. These findings support the broad use of mesh in VHR, despite concerns about potential complication.

**Metabolic Alteration after a Cholecystectomy**

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**Introduction:** Recent data suggests cholecystectomy may lead to metabolic consequences, including altered bile acid circulation, disrupted glucose homeostasis, and risk for metabolic syndrome. We sought to test this metabolic disruption hypothesis using a robust nationally representative dataset.

**Methods:** Data extraction and analysis were performed on the National Health and Nutrition Examination Survey 2017 March 2020 pre-pandemic dataset using STATA 18 (Stata Corp, College Station, TX). All participants aged  $\geq 20$  years with a cholecystectomy history known (yes/no) who completed laboratory testing were included. Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) levels were compared between groups and by BMI range using multivariable linear regression models adjusted for covariates associated with gallstone disease.

**Results:** We identified 3,911 patients and calculated a national prevalence of gallbladder operation at 11.5%, with 18.0% of women and 5.5% of men having undergone operation. In multivariable linear regression, gallbladder operation was significantly associated with increased HOMA-IR (95% CI 0.04 - 0.27,  $p = 0.009$ ). Using the same regression model with interaction between gallbladder operation and BMI, there was a significant rise in HOMA-IR levels among patients with BMI below  $40 \text{ kg/m}^2$ , compared with nonoperative patients with similar BMI ( $p < 0.01$ ) (Figure 1).

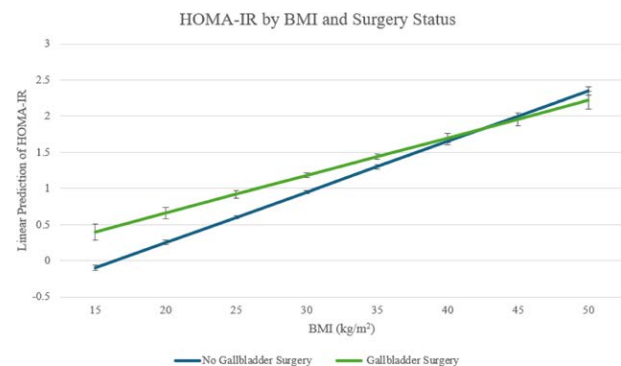


Figure 1.

**Conclusion:** Cholecystectomy demonstrated an increased association with elevated HOMA-IR, even after adjusting for BMI. Our data strongly supports recent literature findings of a BMI-independent association between cholecystectomy and metabolic disruption. Further prospective studies are warranted to validate these data and to offer insight into the primary mechanisms.

**Neighborhood of Residence Is Associated with Access to Elective General Surgery**

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**Introduction:** Emergency surgery often results from delay in obtaining timely treatment and can serve as an indicator of health-care access. We aimed to assess factors associated with emergency surgery.

**Methods:** All patients who underwent cholecystectomy, colectomy, inguinal hernia repair (IHR), or ventral hernia repair (VHR) within a single healthcare system in Ohio between 2012 and 2022 were included. Sociodemographics were extracted from the electronic medical record and merged with the Area Deprivation Index (ADI). For each procedure, propensity score matching (PSM) was performed on age and Charlson Comorbidity Index.

**Results:** A total of 107,939 operations were identified, with 42,308 (39.1%) classified as emergent. After PSM, there were 58,742 operations: 25,388 cholecystectomy, 13,380 colectomy, 8,496 IHR, and 11,478 VHR. Across all operations, the emergency cohorts exhibited a higher proportion of Black patients (cholecystectomy: 1932 (15.22%) vs 1197 (9.43%); colectomy: 488 (14.59%) vs 864 (8.61%); IHR: 245 (17.3%) vs 599 (8.46%); VHR: 763 (13.29%) vs 564 (9.83%); all  $p < 0.001$ ); see Figure 1. Moreover, the emergency cohorts demonstrated a greater prevalence of patients in the highest ADI tertile (cholecystectomy: 6120 (48.21%) vs 5367 (42.28%); colectomy: 1610 (48.13%) vs 3888 (38.74%); IHR: 664 (46.89%) vs 2350 (33.19%); VHR: 2633 (45.88%) vs 2164 (37.71%); all  $p < 0.001$ ). Additionally, there was a higher proportion of Medicaid beneficiaries within all emergency cohorts (cholecystectomy: 2172 (17.11%) vs 1664 (13.11%); colectomy: 419 (12.53%) vs 625 (6.23%); IHR: 128 (9.04%) vs 353 (4.99%); VHR: 628 (10.94%) vs 505 (8.8%); all  $p < 0.001$ ).

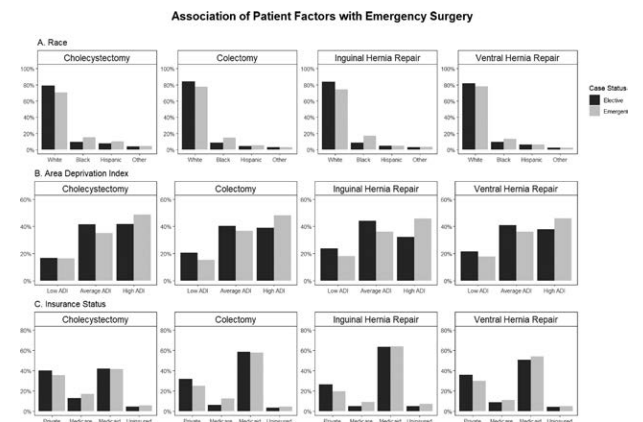


Figure 1.

**Conclusion:** High-deprivation neighborhoods, Black race, and Medicaid were associated with emergency surgery, likely indicating diminished access to timely elective surgical care within these sub-

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groups. Efforts to increase equity should address drivers of neighborhood deprivation and systemic racism.

**Opioid Over-Prescription after Mesh-Based, Outpatient Ventral Hernia Repair**

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**Introduction:** Despite efforts to minimize opioid prescribing, ventral hernia repair (VHR) with mesh remains notoriously painful, often requiring postoperative opioid analgesia. Here, we aim to characterize patterns of opioid prescribing for the heterogenous group of patients and procedures that comprise mesh-based, outpatient VHR.

**Methods:** The Abdominal Core Health Quality Collaborative registry was queried for patients undergoing VHR with mesh who were discharged the same or next day between 1/2019 and 10/2023. Procedures were broadly classified by approach and mesh location: open, minimally invasive (robotic or laparoscopic) with intraperitoneal mesh (MIP), and minimally invasive with retromuscular or preperitoneal mesh (MRPP). Surgeon-reported opioid prescription quantity and patient-reported 30-day consumption data were reviewed.

**Results:** Of 2795 patients who met inclusion criteria (46.1% open, 22.7% MIP, 31.2% MRPP), approximately 80% of patients consumed ≤10 tablets of opioid pain medication (open 87.7%, MIP 78.4%, MRPP 84.2% - Table 1). For patients who were prescribed ≤10 tablets, the median number of unconsumed tablets was 5 (interquartile range [IQR] 0-8). For patients who were prescribed >10 tablets, the median number of unconsumed tablets was 10 or more (open 10 [IQR 2-16], MIP 10 [IQR 2-18], MRPP 12 [IQR 5-16]). The number of tablets consumed

was positively correlated with the number of tablets prescribed (Kendall's rank correlation = 0.232, p < 0.001).

**Conclusion:** Regardless of technique, for outpatient VHR with mesh, the fewer opioid tablets prescribed, the fewer tablets patients consumed. Decreasing the prescription quantity to ≤10 tablets, coupled with preoperative patient education, may help minimize excess opioid prescribing while still achieving adequate pain control.

**Optimizing Outcomes for Patients with New Ileostomy in a Community Hospital System Using a Standardized Multidisciplinary Postoperative Protocol**

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**Introduction:** Patients with new ileostomy are susceptible to high rate of readmission due to dehydration and acute kidney injury (AKI). A multidisciplinary protocol was instituted to decrease readmission and prevent AKI in patients with new ileostomy.

**Methods:** A quality improvement project was initiated consisting of patient education and early nurse phone follow-up at a single community hospital in January 2021. Following this standardized protocol, anti-diarrheal medication and diet were adjusted to a target ileostomy output of 700-1000 mL/day. Patients reporting symptoms of dehydration were evaluated in-person. Labs were obtained if necessary and supplemental intravenous fluids were provided outpatient as needed. New ileostomy patients managed with the protocol over a 3-year period (post-Pr) were compared with patients with new ileostomy in the 3 years prior (pre-Pr).

**Results:** Over 72 months, 91 patients had new ileostomy; 43 were managed under the new protocol. Baseline demographics, cardiovascular risk factors, and rate of elective and minimally invasive procedures were similar between the groups. Malignancy was the most common indication for operation in both groups. Readmission rate within 60 days was 27.1% (13/48) in the pre-Pr group and 7.0% (3/43) in the post-Pr group, p = 0.0138. AKI rate at readmission

**Table 1.** Opioid Prescription and Consumption Data for Patients Undergoing Ventral Hernia Repair

Procedure and mesh location (No. of patients)	Median (IQR) N of tablets prescribed	N (%) of patients who consumed ≤10 tablets	Median (IQR) N of tablets remaining for patients prescribed ≤10 tablets	Median (IQR) N of tablets remaining for patients prescribed > 10 tablets
Open (1288)	10 (8-12)	87.7% (1129)	5 (0-8)	10 (2-16)
Onlay mesh (128)	10 (8-20)	88.3% (113)	3 (0-6)	18 (5-20)
Preperitoneal/Retromuscular mesh (809)	10 (8-15)	85.4% (691)	6 (0-8)	10 (2-16)
Open- Intraperitoneal mesh (351)	10 (7-10)	92.6% (325)	5 (0-8)	8 (2-12)
MIP- Intraperitoneal mesh (635)	12 (10-20)	78.4% (498)	5 (0-8)	10 (2-18)
Robotic (356)	10 (10-20)	77.2% (275)	6 (0-8)	10 (2-18)
Laparoscopic (279)	12 (10-20)	79.9% (223)	4 (0-8)	10 (2-18)
MRPP- Retromuscular/preperitoneal mesh (872)	10 (10-16)	84.2% (734)	5 (0-8)	12 (5-16)

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was similar at 10.4% and 2.3% in the pre-Pr and post-Pr groups respectively,  $p = 0.2073$ .

**Conclusion:** A standardized multidisciplinary protocol for new ileostomy resulted in decreased readmission within 60 days compared with the pre-protocol period.

### Outcomes after Percutaneous Cholecystectomy Tube Placement

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**Introduction:** Percutaneous cholecystostomy (PC) is indicated for patients with cholecystitis who are at high-risk for cholecystectomy (CCY). Previous studies demonstrated that mortality did not differ for PC vs operation, though complication rate was higher for PC. We studied outcomes of PC placement in patients given their medical comorbidity.

**Methods:** This study was a retrospective chart review from April 2015 to June 2022.

**Results:** We evaluated 265 patients, 63% were men, mean age was 74 years. A total of 63.7% of patients did not receive surgery (NS). 74% in the surgery group (SG) underwent minimally invasive CCY and 27% underwent open CCY. The complication rate was 11%. The SG were younger (77 years NS vs 69 years SG,  $p < 0.001$ ) and had lower Charleston Comorbidity Index (CCI) (7 NS vs 5 SG  $p < 0.005$ ). Overall mortality was 38.8%, with 8.9% dying from sepsis related to cholecystitis. The non-survivors had significantly higher CCI (7 vs 6  $p < 0.001$ ). Mortality was significantly higher in NS (odds ratio [OR] 0.18 95% CI 0.10, 0.33) even when controlling for age and gender. One-year overall probability of survival was 73% (95% CI 0.67-0.78). Probability of survival was greater in the SG (95%)

compared with NS (60%). Median overall survival was 5.3 years and 3.1 years for NS ( $p = 0.001$ ) (Figure 1).

**Conclusion:** Mortality was significantly higher in the NS group, reinforcing surgeon judgement on surgical candidacy. Those who did undergo operation after PCT had a low complication rate and were able to undergo minimally invasive CCY, emphasizing that PCT placement is a safe temporizing measure for cholecystitis.

### Outcomes of Early Compared with Delayed Initiation of Feeding after Placement of Percutaneous Endoscopic Gastrostomy Tube: A Systematic Review and Meta-Analysis

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**Introduction:** The American Society of Parenteral and Enteral Nutrition (ASPEN) considered feeding within 4 hours of percutaneous endoscopic gastrostomy (PEG) tube placement safe. Still, there remains variation in practice, with feeding delay up to 24 hours after PEG placement. A plausible reason is a weakness in the evidence supporting the recommendation. Our objective was to systematically review the current literature on early vs delayed feeding after PEG placement and compare their outcome in a meta-analysis.

**Methods:** We systematically searched Ovid MEDLINE, EMBASE, Cochrane Library, CINAHL, and Web of Science for studies comparing early with delayed feeding outcomes after PEG placement. Randomized and non-randomized studies in the adult population with fully published results were included. Outcomes of studies that defined early feeding as  $\leq 4$  hours were compared with those that defined delayed feeding as  $>4$  hours in a meta-analysis. Primary outcomes included postoperative vomiting, diarrhea, stoma leakage, stoma infection, bleeding, intra-abdominal infection, and aspiration pneumonia. The secondary outcome was 30-day mortality. We used Cochrane Risk of Bias tool 2 to assess the risk of bias in randomized studies and The Newcastle-Ottawa scale in non-randomized studies. PROSPERO registration: CRD42023483520.

**Results:** Of 4751 studies, 12 were eligible, but 11 with 2880 patients met inclusion in the meta-analysis. There was no significant difference in the primary and secondary outcomes between both groups. Intra-abdominal infection could not be examined because of scarce reporting by authors.

**Conclusion:** This robust meta-analysis demonstrates that outcomes of early and delayed feeding after PEG placement are similar, thereby supporting early feeding per ASPEN's recommendation.

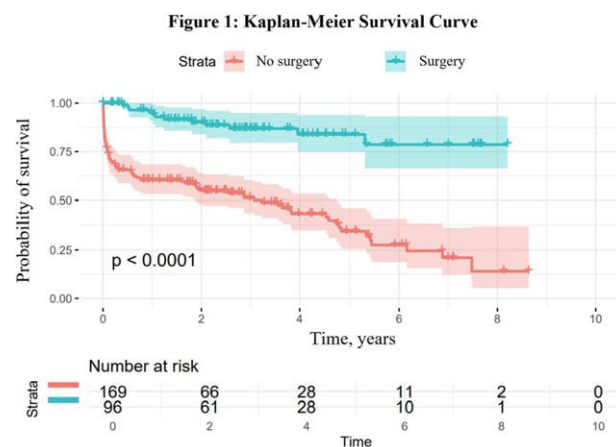


Figure 1.

### Parkland Scale: Is It Useful as a Postoperative Prognosis Factor in Laparoscopic Cholecystectomy?

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**Introduction:** The Parkland Scale is an intraoperative classification designed to classify the severity of disease, but it also serves to estimate the surgical difficulty of laparoscopic cholecystectomy. The aim of this study is to determine the association between the Parkland tier system and postoperative outcomes (after laparoscopic cholecystectomy) in patients with acute cholecystitis.

**Methods:** An ambivalent cohort study that recruited patients 18 years of age or older with acute cholecystitis who underwent laparoscopic cholecystectomy at the National University Hospital of Colombia between 2016 and 2020 was conducted. We excluded those with cholangitis, pancreatitis, and those undergoing common bile duct exploration or conversion to open operation for any cause other than laparoscopic cholecystectomy.

**Results:** A total of 884 patients underwent operation for acute cholecystitis as a medical emergency, 680 for biliary colic in the context of an outpatient clinic, and 40 patients diagnosed with acute cholecystitis required conversion to open operation. The bivariate analysis demonstrates an association with Parkland. But in the multivariate analysis with logistic regression, there was no association between the Parkland system and the composite outcome (reintervention, surgical site infection, or readmission within 30 days) after adjusting for the other variables.

**Conclusion:** The Parkland Scale has shown performance in predicting the level of surgical difficulty in laparoscopic cholecystectomy, but studies with sufficient statistical power to determine association between this tool and postoperative outcomes are still lacking.

### Pilot of Tele-Acute Care Surgery Service to Under-Resourced Hospitals

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**Introduction:** Tele-consultation has been shown to be effective in decreasing trauma transfers and improving trauma care to under-resourced hospitals. Given the difficulty many patients face in finding adequate surgical care, and the advantages shown with telehealth in other fields of medicine, we hypothesized that tele-acute care surgery (ACS) would allow for expedited care of patients facing acute surgical disease.

**Methods:** Two under-resourced hospitals were identified as having a shortage ACS coverage. A tele-ACS service was designed, involving teleconsult by on-call surgeons at a quaternary care hospital, direct

to preoperative protocols, and post-anesthesia care unit (PACU) discharge protocols.

**Results:** Ten patients were included in a 6-month period. The average age was 42.9 years, with 5 women. Seven had appendicitis, 1 necrotizing soft tissue infection, 1 pilonidal abscess, and 1 nonoperative diverticulitis. Nine were transferred directly to the operating room; the diverticulitis patient remained at the community hospital for medical management. Two patients were discharged from the PACU.

**Conclusion:** The trial proved to be a successful implementation of a pilot tele-ACS service for hospitals with limited resources, particularly on-call acute care surgeons. With the ability to consult surgeons working at well-sourced hospitals, patients receive expedited care when it comes to operative intervention. With the close involvement of the pre- and postoperative units, patients who present to under-resourced hospitals can receive efficient and even expedited care needed for their disease process.

### Planned or Unplanned Return to Operating Room Associated with Increased Mortality and Complication in Emergency General Surgery Patients

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**Introduction:** Emergency general surgery (EGS) represents a wide spectrum of disease with a high complication and mortality rate. Return to operating room (RTOR) after EGS procedures is common, with unplanned RTOR representing a surgical quality indicator. We sought to evaluate the association of any RTOR with mortality and complication to identify opportunities to improve outcomes in a large, integrated healthcare system.

**Methods:** This retrospective cohort study included adult EGS patients from 2017 through 2021 undergoing appendectomy, cholecystectomy, small bowel resection, colectomy, or peptic ulcer procedures. The primary outcome was inpatient mortality; secondary outcomes were venous thromboembolism (VTE), surgical site infection (SSI), extended length of stay ( $\geq 75^{\text{th}}$  percentile by procedure) (ELOS), and readmission. Outcomes were adjusted for age, race, gender, social deprivation index, Elixhauser Comorbidity Index, initial lactate, and shock index.

**Results:** A total of 9354 EGS episodes of care were analyzed, with 9% requiring RTOR and 2.9% requiring unplanned RTOR. RTOR for any reason was associated with increased inpatient mortality ( $p < 0.0001$ , odds ratio [OR] 4.8), SSI ( $p < 0.0001$ , OR 2.8), VTE ( $p < 0.0001$ , OR 3.6), and ELOS ( $p < 0.0001$ , OR 11.6). Compared with patients with planned RTOR, patients requiring unplanned RTOR had increased ELOS ( $p = 0.01$ , OR 1.8) but no difference in mortality or other complication (Figure 1).

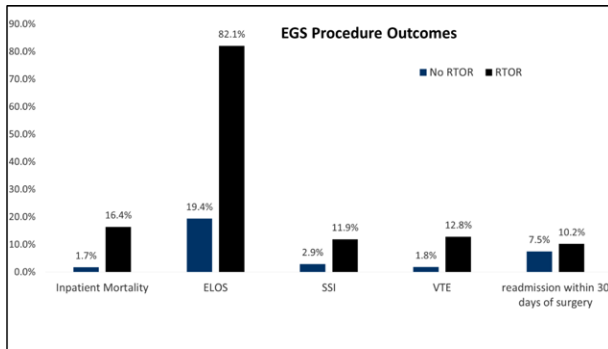


Figure 1.

**Conclusion:** Any RTOR is associated with inpatient mortality, SSI, VTE, and ELOS. RTOR has been proposed as a quality indicator related to many factors but is also a major predictor of adverse perioperative complication. In addition to efforts to decrease RTOR rate, appropriate risk adjustment for surgical outcomes, considering etiologies of RTOR, should be studied.

**Pre- vs Post-Laparoscopic Common Bile Duct Exploration Program: A Direct-to-Surgery Approach Reduces Length of Hospital Stay and Postoperative Procedures**

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**Introduction:** Suspected choledocholithiasis can be managed with 1 of 2 treatment pathways: a direct-to-surgery approach with intraoperative cholangiogram and possible laparoscopic common bile duct exploration (LCBDE), or preoperative duct clearance before cholecystectomy. This study investigated patient outcomes pre- and post-implementation of an LCBDE program.

**Methods:** This was a single-center retrospective review of adult patients admitted with biliary disease. Patients were split into pre- (2/1/2020 - 1/31/2021) and post- (2/1/2021 - 2/28/2022) implementation of the LCBDE program. The primary outcome was total number of endoscopic retrograde cholangiopancreatography/magnetic resonance cholangiopancreatography (ERCP/MRCP). Secondary outcome was length of index hospitalization (LOS).

**Results:** There were 184 patients with suspicion of choledocholithiasis. The majority of patients were women (62%), and 95 (52%) were in the pre-implementation cohort. Overall, fewer post-implementation patients received any imaging procedure either pre- or postoperatively (56% vs 37%, p = 0.05). However, there were no differences in patients who received preoperative imaging between the 2 groups (39% vs 34%, p = 0.46), but fewer postoperative patients had imaging (19% vs 8%, p = 0.03), largely driven by ERCP (12 vs 4, p = 0.05). There was 1 LCBDE performed in the pre-implementation cohort compared with 20 in the post cohort (p < 0.00). The median LOS was 2 days shorter in the post-

implementation cohort (2 days, IQI = 1.0; 4.0 vs 4 days, IQI = 2.0; 5.0, p < 0.001) (Figure 1).

Figure 1: Summary of demographics and outcomes of patients undergoing surgery for acute gallstone-related disease.

	Pre-Implementation (n=95)	Post-Implementation (n=89)	P-value
Female Gender, n (%)	59 (62.1%)	55 (61.8)	
Age, mean (SD)	50.76 (19.77)	54.52 (19.55)	
Diagnosis, n (%)			
- Acute Cholecystitis	49 (52%)	52 (59%)	
- Choledocholithiasis	8 (8%)	15 (17%)	
- Biliary colic	10 (11%)	8 (9%)	
- Gallstone pancreatitis	28 (30%)	14 (16%)	
Admitted to ACS	64	37	
Length of Stay, d, median (IQI)	4.00 (2.00; 5.00)	2.00 (1.00; 4.00)	<0.001
Patients Who Had Any Imaging, n (%)	53 (56%)	37 (42%)	0.05
Number of Procedures Per Patient, median (IQI)	1.0 (0.0; 1.0)	0.0 (0.0; 1.0)	0.13
Patients Who Had Any Preoperative imaging, n (%)	37 (39%)	30 (34%)	0.46
Patients Who Had Any Postoperative imaging, n (%)	18 (19%)	7 (8%)	0.03
Pre-Op MRCP, n (%)	20 (21.1)	15 (16.9)	0.47
Pre-Op ERCP, n (%)	26 (27.4)	24 (27.0)	0.95
Post-Op ERCP, n (%)	12 (12.6)	4 (4.5)	0.05
Trancystic LCBDE, n (%)	1 (1%)	20 (23%)	<0.001
Readmission, n (%)	10 (10.5)	5 (5.6)	0.22

Figure 1.

**Conclusion:** Our institution implemented the direct-to-surgery approach for patients with suspected choledocholithiasis. Implementation of this strategy was associated with fewer patients who received a procedure in general, fewer postoperative procedures, and decreased length of stay.

**Race and Insurance Status Predict Time to Procedure in Patients Undergoing Emergency General Surgery Procedures**

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**Introduction:** Delay in time to operation represents an important metric for hospitals and has been shown to increase morbidity and mortality. We sought to compare patient factors across levels of time to procedure for patients who underwent emergency general surgery procedures.

**Methods:** We conducted a retrospective study of the National Inpatient Sample (NIS) from 2016 to 2019 of patients undergoing emergent procedures. We stratified patients into 3 groups: emergent procedure (EP), increased time to procedure (ITTP), and significantly increased time to procedure (SITP). We applied logistic

regression models predicting SITP. We adjusted all analyses with standard NIS weighting.

**Results:** We identified a total of 2,005,095 procedures for the analysis. The mortality was lower in the ITTP group at 2.4% compared with 3.6% and 3.4% within the EP and SITP groups, respectively. Our analysis demonstrated Black (hazard ratio [HRh] 1.22, 95% CI [1.19, 1.24]) and Hispanic race (HR 1.11, 95% CI [1.07, 1.15]) had greater odds of increased time to operation compared with White patients. Government insurance carried higher odds for the SITP group (HR 1.20, 95% CI [1.17, 1.22]) over private insurance.

**Conclusion:** This study represents the first published identification of racial and socioeconomic disparity in increased time to operation. The reasons for differences could represent important markers for investigation into operating room efficiency as well as a potential source of physician bias. We recommend further individual institutional research to confirm and understand the presence of this disparity, and to develop effective strategies to reduce this disparity.

**Rate and Outcomes of Occult Malignancy and Other Pathology among Patients Undergoing Appendectomy for Acute Appendicitis**

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**Introduction:** With the nonoperative management of acute appendicitis becoming more commonplace among tertiary care centers, an understanding of the risk and outcomes of occult malignancy and other pathology associated with a presentation of appendicitis is increasingly more important. We report a 4-year experience of patients undergoing appendectomy for acute appendicitis at the Lahey Clinic.

**Methods:** A retrospective chart review from January 2019 through December 2022 at a tertiary care hospital was conducted.

**Results:** A total of 784 patients underwent appendectomy for appendicitis; 699 (89.3%) were performed for an acute presentation, 51 (6.5%) for interval appendectomy, and 33 (4.2%) for either failure of nonoperative management or recurrence within 30 days. The mean age of the study population was 45 years, 58% were women, and the mean length-of-stay was 1 day. A total of 741 appendectomies were performed laparoscopically, 15 were open, and 28 were converted to open. There were 3 in-hospital mortalities due to septic shock. Notably, 41 patients (5.2%) had non-inflammatory pathology identified on pathology, including 32 patients (4%) with pre-malignant or cancerous lesion (see Table 1). All 5 patients diagnosed with adenocarcinoma underwent right colectomy, as did 1 of the 5 patients diagnosed with an appendiceal carcinoid. With a mean follow-up of 26.6 and 23.6 months for the adenocarcinoma and carcinoid groups, respectively, all these patients survived.

**Table 1.**

**TABLE: Pathology of Appendectomy Specimens**

Type	# of patients	% of total
Acute appendicitis	743	94.5%
Serrated adenoma	12	1.5%
Adenocarcinoma (including mucinous and goblet cell types)	5	0.6%
Carcinoid	5	0.6%
Mucinous neoplasm	10	1.3%
Granulomas concerning for Crohn's disease	3	0.4%
Implanted endometrioma	6	0.8%

**Conclusion:** One in 20 patients undergoing appendectomy for appendicitis had a different pathology, including precancerous and cancerous lesions. Accordingly, informing patients of the risk of occult malignancy and associated conditions is vital when discussing nonoperative options for the treatment of appendicitis.

**Reducing Pain after Laparoscopic Abdominal Surgery Through Active Gas Removal: A Systematic Review and Meta-Analysis**

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**Introduction:** Retention of intra-abdominal gas after laparoscopic surgery is associated with increased postoperative pain, longer hospitalization, and increased risk of postoperative complication. This systematic review aims to evaluate the efficacy of active gas removal techniques and their impact on postoperative well-being.

**Methods:** A comprehensive search was conducted on Cochrane, EMBASE, Pubmed, and Scopus databases of randomized controlled trials. Articles were included in the meta-analysis when homogeneous endpoints were reported. The study protocol was registered to PROSPERO: CRD42023490335.

**Results:** Twenty-five studies, which included 2,868 patients, met inclusion criteria. The majority of studies focused on laparoscopic cholecystectomy and included maneuvers such as intra-operative suction, drain placement, pulmonary recruitment maneuver (PRM), or a combination of gas removal techniques. Meta-analysis revealed drain placement did not demonstrate reduced pain scores. However, intraoperative suction significantly reduced pain after 24 hours in

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**Table 1.** The Effect of Active Gas Removal Techniques in Reducing Pain

Intervention Subgroup	No. of Patients, Intervention	No. of Patients, Control	Standard Mean Difference, IV, Random, 95% CI
Drain Placement <24 Hours	212	201	0.62 [-1.43, 2.67]
Drain Placement >24 Hours	182	172	1.37 [-2.71, 5.46]
Suction <24 Hours	91	97	0.12 [-1.23, 1.48]
Suction >24 Hours	180	183	-0.86 [-1.45, -0.26]
PRM <24 Hours	30	30	-0.83 [-1.36, -0.30]
PRM >24 Hours	30	30	-1.35 [-1.92, -0.79]
Combined Maneuvers <24 Hours	26	25	-0.91 [-1.49, -0.33]
Combined Maneuvers >24 Hours	26	25	-1.56 [-2.19, -0.92]

the postoperative period (g = -0.86, 95% CI -1.45 to -0.26). PRM and combined maneuvers showed reduced pain scores across the evaluated studies at both under and over 24 hours postoperation (Table 1). However, despite reduced pain, no clinically significant reduction in hospital length of stay were found in any of the 4 investigated interventions.

**Conclusion:** Intraoperative suction of residual gas and PRM are low-risk, low-cost interventions which proved to reduce postoperative pain. Adopting these techniques as standard of care to lower pain can improve patient satisfaction.

**Risk-Specific Training Cohorts Improve Performance of a Deep Learning Surgical Risk Prediction Model**

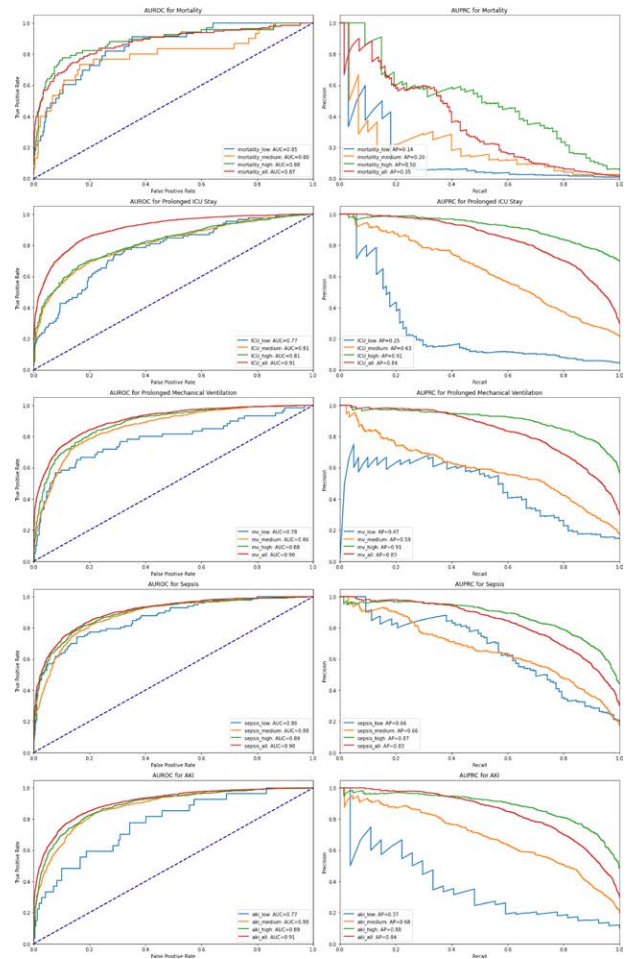
Jeremy Balch, MD, Matthew M Ruppert, MS, Timothy R Buchanan, BS, Ziyuan Guan, MS, Kenneth Abbott, MD, Benjamin Shickel, PhD, Tyler J Loftus, MD, FACS  
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**Introduction:** Machine learning tools are increasingly deployed in risk prediction algorithms for clinical decision support in surgery. Data imbalance and bias may impact model performance. We hypothesize that model performance will improve when trained on risk-specific cohorts.

**Methods:** MySurgeryRisk is a deep learning model which generates risk scores for common postoperative complications. Originally trained on all inpatient surgical admissions at a single academic hospital over a 7-year period, we subsequently retrained the model on separate cohorts for high-, medium-, and low-risk CPT codes defined by upper-, middle-, and lower-third cutoffs for known incidence of 5 complications: in-hospital mortality, prolonged ICU stay ≥48 hours, prolonged mechanical ventilation ≥ 48 hours, sepsis, and acute kidney injury.

**Results:** A total of 74,800 cases were studied. There were no notable differences between age, BMI, sex, and race between the cohorts. Low-risk CPT codes were defined as having less than 1% and 7% for in-hospital mortality and prolonged ICU stay, respectively, and were defined as 0% for prolonged mechanical ventilation, sepsis, and AKI. High-risk cutoffs were 3%, 47%, 8.3%, 4.6%, and 15% for

each complication, respectively. While area under the receiver operating characteristic curve (AUROC) had only moderate variance between models, area under the precision-recall curve (AUPRC) and F1 scores were discordant, with high-risk class outperforming the original model, medium-class, and low-risk class in all complication predictions (Figure 1).



**Figure 1.**





5 years (19%), 5-10 years (22%), and more than 10 years (59%). Most (84%) were general surgeons or in a subspecialty, followed by gynecologists, urogynecologists, and urologists. Among surgeons with experience transection RL (93%), 4% reported associated adverse outcomes. Most surgeons (87%) did not believe that RL transection, even bilateral, results in adverse outcomes. General surgeons were more likely than gynecologists and urologists to consider RL transection to improve inguinal hernia repair (4.1 vs 3.7,  $p < 0.001$ ) (Figure 1).

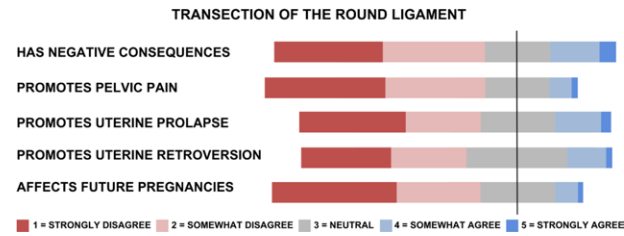


Figure 1.

**Conclusion:** Most general surgeons, gynecologists, and urologists agree that the RL can be safely divided. However, there remains uncertainty about the consequences of RL handling and its impact on outcomes after inguinal hernia repair in women. More physiologic and outcomes research is necessary to improve and standardize inguinal hernia care in women.

### Social Deprivation Index Is Associated with Worse Outcomes in Emergency General Surgery Patients Undergoing High-Risk Procedures

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**Introduction:** Emergency general surgery (EGS) disorders represent a wide spectrum of disease with a high complication and mortality rate. Social risk factors have been associated with mortality in the EGS population. Social deprivation index (SDI) is a validated geographic area demographic index used to quantify variations in healthcare. We aimed to examine the association of SDI with mortality and complication rate after high-risk EGS procedures across a large integrated healthcare system.

**Methods:** This is a retrospective cohort study of adult EGS patients from 2017 to 2021 after high-risk procedures (small bowel resection, colectomy, or peptic ulcer procedure). The primary outcome was inpatient mortality; secondary outcomes were return to operating room (RTOR), venous thromboembolism (VTE), and extended length of stay ( $\geq 75^{\text{th}}$  percentile by procedure) (ELOS). Outcomes were analyzed by SDI and adjusted for age, race, Elixhauser Comorbidity Index, initial lactate, and shock index.

**Results:** A total of 2500 high-risk procedure episodes of care were analyzed. EGS patients undergoing high-risk procedures from the most disadvantaged areas had a higher mortality rate than those

from the least disadvantaged areas ( $p = 0.01$ , odds ratio [OR] 2.1). Patients from the most disadvantaged areas were also more likely to require RTOR and have an ELOS than patients from the least disadvantaged areas ( $p = 0.001$ , OR 1.9;  $p = 0.047$ , OR 1.5) (Figure 1).

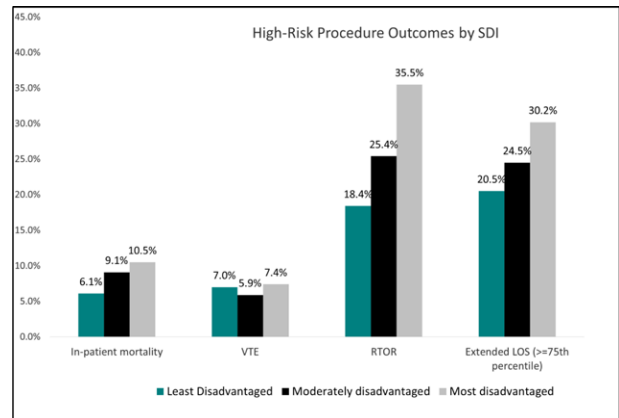


Figure 1.

**Conclusion:** SDI is associated with higher mortality, RTOR, and ELOS in EGS patients undergoing high-risk procedures. This study highlights the need for further evaluation of socioeconomic factor influence on outcomes in high-risk patients, which may lead to geographically targeted interventions and prevention strategies.

### Splenic Embolization vs Splenectomy: Comparing Infectious Complication Rate

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**Introduction:** The use of splenic artery embolization (SAE) as a management strategy for splenic injury is well supported by the literature. We aimed to compare the rate of 30-day readmission and infectious complication between SAE and splenectomy (SP).

**Methods:** This was a retrospective analysis of the National Readmission Database (NRD) between 2017 and 2019. We identified adult patients with any grade of splenic injury requiring surgical intervention, either SAE or SP. The primary outcome of this study was the rate of infectious complication.

**Results:** A total of 38,378 patients had a splenic injury, only 6,529 (17%) required intervention, 1,925 (29.5%) were managed with SAE, and the remaining underwent SP. In-hospital infectious complication was higher for SP (26.5% vs 15.1%,  $p = 0.001$ ). Among these index admission complications, pneumonia was higher for SP (17.7% vs 10.1%,  $p = 0.001$ ). A total of 760 (11.6%) were readmitted at 30 days. All-cause 30-day readmission rate did not significantly differ between the 2 groups (12.5% for SP vs 11.2% for SAE,  $p = 0.196$ ). However, 30-day readmission due to infectious complication was significantly higher in the SP population (3.4% vs 2.3%,  $p = 0.001$ ). There was no difference in readmission due to pneumonia (2.5% vs 2.7%,  $p = 0.946$ ). Deep incisional surgical site infection (SSI) did not differ

between the groups, while organ/space SSI was higher for SP (0% vs 0.5%,  $p = 0.001$ ). Of all SPs, 30.8% were performed in small hospitals, vs 25.4% of all SAEs. A similar trend was seen for non-teaching hospitals (15.7% vs 9.8%,  $p = 0.001$ ) (Table 1).

**Table 1.** Comparing of All-Cause Readmission and Infectious Rate Between Splenic Artery Embolization and Splenectomy

All-cause readmission	Splenic Artery Embolization (n = 1925)	Splenectomy (n = 4604)	p Value
Days until first readmission, Median (IQR)	22 (7-58)	24 (8-69)	0.047
In 30 days, n (%)	241 (12.5)	519 (11.2)	0.196
Infection rate			
In-hospital, n (%)	290 (15.1)	1209 (26.5)	0.000
In 30 days, n (%)	44 (2.3)	154 (3.4)	0.001

**Conclusion:** Splenectomy is linked to a higher risk of infectious complication, both in-hospital and at readmission.

**Surgeon Intraoperative Sympathovagal Balance Influences Patient Outcomes**

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**Introduction:** Heart rate variability parameters quantifying sympathovagal balance have been associated with intraoperative surgeon stress and cognitive workload. The present study interrogates the relationship between surgeon sympathovagal balance in the operating room and patient outcomes.

**Methods:** Attending surgeons from 7 specialties across 4 French hospitals were enrolled from 01/11/21 to 12/23/21. Sympathovagal balance during the first 5 minutes of each operation was quantified via the ratio of the absolute power of the low and high-frequency domains (LF/HF ratio) of interbeat heart rate variability collected via Polar monitors. LF/HF ratio for each surgeon was normalized to their median during the study period to control for baseline heart rate variability differences. The association between normalized LF/HF ratio and patient 30-day major surgical complication was modeled by multivariable regression after controlling for possible confounders including surgeon age, professor status, time of incision, patient comorbidity, and the procedure complexity.

**Results:** The cohort included 793 operations, 18.2% of which resulted in major operative complication, performed by 38 surgeons. Median surgeon age was 46.5 years, 21.1% were women, 57.9% were professors, and they performed a median [interquartile

range] of 17 [9, 27] operations. Surgeon heart rate during the first 5 minutes was 88 [77,99] beats per minute and LF/HF ratio was 1.00 [0.71, 1.32] after normalization. After adjustment, increased surgeon sympathovagal balance was significantly associated with reduced major operative complication (adjusted odds ratio = 0.63 [0.42, 0.94],  $p = 0.025$ ) (Table 1).

**Table 1.** Adjusted for a Risk Score Created Based on 3,644 Separate Operations Performed by the Same Surgeons

Predictor	aOR [95% CI]	p Value
Normalized LF/HF Ratio	0.63 [0.42, 0.94]	0.025*
Age of Surgeon (+10 Years)	1.04 [0.77, 1.40]	0.80
Professional Status (Professor vs Non-Professor)	0.59 [0.36, 0.97]	0.039*
Incision Time of Day		
Morning	Ref	-
Afternoon	1.14 [0.73, 1.77]	0.55
Overnight	0.67 [0.20, 1.90]	0.47

**Conclusion:** Increased surgeon sympathovagal balance was associated with reduced postoperative morbidity and may provide a novel avenue for improving patient care.

**Surgeons and Screen Time: A Cross-Sectional Analysis of Surgeons Electronic Health Record Use after Hours**

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**Introduction:** High physician burnout rate is notably prevalent in surgery, exacerbated by the implementation and use of electronic health records (EHR), increasing administrative burden and often requiring significant after-hours work. This analysis aims to quantify the “off-hours” EHR burden on surgeons and explore disparity by surgeon gender or subspecialty.

**Methods:** HER login data for attending surgeons at an academic medical center were analyzed over 1 month. Demographics included gender, subspecialty, and workstation type. EHR login variables included number of logins, time expended per login, and time of day for login initiation. Initiation time of day was further divided into “business hours” (7 am-7 pm) and “off-hours” (7 pm-7 am). Descriptive and statistical analyses were performed.

**Results:** Among 187 surgeons (85 women, 102 men) in this analysis, 1,409 hours of HER login time were logged “off-hours” (out of a total 11,123 hours of EHR usage), potentially costing an estimated \$235,303. Female surgeons spent 9.97% (interquartile range [IQR] 2.86%, 19.73%) logged in “off-hours” while male surgeons spent 8.00% (IQR 0.92%, 17.09%) logged in “off-hours” ( $p = 0.15$ , Figure 1a). By subspecialty, median percentage “off hours” login times are shown in Figure 1b, with orthopaedic/hand surgeons spending 11.99% “off-hours” while otolaryngology/plastic surgeons spent less than 1% ( $p = 0.34$ ).

Figure 1a

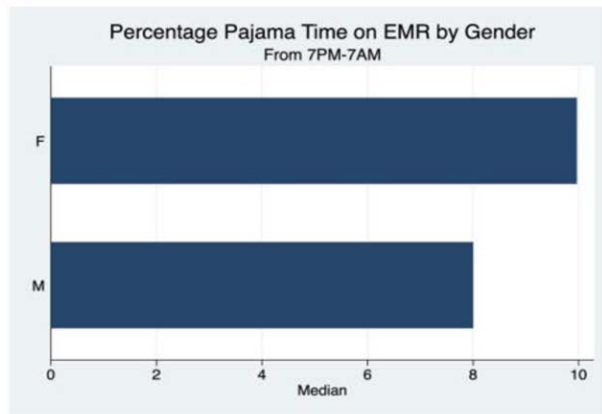


Figure 1b

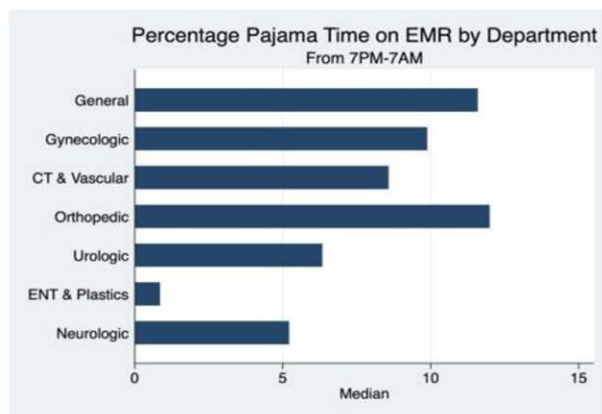


Figure 1.

**Conclusion:** Surgeons face significant “off-hours” EHR demands. Variability in “off-hours” EHR usage was noted across subspecialties and gender, though without statistical significance. These findings highlight the intrusion of EHR tasks into surgeons’ personal time, necessitating further investigation into their impact on work-life balance and burnout. Addressing these issues is crucial for enhancing surgeons’ well-being and job satisfaction.

### Surgery Sustainability and Optimization of Waste Management: A Monocentric Experience

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**Introduction:** The scientific community is advancing green initiatives in surgical practice to reduce CO<sub>2</sub> emissions (E<sub>CO2</sub>). Our clinic started a recycling protocol in operative rooms (ORs). We aim to quantify E<sub>CO2</sub> and waste management cost after the protocol.

**Methods:** Before the protocol, all waste was disposed as hazardous (HW). After 3 months of monitoring, containers for plastic, glass,

paper, metal, drugs, dry matter, and HW were placed in ORs 5 and 7, and for plastic, paper, and HW in the others. After the protocol, ORs 5 and 7 were monitored for 3 months; all ORs for 2 months. E<sub>CO2</sub> was calculated using the waste-specific coefficient. To calculate CO<sub>2</sub> savings (CO<sub>2</sub>-S) and cost saving (CS) for each type of waste, the assumption was made that all the recycled waste would have otherwise been disposed as HW.

**Results:** Before the protocol, all ORs produced 29103.78 kg of waste; ORs 5 and 7 2202.92 kg. E<sub>CO2</sub> and disposal cost was 110594.36 kg and 40716.19 € for all ORs; 8371.10 kg and 3081.89 € for ORs 5 and 7. After the protocol, total waste was 3277.91 kg: plastic 244.52, glass 163.04, paper 260.22, metal/aluminum 5.42, drugs 0.8, dry matter 46.75, HW 2557.96 for ORs 5 and 7. E<sub>CO2</sub> 11189.61 kg; CO<sub>2</sub>-S 1266.45 kg (10.2%); disposal cost 3962.42 €; CS 624.49 € (13.6%). Overall waste production for all ORs was 19007.66 kg: paper 677; plastic 576; HW 17754.66. E<sub>CO2</sub> 70253.58 kg; CO<sub>2</sub>-S 1975.53 kg (2.7%); disposal cost 25524.37 €; CS 1067.35 € (4%).

**Conclusion:** Recycling in ORs is feasible. In our clinic, 21.96% of waste (719.95 out of 3277.91 kg) was successfully recycled in 2 ORs and 6.59% (1253 out of 19007.66 kg) in all ORs. This leads to CO<sub>2</sub>-S of 2.7-10.2% and CS of 4-13.6%. Embracing recycling could realize a more environmentally conscious healthcare system and optimize financial resources.

### Teaching a New Dog Old Tricks: Electronic Health Record Burden by Number of Practice Years

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**Introduction:** Electronic health record (EHR) use has surged over the past 2 decades. Physicians reporting burnout have cited the EHR as a primary cause. Higher attrition and burnout rates of early-career surgeons are well documented, and further research into variance in EHR burden by surgeon experience level is vital. This study assessed differences in EHR use between attending surgeons at various career stages.

**Methods:** A retrospective analysis of EHR activity was conducted May 2022-May 2023 for 593 attending surgeons. Gender, years since residency completion (practice years), clinical workload (FTE), and specialty were documented. Metrics were analyzed including total time spent in the EHR, notes, orders, and inbasket, as well as volume of inbasket messages. Multivariable linear regression was performed to compare outcomes by number of practice years while controlling for physician characteristics, clinic workload, and practice volume.

**Results:** For every 10 additional years of experience, surgeons spent significantly less time in the EHR and received fewer messages (both  $p < 0.001$ ). Increased practice years was significantly correlated with reduced EHR activity outside clinical hours ( $p = 0.003$ ),

reduced time on unscheduled days ( $p = 0.008$ ), and increased orders with team contributions ( $p < 0.001$ ) (Figure).

**Conclusion:** Increased surgeon practice years was significantly associated with decreased EHR burden. These findings raise concerns for the role of EHR workload in early-career surgeon burnout and underscore the need for strategies to alleviate documentation burden in new providers. Further study must investigate the potential for a causal relationship between EHR burden, practice years, and burnout.

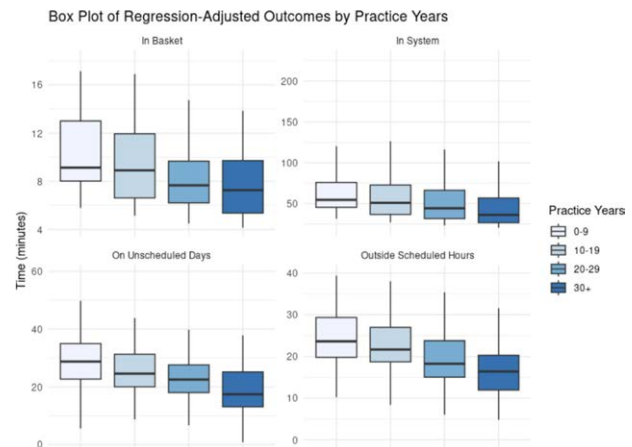


Figure 1.

**The Association of the Environmental Justice Index with Outcomes in General Surgery**

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Cleveland Clinic, Cleveland, OH

**Introduction:** The Environmental Justice Index (EJI) from the CDC nationally ranks the cumulative impacts of environmental injustice at the census-tract level based on social vulnerability and environmental burden (eg air and water pollution). We aimed to assess the association between EJI and outcomes after surgical operations.

**Methods:** All patients who underwent appendectomy, cholecystectomy, colectomy, inguinal hernia repair (IHR), ventral hernia repair (VHR), or exploratory laparotomy within a single healthcare system between 2012 and 2022 were included. Sociodemographic variables and postoperative outcomes were extracted from the electronic medical record. Multivariable logistic regression was used to assess the association between EJI and outcomes, controlling for age, race, sex, insurance status, Charlson Comorbidity Index, operation, and case urgency.

**Results:** A total of 129,215 patients underwent 11,976 (9.3%) appendectomies, 34,343 (26.6%) cholecystectomies, 25,328 (19.6%) colectomies, 9,300 (7.2%) exploratory laparotomies, 24,315 (18.8%) IHRs, and 23,953 (18.5%) VHRs. Sociodemographics included a median age of 57.0 (interquartile range [IQR] 43.1-68.4)

years; 78.8% White, 10.9% Black, and 6.7% Hispanic, 40.8% privately insured, 53.7% publicly insured, and 5.4% uninsured. The overall 30-day mortality rate was 1.1% ( $n = 1,398$ ), 30-day readmission rate was 7.1% ( $n = 9,125$ ), and 30-day reoperation rate was 2.3% ( $n = 2,990$ ). On multivariable logistic regression, EJI was associated with an increased risk of 30-day mortality (1.46 odds ratio [OR], 95% CI 1.18-1.78; Table 1), 30-day readmission (1.19 OR, 95% CI 1.10-1.29), and 30-day reoperation (1.18 OR, 95% CI 1.03-1.35).

**Table 1.** Multivariable Logistic Regression Comparing Mortality with Sociodemographic Patient Factors

Patient factor	Odds Ratio	95% CI	p Value
Environmental Justice Index	1.46	1.18-1.78	<0.001
Age	1.05	1.04-1.58	<0.001
Race, White	1.00		
Black	1.18	1.00-1.39	0.037
Hispanic	0.42	0.28-0.62	<0.001
Other	1.29	0.94-1.72	0.102
Insurance, Private	1.00		
Public	1.11	0.93-1.33	0.245
Uninsured	3.21	2.54-4.05	<0.001

**Conclusion:** The EJI was associated with adverse outcomes after common general surgery operations. As health systems endeavor to reduce disparity, EJI may be useful to identify high-risk geographies and advocate for changes in the built environment.

**The Burden of Emergency General Surgery Hospitalization on Patients and Informal Caregivers: A Qualitative Study**

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**Introduction:** Emergency general surgery (EGS) hospitalization often occurs unexpectedly, leaving patients and family members to cope with complex diagnoses that alter daily life. We sought to explore stressors of hospitalization for both EGS patients and their informal caregivers.

**Methods:** We conducted 30-minute semi-structured interviews of EGS patients and their caregivers at a single academic center (April-October 2023) using purposeful sampling to include adult EGS patients hospitalized  $\geq 7$  days. Patients identified their primary caregiver. Interviews were completed until thematic saturation was reached, coded in NVivo, and analyzed using a modified grounded theory approach.

**Results:** Of 27 participants, 17 were EGS patients and 10 were caregivers. Many patients reported no identifiable stressors before hospitalization. During hospitalization, most patients stressed about their EGS conditions and care plans (Figure 1). Patients also reported emotional stress around missing day-to-day life. Less than half of patients experienced stress related to employment. Caregivers, most

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commonly female adult children of EGS patients, reported their own health and other caregiving responsibilities as stressors outside of the patient's hospitalization. Some caregivers experienced relief during hospitalization, while others experienced anxiety. Complication had a significant negative emotional toll on caregivers. Most caregiver financial stressors involved missing work and managing the patient's finances. Transportation and childcare were infrequent sources of stress for both caregivers and patients (Figure 1).

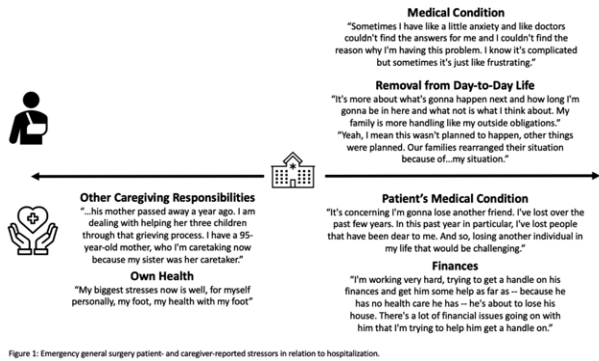


Figure 1: Emergency general surgery patient- and caregiver-reported stressors in relation to hospitalization.

Figure 1.

**Conclusion:** The stress of hospitalization impacts both EGS patients and their caregivers. Efforts to support patients should focus on care plan communication, while efforts for caregivers should focus on social services and emotional support.

### The New Orleans Hernia Event Reduction: A Novel Indication for Amnion (NO HERNIA) Clinical Trial for Biological Prophylaxis Against Incisional Hernia

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Louisiana State University Health Sciences Center, New Orleans, LA; Ochsner Health, New Orleans, LA

**Introduction:** Incisional hernia (IH) occurs in 12-14% of laparotomy patients and incurs annual costs of \$6-10 billion. In the US, there is no standard for IH prophylaxis. In pilot studies, we showed that dehydrated human amniotic-chorionic membrane (dHACM) onlay on closed abdominal fascia reduced IH formation. We therefore designed the New Orleans Hernia Event Reduction: A Novel Indication for Amnion (NO HERNIA) trial (NCT04417140). This prospective, double-blinded, multi-centered randomized controlled trial tested the hypothesis that dHACM would reduce IH frequency and size in high-risk patients.

**Methods:** Twenty-eight surgeons at 4 hospitals screened patients undergoing laparotomy with incisions  $\geq 6$  cm. Those at  $\geq 150\%$  IH risk were offered enrollment. Subjects were randomized 1:1 to fascial closure alone (control) or closure plus dHACM (treatment). Six months postoperatively, subjects underwent blinded radiographic evaluation (CT, MRI, or ultrasound) for IH. The primary outcomes were IH formation rate and IH size.

**Results:** Between September 2019 and September 2023, 530 subjects were screened and 234 (44.3%) were enrolled (control n = 116, treatment n = 118, Figure 1). Primary outcomes data were obtained in 109 subjects (46.6%, control n = 57, treatment n = 52). IH occurred in 12 (21.1%) control subjects vs 8 (15.4%) treatment subjects ( $p = 0.47$ ). Maximum IH size was decreased in treatment ( $59.4 \text{ cm}^2$ ) vs control ( $225 \text{ cm}^2$ ) subjects.

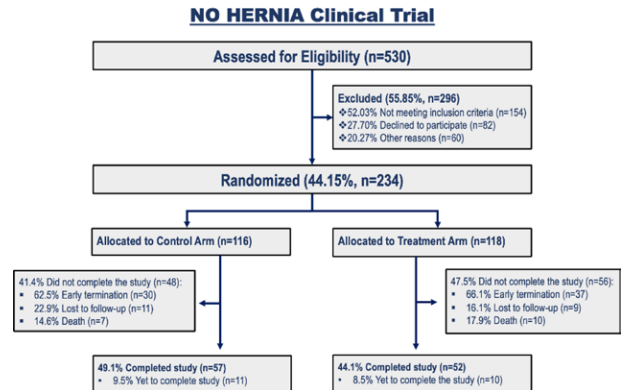


Figure 1.

**Conclusion:** In high-risk patients, abdominal fascial closure with dHACM onlay reduced both IH formation and maximum IH size compared with closure alone. The benefit was comparable to prior trials of IH prophylaxis using polypropylene mesh. Definitive studies are warranted.

### The Receipt of Nonelective Cancer-Specific Gastrointestinal Surgery: Does Rurality Matter?

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**Introduction:** Rural communities constitute a populace marked by various social challenges influencing health outcomes. As such, nonelective operations for cancer may have a disproportionate impact on rural populations. We explored patient and county-level factors contributing to differences in the receipt of nonelective cancer-specific surgery between rural and urban residents.

**Methods:** A retrospective study of adult patients captured in Surveillance, Epidemiology, and End Results-Medicare between January 2008 and December 2015. Patients with incident cancer of the stomach, liver, pancreas, gallbladder, or other biliary origin and who underwent cancer-specific surgery were included. The primary outcome was nonelective cancer-directed surgery among rural vs urban residents. We conducted a multivariable mixed-effects logistic regression model to adjust for confounders while accounting for county-level clustering.

**Results:** In total, 8,181 underwent operative intervention; 2115 (26%) were nonelective. The incidence of nonelective

operation was similar between rural and urban [237 (24%) and 1,878 (26%);  $p = 0.10$ ]. There was no statistically significant difference in the unadjusted and adjusted odds of nonelective operation between rural and urban residents [odds ratio (OR) 0.88, 95% CI (0.75-1.02);  $p = 0.10$ ] and [adjusted odds ratio (aOR) 0.93, 95% CI (0.76-1.12);  $p = 0.44$ ]. Additionally, high social vulnerability index counties or Black race was significantly associated with increased odds of nonelective operation [aOR 1.40, 95% CI (1.07-1.84);  $p = 0.02$ ] and [aOR 1.55, 95% CI (1.39-1.87);  $p = <0.0001$ ] (Figure 1).

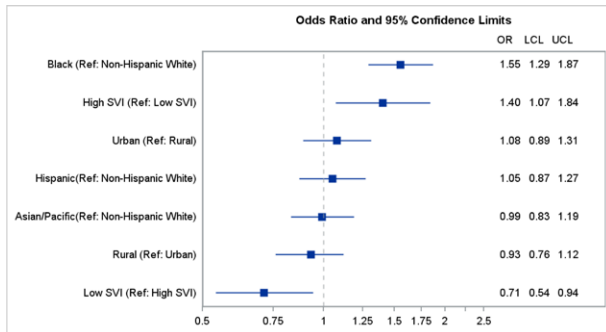


Figure 1.

**Conclusion:** This study provides insights into receiving nonelective operation across different demographic and geographic groups. Further research is warranted to explore whether disparity in outcomes persists despite the comparable likelihood of receiving nonelective operation between rural and urban communities.

### The Significant Gender Gap in Surgery Well-Being Leadership

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**Introduction:** Despite advancements in gender equality in academic medicine, disparity persists in promotion, salary, and work roles, with women performing a higher rate of uncompensated service tasks. Hospital systems are appointing well-being leaders to address burnout and improve work-life integration. It remains unknown whether gender disparity exists in these positions. We hypothesized a gender gap in well-being positions with higher proportions of women performing these duties.

**Methods:** We identified the top 100 medical schools for research using the 2023-2024 US News and World Report. Online searches identified well-being leadership for each medical school, affiliated surgery department, and hospital system. Gender was determined using pronouns in professional biographies. Statistical analyses included chi-square tests comparing observed gender distribution with expected distributions.

**Results:** Surgery departments had the highest proportion of women in well-being leadership, with 18 out of 21 leaders (86%), compared with 54 out of 74 (73%) in medical schools and 39 out of 62 (63%) in hospital systems. Compared with expected distri-

butions, surgery departments ( $p = 0.001$ ) and medical schools ( $p = 0.004$ ) had significantly more women well-being leaders.

**Conclusion:** Gender disparity in well-being roles, particularly in surgery departments, are significant. While increasing women's representation in leadership promotes visibility, it risks perpetuating stereotypes associating nurturing roles with women. Women physicians experience a higher rate of burnout than men, and appointing women to address this issue can exacerbate the burden. Our study relies on online data, which may be incomplete. Further investigation is needed to understand the financial, career, equity, and well-being implications of this gender gap.

### The State of Surgical Leadership: A Nationwide Analysis of Department Chairperson Demographics and Surgical Specialty

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Juan, PR; Philadelphia College of Osteopathic Medicine, Haddon  
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**Introduction:** In our study we aim to assess trends in gender, race, and surgical specialties among US surgery department chairs. Despite growing recognition of diversity's importance in medical leadership, there is a lack of comprehensive data on the demographics of general surgery chairpersons. This research examines these leaders' race, sex, age, specialty, American medical graduate vs foreign medical graduate status, and years of practice to identify trends and gaps in leadership diversity.

**Methods:** Our data collection began with a comprehensive list of long-term hospitals obtained from The Cecil G Sheps Center. We predominantly conducted web searches to gather our data, focusing on reliable sources such as hospital websites, official announcements, the Society of Surgical Chairs (SSC) website, and Healthgrades.com. When online information was missing, we directly contacted the general surgery departments. We assessed race by analyzing available photographs, last names, and the backgrounds of the chairpersons. To mitigate potential bias in this subjective evaluation, all research team members undertook an Implicit Association Test to minimize racial bias.

**Results:** A total of 990 surgery department chairs were identified: 82.83% were men, with 82% identifying as White, 5% Asian, 4% Black, and 3% Latino or Hispanic. About half, 54%, were general surgeons. The leading subspecialties included orthopaedic, vascular, thoracic, and urology surgery.

**Conclusion:** The findings of our study illuminate a significant skew toward White male leadership within general surgery departments across the US, particularly among those who are American medical

graduates and over 56.6 years of age. About half of these chairs have subspecialties with varied representation across specialties.

### Think Twice: De-Implementation of Routine Laboratory Testing in Acute Care Surgery

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**Introduction:** De-implementation of routine laboratory testing promotes high-value care. Laboratory reduction efforts in surgical patient populations, however, are limited. Here, we evaluate the impact of an improvement intervention on decreasing low-value laboratory testing in acute care surgery.

**Methods:** Our multidisciplinary team aimed to reduce inpatient acute care surgery labs by 25% in 1 year. The patient cohort consisted of non-ICU, acute care surgery (ACS); trauma and emergency general surgery) patients with operative and nonoperative admission with length of stay 30 days or fewer. The intervention emphasized test ordering as clinically indicated with discontinuation of routine daily labs. Implementation consisted of monthly communication with clinical team members, circulating guideline mate-

rials to surgical team members, and posting intervention-related resources in workspaces. Data was collected prospectively from the electronic medical record. Primary outcomes measures were evaluated with statistical process control methods accepted in healthcare.

**Results:** There were 3606 preintervention patients (November 2019-October 2021) and 4,349 postintervention patients (November 2021-December 2023). Mean lab tests per patient-day for surgical patients (n = 1365 preintervention, 1444 postintervention) decreased from 4.1 to 3.0 tests after intervention (Figure 1). Mean lab tests per patient-day for non-surgical patients (n = 2241 preintervention, 2905 postintervention) decreased from 3.5 to 2.5 labs (Figure 1). There was no difference in pre- and postintervention 30-day readmission rate. We estimate 25,947 total labs saved throughout the study period.

**Conclusion:** Our intervention significantly reduced laboratory testing in both surgical and non-surgical ACS patients and sustained these improvements over 24 months. Dissemination of these efforts will promote high-value surgical care.

### Use of Risk Assessment Tools in Emergency General Surgery: A Survey of Canadian General Surgeons

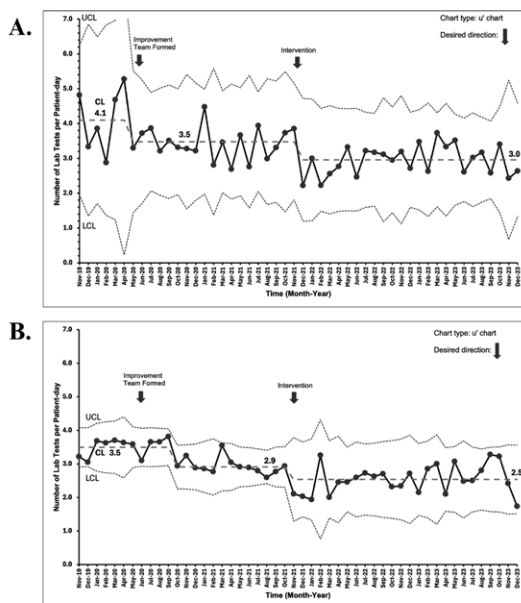
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**Introduction:** The applicability of risk assessment tools (RATs) for emergency preoperative risk assessment (PRA) is unclear. We sought to investigate how Canadian surgeons approach PRA for emergency general surgery (EGS) and their awareness of available RATs.

**Methods:** Canadian Association of General Surgeons members were invited to complete an online cross-sectional survey. Descriptive statistics were reported.

**Results:** Of 278 respondents (response rate 18.2%), 70% were attending surgeons (44% had 5-10 years in practice, 47% >10 years), 5% fellows, and 25% residents. A total of 51% of participants were acute care surgery (ACS) fellowship trained and 93% worked in centers with a dedicated ACS service. Most worked in medium-/large-volume centers (90%) and teaching hospitals (77%). 55% of participants used RATs for PRA; this rate rose among trainees (57% residents, 86% fellows) and decreased with increasing years in practice (60%, 53%, and 48% for <5, 5-10, or >10 years, respectively). ACS fellowship-trained surgeons used RATs more frequently. Surgeons used RATs most often to predict complication in elderly and high-risk patients (Table 1). The best known and used tools were the American College of Surgeons NSQIP calculator (68% and 59%) and the Emergency Surgery Acuity Score (ESAS, 66% and 47%, respectively). Surgeons were divided as to accuracy of RAT estimates, with 47% considering them generally accurate and 49% inaccurate.



**Figure 1.** Statistical process control chart ( $\bar{x}$  chart) demonstrating lab tests per patient-day. Timing of improvement team formation and intervention implementation are indicated by gray arrows. CL, center line (mean labs/patient-day); UCL, upper control limit (3 sigma); LCL, lower control limit (3 sigma). **Panel A.** Surgical patient mean labs per patient-day. Special cause variation occurred in May 2020 resulting in a center line shift from 4.1 to 3.5 labs per patient-day (8 points below the center line). Special cause variation was again seen beginning December 2021 resulting in a second center line shift from 3.5 to 3.0 labs per patient day (8 points in a row below the center line). The final reduction from baseline was sustained for 24 months. **Panel B.** Nonsurgical patient mean labs per patient-day. Special cause variation occurred in October 2020 resulting in a center line shift from 3.5 to 2.9 labs (4 of 5 points outside 2 sigma). Special cause variation was again seen beginning November 2021 resulting in a center line shift from 2.9 to 2.5 labs (3 points below the LCL, one point above center line, followed by 14 consecutive points below center line). The final reduction from baseline was sustained for 25 months.

**Figure 1.**

\*Excellence in Research Award recipient.

**Table 1.** Risk Assessment Tools: Counseling, Reason for Using or Not Using

In your EGS practice, which patients do you counsel on perioperative risk beyond the routine discussion of procedure-specific complications? Check all that apply	All patients over a certain age	All patients perceived to be “high risk”	Patients who ask about risk	All/nearly all patients
	55.8%	38.1%	33.5%	45%
For which EGS patients do you use perioperative risk assessment tools? Check all that apply	All patients over a certain age	All patients perceived to be “high risk”	Only when trying to justify not operating	Always/ almost always
	59.7%	54.3%	21.2%	26.3%
If you use risk assessment tools with your EGS patient, what do you use them for primarily? Check all that apply	Prediction of minor complications	Prediction major complications	Prediction of mortality	Prediction of patient disposition/ functional outcomes
	59.3%	70.5%	52.2%	28.1%
If you use risk assessment tools with your EGS patients, how do you incorporate these into your decision-making? Check all that apply	Use to guide to which patients to recommend non-operative management	Use to help patients understand their risk	Use to reinforce decisions made based on clinical judgment	Other
	60.1%	71.2%	40.3%	1.4%
If you do not use risk assessment tools with your EGS patients, why not? Check all that apply	They are not easily accessible in EGS context	They are cumbersome to use or take too much time	I do not think they are applicable to my patient population	I’m not familiar with them
	41%	33.4%	31.6%	14.7%

**Conclusion:** RATs are underused in favor of personal judgment. Use of RATs may facilitate decision-making in elderly/complex patients and help reduce variability in practice, particularly for trainees and less experienced surgeons.

**Use of Stabilized Isotonic Sodium Hypochlorite Solution for Prevention of Complication in Complicated Appendicitis**

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**Introduction:** Complicated appendicitis is one of the primary indications for operation. Its mortality rate is low; however, the postoperative complication rate can reach up to 50%. Various techniques have been described for these procedures, intraperito-

neal lavage being 1 of them. Solutions such as povidone-iodine or saline solution (SS) have been reported. Public hospitals have recently used isotonic stabilized sodium hypochlorite solution (ISSHS) in these procedures; however, its effectiveness has not been reported.

**Methods:** A prospective, and comparative study was undertaken involving patients diagnosed with complicated appendicitis, who were subsequently divided into 2 groups: those subjected to lavage with SS and those treated with ISSHS. The duration of hospitalization and prevalence of postoperative complication were compared. Chi-square test and Student’s *t*-test were used for statistical analysis.

**Results:** A total of 120 patients were evaluated, with 60 patients per group. The mean age was 37.62 ± 14.75 years. The overall average length of hospital stay was 4 days. For the SS group, it was 6.15 days, and for the SEHSI group, it was 1.86 days (p = 0.00). Statistically significant differences were observed when comparing postoperative complication between the groups: seroma (p = 0.001), wall abscess (p = 0.001), wound infection (p = 0.02), abdominal distention (p = 0.002), surgical wound pain (p = 0.001), postoperative ileus (p = 0.01), and intra-abdominal abscess (p = 0.000) (Table 1).



**Table 1.** Complication Between 2 Groups

Complication	Total (n = 120)	Saline solution (n = 60)	Stabilized isotonic sodium hypochlorite solution (n = 60)		p Value
Seroma	43 (35.83%)	30 (50%)	13 (21.67%)		0.001
Wall abscess	20 (16.67%)	15 (25%)	5 (8.33%)		0.01
Wound infection	31 (25.8%)	22 (36.67%)	9 (15%)		0.02
Abdominal distention	46 (38.33%)	32 (53.33%)	14 (23.33%)		0.002
Surgical wound pain	30 (25%)	24 (40%)	6 (10%)		0.000
Postoperative ileus	25 (20.8%)	18 (30%)	7 (11.67%)		0.01
Intra-abdominal abscess	16 (13.3%)	16 (26.67%)	0 (0%)		0.000

**Conclusion:** The use of ISSHS was effective in reducing complication from complicated appendicitis in our study. It also showed a decrease in hospital stay.

### Where One Lives Is Associated with Mortality after General Surgery: A Study of the Area Deprivation Index in a Non-Medicare Population

Abby R Gross, MD, Chase Wehrle, MD,

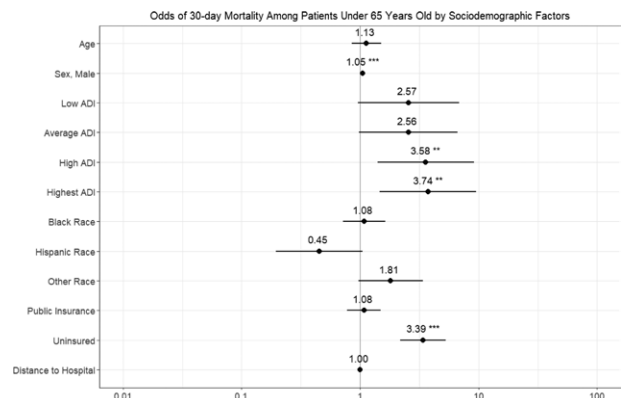
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**Introduction:** The influence of neighborhood on surgical outcomes has been underexplored in heterogeneously insured populations. We aimed to examine the association between sociodemographic characteristics, neighborhood deprivation, and mortality in patients ineligible for Medicare.

**Methods:** Patients under 65 years of age who underwent appendectomy, cholecystectomy, colectomy, inguinal hernia repair (IHR), or ventral hernia repair (VHR) within a single healthcare system between 2012 and 2022 were included. Sociodemographic and postoperative outcomes were extracted from the medical record and merged with the Area Deprivation Index (ADI), which was categorized into quintiles. The association between 30-day mortality and sociodemographics was assessed with multilevel logistic regression, controlling for age, Charlson Comorbidity Index, operation type, and case urgency with nesting within neighborhood.

**Results:** A total of 81,824 patients underwent 10,289 (12.6%) appendectomies, 25,098 (30.7%) cholecystectomies, 15,093 (18.4%) colectomies, 14,275 (17.4%) IHRs, and 17,069 (20.9%) VHRs with overall mortality rate of 0.26% (n = 213). Compared with private insurance, uninsured patients had an increased mortality risk (odds ratio [OR] 3.39, 95% CI 2.17-5.29); however, patients on Medicaid did not (OR 1.08; 95% CI 0.78-1.49). The mortality risk increased with increasing ADI (Figure 1), with the highest risk in the top quintile (OR 3.74, 95% CI 1.46-9.56). There was no association between 30-day mortality and race or distance to hospital.

**Figure 1.**

**Conclusion:** Mortality after common general surgical procedures was associated with a lack of insurance and increased neighborhood deprivation in patients under the age of 65 years. Addressing drivers of neighborhood deprivation and increasing public insurance coverage may minimize disparity in postoperative mortality after general surgery.

### ePosters

#### A Comparison Between the Five-Item Modified Frailty Index (5-mFI) and ASA Score at Predicting Surgical Outcomes after Inguinal Hernia Repair

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**Introduction:** The five-item modified frailty index (5-mFI), a recently described preoperative risk measure, assigns one point for each of the following comorbidities if present 30 days before surgery: hypertension, COPD, congestive heart failure, diabetes mel-

litus, and a dependent functional status. We sought to compare the effectiveness of 5-mFI and the American Society of Anesthesiologists Score (ASA) in predicting outcomes after inguinal hernia repairs.

**Methods:** A retrospective analysis of inguinal hernia repair in adult patients between 2014 and 2023 was extracted from the Abdominal Core Health Quality Collaborative registry. 30-day mortality, readmission, post-operation complications, reoperation, surgical site infection (SSI), and surgical site occurrences (SSO) were cross-matched with ASA and 5-mFI scores to determine sensibility and specificity. Receiver operator characteristic curves (ROC) and area under the curves (AUC) were compared using DeLong tests. The best threshold was determined using Youden's statistic.

**Results:** A total of 16,537 patients were included. Median age was 64 years (range 50-71), 91% (n = 14998) were male. The AUC of the 5-mFI compared to ASA was significantly lower in mortality, postoperative complications and SSO. No difference was observed in risk of readmission, re-intervention, or SSI. The optimum cut-off for 5-mFI to predict postoperative outcomes was  $\geq 1$  for all outcomes except SSI, which was predicted at  $\geq 2$ . The optimum cutoff for the ASA score for all outcomes was  $\geq 3$ .

**Conclusion:** Our results suggest that 5-mFI is less accurate than ASA score at predicting outcomes within 30 days. ASA score could only reliably predict mortality (AUC 0.838) after inguinal hernia repair.

### Applications of Quantum Computing in Clinical Care: A Scoping Review

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**Introduction:** Quantum computing is a groundbreaking technology that harnesses properties of quantum mechanics to process information in a novel way, enabling it to solve certain complex problems more efficiently than classical computers. Due to its budding potential, QC's role in clinical medicine research is burgeoning. This review seeks to aggregate and examine the use and prospects of QC in clinical settings.

**Methods:** A scoping review was conducted using PubMed, Scopus, and Web of Science databases. Search parameters included "quantum computing" and "clinical medicine", with a timeframe spanning January 2015 to January 2024. The review targeted articles showcasing QC applications with direct relevance to clinical care, excluding those without direct relevance.

**Results:** Studies highlighting the applications of QC in clinical care were identified from the search, with 38/240 publications reviewed meeting inclusion criteria. Discussion regarding applications of QC in medical imaging (48.65%), clinical decision-making (42.8%), and oncology (40.54%) were most common. The most prevalent applications in clinical specialties were within neurology and neurosurgery. Applications were also noted in other surgical (orthopaedic, urologic, general, head and neck) and clinical (dermatology, cardiology, infectious disease) specialties. Temporal analysis showed a sharp increase in interest: zero publications in 2015-2017, five in 2018-2020, and thirty-three in 2021-2023.

**Conclusion:** The applications of QC in clinical care is rapidly growing. Like AI, QC is moving toward more practical systems to enhance utility in healthcare. This review underscores the need for further development of QC in clinical settings and highlights its potential to improve healthcare delivery and patient outcomes.

### Armies Build Resistance: Increased Bacterial Resistances in Perforated Appendicitis

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**Introduction:** Perforated appendicitis is associated with increased morbidity and mortality, but its bacterial landscape is largely understudied. We sought to characterize the bacterial species and sensitivities causing perforated appendicitis.

**Methods:** A retrospective, multi-institutional review of patients who underwent laparoscopic appendectomy between January 2020 and July 2023 was performed. Perforated appendicitis with culture results were included. Moderately resistant bacteria was defined as resistance to more than three antibiotics. Student's t-tests were applied appropriately.

**Results:** 138 patients who underwent laparoscopic appendectomy with cultures were analyzed. Patients experienced  $2.51 \pm 1.65$  days of pain prior to presentation. 59 unique species were cultured, averaging  $2.57 \pm 1.33$  species per patient. The most common were *E. coli* (n = 108, 78.2%), *P. aeruginosa* (n = 26, 18.8%), and *B. fragilis* (n = 23, 16.6%). 34 (24.6%) patients had moderately resistant strains of bacteria, and the most common strains with tested resistance were *E. coli*, *P. aeruginosa*, *E. avium*, and *S. viridans*. Of the resistant *E. coli* strains, 56 (94.9%) were resistant to ampicillin, 46 (77.9%) to ampicillin/sulbactam, and 25 (42.3%) to trimethoprim-sulfamethoxazole. 5 (3.6%) had cultures with ESBL, and 5 patients (3.6%) had resistance to piperacillin-tazobactam. Patients with moderately resistant bacteria had more species per culture than those without any moderately resistant bacteria ( $3.21 \pm 1.49$  vs  $2.36 \pm 1.21$ ,  $p < 0.002$ ).

**Conclusion:** Our finding of high rates of resistant bacteria suggests both the urgency for antibiotic stewardship and the importance of culture collection. Such resistance is more likely to be present in polymicrobial cultures.

### Association of Nonoperative Treatment of Appendicitis Rates and the Publication of CODA

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**Introduction:** The APPAC trial in 2015 proved feasibility of non-operative management of appendicitis (NOTA), but the

practice was not widely adopted for concerns of generalizability to the US population. The CODA trial, published in 2020, was a large-scale US-based study demonstrating the safety and efficacy of NOTA. We hypothesized that following CODA, rates of surgical treatment of appendicitis decreased while those of NOTA increased.

**Methods:** Patients presenting with uncomplicated appendicitis to UCLA Health between 2015-2023 were reviewed. Those who received an appendectomy within 2 days of presentation were categorized as “initial surgery”, while those who did not were considered “initial NOTA” treatment. The rates of treatment were calculated in whole years before and after publication of CODA (November 12, 2020).

**Results:** A total of 2,901 patients presented with uncomplicated appendicitis, of which 2,114 (73%) received initial surgery and 787 (27%) had initial NOTA. The rates of managements for 3 years after publication of CODA were similar to those for 5 years before CODA. Of the initial NOTA cohort, 156 (20%) required eventual appendectomy: 14 during the same admission (median days to surgery 4, interquartile range [IQR] 3-7 days) and 142 during a later admission (median days to surgery 72, IQR 30-176 days).

**Conclusion:** Despite compelling evidence that appendicitis can be treated non-operatively, most patients undergo appendectomy as initial treatment. The rate of NOTA was unchanged even after the publication of a very large-scale trial, which is consistent with previous findings that when given a choice, patients elect for surgery.

### Automated Large-Scale Cell Annotation with Self-Supervised Learning

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**Introduction:** Cell type annotation is a critical part of single-cell sequencing data analysis. Traditional manual annotation methods have very tedious and time-consuming steps and rely on a priori knowledge with a certain subjective bias. However, the tools needed to automatically analyze and interpret these datasets on a large scale do not yet exist.

**Methods:** In this paper, we develop a deep learning-based self-supervised method for efficient cellular phenotype classification while reducing the annotation burden. The method first learns intrinsic pairwise similarities from unlabeled cell images, and then maps the learned features to cell labels via a small fraction of annotated reference samples to achieve accurate cell classification. The results are compared with multiple methods, extensively and rigorously validating the superior performance of the method in terms of cell type annotation, novel cell type discovery, batch effect robustness, and model interpretability.

**Results:** The study utilizes five multiplexed immunohistochemistry datasets and one imaging mass spectrometry cytology dataset for training and testing. The results show that the present method achieves weighted F1 scores of 0.79 to 0.96 on the six datasets when using 5% of the annotated data, which is comparable to fully supervised classifiers with 2,000 to 10,000 annotated cells.

**Conclusion:** This approach not only reduces the manual annotation burden, but also provides new opportunities for efficient large-scale learning of histological multiplexed imaging data.

### Biologic versus Permanent Synthetic Mesh: What Hernia Recurrence Risk Will Patients Accept to Avoid a Permanent Implant?

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**Introduction:** Patients' perceptions about permanent mesh for ventral hernia repair (VHR) may be due to lack of knowledge of risks or influenced by media. We aimed to assess patients' threshold for accepting the risk of hernia recurrence to avoid synthetic mesh.

**Methods:** Adult patients with prior or upcoming VHR viewed a one-time video decision aid describing recurrence risk with biologic versus synthetic mesh. Based on randomized trials, the recurrence rate using synthetic mesh was set at 9%. Patients were asked to choose biologic or synthetic mesh using a probability trade-off (PTO) technique, varying the recurrence rate with biologic mesh. PTO was repeated with additional information about wound complications. The threshold value was the recurrence rate (1-100%) at which a patient would no longer choose biologic mesh. Linear regression assessed factors associated with lower PTO scores or risk aversion to biologic mesh.

**Results:** Of 75 patients, 67% did not want biologic mesh, 21% would accept biologic mesh if it had lower recurrence rate than synthetic, and 12% would choose biologic mesh despite a higher hernia recurrence rate. Additional information about wound complications had little effect on results (68%, 20%, and 12%). On multivariable analysis, postoperative patients had higher PTO scores than preoperative patients (4.4, CI 0.71-8.2), and Hispanic patients had lower PTO scores than White patients (-4.2, CI -8.5-0.1).

**Conclusion:** Contrary to the current literature, most patients preferred synthetic mesh at any recurrence rate over biologic mesh. Further studies should focus on identifying drivers of patients' preference for mesh type.

### Cholelithiasis Management: When to Skip the MRCP

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**Introduction:** MRCP is used in the management of suspected acute biliary obstruction to determine the presence of cholelithiasis. This imaging study adds cost and time to a patient's hospitalization without any therapeutic benefit. ERCP is both

diagnostic and therapeutic, and is the main treatment modality for choledocolithiasis. The aim of this study is to determine the parameters that differed between patients with suspected choledocolithiasis who underwent ERCP directly versus those who underwent MRCP prior to ERCP.

**Methods:** This is a retrospective study. Patients included had an admitting diagnosis related to biliary pathology and underwent cholecystectomy on the same admission as their MRCP or ERCP.

**Results:** 183 patients underwent preop ERCP only and 171 patients underwent both pre-op MRCP+ERCP. Median CBD size on ultrasound for the pre-op ERCP group was 7 mm vs 8 mm in the pre-op MRCP + ERCP group ( $p = 0.2167$ ), median alkaline phosphatase 174 U/L vs 147 U/L ( $p = 0.1630$ ), and median total bilirubin 2.9 mg/dL vs 1.9 mg/dL ( $p < 0.0001$ ). In the pre-op ERCP only group, 107 patients had choledocolithiasis on ERCP (58.47%) vs 117 patients (68.42%) in the pre-op MRCP+ERCP group ( $p = 0.0523$ ). Of 150 patients who had a total bilirubin  $\geq 2.9$  and underwent ERCP, 105 (70.00%) had choledocolithiasis.

**Conclusion:** In suspected choledocolithiasis, elevated total bilirubin level ( $\geq 2.9$  mg/dL) was the most significant parameter leading clinicians to proceed directly with ERCP. We recommend that patients presenting with suspected choledocolithiasis with total bilirubin  $\geq 2.9$  mg/dL proceed directly with ERCP without undergoing prior MRCP.

### Chronic Pain and Musculoskeletal Ailments in Surgical Specialty Residents and Attendees

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**Introduction:** Prevalence of musculoskeletal pain in GS residents and attendings has been reported in up to 80% associated to an 80h work-week in the US. Whilst the average in Mexico is 113h, no statistics or studies have been reported. Aggravating factors that have been recognized: years of practice, hours of surgery/week and, BMI. The most commonly identified types of musculoskeletal conditions are neck and lowerback pain. Chronic pain frequently limits physical performance, requires medical attention and is cause for absenteeism.

**Methods:** An observational, and cross-sectional study was carried out in February 2024, on the residents and attendees of surgical specialties at our hospital. We applied a 3 section questionnaire covering demographic variables, The questionnaire from Colombia University and, the "Nordic Musculoskeletal Questionnaire."

**Results:** Correlation between hours in surgery/week and pain in the middle back ( $p.023$ ), hip ( $p.024$ ) and lower extremities ( $p.003$ ).

Neck pain was increased in relation to open surgery ( $p.015$ ). Shoulder pain was, upper ( $p.045$ ) and lower back ( $p.035$ ) correlated to open surgery in the last 12 months ( $p.035$ ). Laparoscopic surgery was associated to ankle pain in the last 7 days ( $p.034$ ). Middle and lower back pain to minimally invasive surgery ( $p 0.002$ ), related to discomfort in the hands/wrists ( $p.017$ ). Fatigue and Age ( $p.036$ ), years of practice ( $p.040$ ), average days/week ( $p.002$ ) and hours/week ( $p.003$ ) correlated with musculoskeletal ailments as were also resident hierarchy and lower extremity pain ( $p.021$ ).

**Conclusion:** Prevalence of musculoskeletal pain was significant in our cohort. Programs for early detection, management and rehabilitation should be included.

### Comparative Efficacy of Open vs Minimally Invasive Inguinal Hernia Repair in Post-Prostatectomy Patients: A Systematic Review and Proportional Meta-Analysis

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**Introduction:** We aimed to compare open and minimally invasive surgery (MIS) approaches for inguinal hernia repair (IHR) in patients with previous prostatectomy via systematic review and proportional meta-analysis.

**Methods:** Cochrane Central, Scopus, SciELO, Lilacs, and PubMed/MEDLINE were searched for studies on open and MIS IHR after prostatectomy. Outcomes such as recurrence, complications, seroma, hematoma, SSI, and conversion rates were analyzed, with subgroup analyses being conducted for open, TEP, and TAPP procedures.

**Results:** Among 402 screened studies, 19 met inclusion criteria, covering 4,870 MIS IHR (97.9%) and 106 open IHR (2.1%) patients. The cumulative frequency of events for MIS IHR was 2.17 per 100 patients for intraoperative complications (2%; 95% CI [1.78; 2.66];  $I^2 = 0\%$ ), 7.16 per 100 for postoperative complications (3.7%; 95% CI [3.44; 14.31];  $I^2 = 92\%$ ), 5.37 per 100 for seroma (1.8%; 95% CI [2.58; 10.87];  $I^2 = 89\%$ ), 0.81 per 100 for SSI (0.13%; 95% CI [0.3; 2.15];  $I^2 = 54\%$ ), 3.96 per 100 for hematoma (3%; 95% CI [1.78; 8.6];  $I^2 = 45\%$ ), 3.19 per 100 patients for pain (2.9%; 95% CI [2.66; 3.81];  $I^2 = 6\%$ ), and 2.46 per 100 for recurrence (1.2%; 95% CI [1.23; 4.86];  $I^2 = 72\%$ ). The conversion rate for MIS stood at 0.98 per 100 (0.14%; 95% CI [0.28; 3.37];

$I^2 = 65\%$ ). Open procedures had significantly higher hematoma rates compared to MIS (17.65 vs. 3.96 per 100;  $P < 0.01$ ), with no difference in seroma rates.

**Conclusion:** MIS IHR outperforms open IHR in post-prostatectomy patients, offering lower complication rates, especially in postoperative hematoma.

### Consult Boot Camp: Case-Based Learning and Simulation in Role Transition

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**Introduction:** The transition from intern to consult resident can be quite difficult and confers a steep learning curve. We aim to evaluate how case-based learning and simulation can assist with this notoriously daunting role shift.

**Methods:** During the last quarter of the 2022-2023 academic year, we held a series of case-based lectures for rising second year surgical residents covering the most common consults in general and vascular surgery. These sessions incorporated elements of simulation and were facilitated by an attending, fellow, and/or chief resident. A survey assessing comfortability with specific skills was conducted pre- and immediately post-lecture series.

**Results:** 14 interns were surveyed. There were 11 responses to the pre-survey and 8 responses to the post-survey. 62.5% of interns felt a little or very confident about evaluating a surgical consult in general post-lecture series compared to 9.1% pre-lecture series. 50% of interns felt a little or very confident about triaging surgical consults post-lecture series compared to 27.3% pre-lecture series. 100% of interns felt that the boot camp contributed positively to their learning. 87.5% of interns agreed that the boot camp changed their approach to evaluating surgical consults in some way. 100% of interns agreed that the boot camp increased their fund of knowledge in both general and vascular surgery.

**Conclusion:** Case-based learning and simulation can increase comfortability with role transition. Long-term surveys are needed to collect qualitative data on performance in these new roles after this intervention.

### Contemporary Inguinal Hernia Repair: Do Cost and Operative Time Still Differ by Approach?

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**Introduction:** Criticism of robotic surgery cost for inguinal hernia repairs has been raised as interest and expertise in robotic surgery has grown over the last decade. We sought to determine if robotic inguinal hernia repair cost was noninferior to laparoscopic or open repair.

**Methods:** Retrospective review of consecutive open, laparoscopic, and robotic inguinal hernia repairs with mesh at a single tertiary academic medical center from 2020-2023 was performed. Costs and operative time were compared for index unilateral and bilateral cases.

**Results:** For open ( $n = 385$ ), laparoscopic ( $n = 35$ ), and robotic ( $n = 312$ ) unilateral repairs, median operative times were 62, 67, and 67 minutes respectively. Open repairs were faster than laparoscopic ( $p = 0.010$ ), but not faster than robotic ( $p = 0.066$ ), while laparoscopic and robotic did not differ significantly ( $p = 0.5$ ). Total costs for unilateral open repairs (\$11,052) were less than laparoscopic (\$13,470,  $p \leq 0.001$ ) or robotic (\$14,362,  $p \leq 0.001$ ), and laparoscopic was less than robotic ( $p = 0.008$ ). For bilateral open ( $n = 56$ ), laparoscopic ( $n = 23$ ), and robotic ( $n = 76$ ) repairs, median operative times were 104, 101, and 87 minutes respectively. Open and laparoscopic times did not differ significantly ( $p = 0.6$ ); however, robotic times were shorter than open ( $p = 0.006$ ) or laparoscopic ( $p = 0.011$ ). Cost was higher for laparoscopic compared to open bilateral repair (\$19,332 vs \$18,293,  $p = 0.014$ ), but robotic (\$18,845) was not significantly different than open ( $p = 0.13$ ) or laparoscopic ( $p = 0.4$ ).

**Conclusion:** Bilateral inguinal hernia repair is fastest when performed robotically and similar in cost to open and laparoscopic surgery. Studies evaluating the impact of surgeon-robotic experience on cost and operative time are warranted.

### Developing a Patient-Centered Clinical Trial for Treatment of Groin Hernias in Women

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**Introduction:** Women have been excluded from all major trials informing care for groin hernia, despite suffering worse outcomes compared to men. Research to improve care for this common disease should consider patient priorities in design and outcomes. We performed a qualitative study among women with groin hernia to inform future clinical trial design.

**Methods:** We conducted semi-structured, qualitative interviews with adult women who had been diagnosed with a groin hernia. Patients were recruited via convenience sampling at a single academic medical center from June 20-December 1, 2023. Interview transcripts were analyzed using a deductively developed codebook and iteratively refined using an inductive approach. Data were analyzed in MAXQDA.

**Results:** Among 35 women (mean age 64; 83% White) representing a range of hernia repair decisions and experiences (27 had previously undergone surgery, 3 awaiting surgery, and 5 opting against surgery), three dominant themes emerged:

- Study design based on female experience: Participants expressed interest in trials to study watchful waiting and female-specific surgical approaches.
- Willingness to Randomization: Participants were enthusiastic about a future trial (46% agreed, 40% were conditional, 14% disagreed).
- Outcomes of interest: Prioritized outcomes for a future trial included pain, understanding the disease process, quality of life, recurrence, long-term consequences, and time away from normal activities.

**Conclusion:** Groin hernia is a common condition for women, with experienced persons in this cohort identifying specific and salient areas of focus for future clinical trials, ultimately striving for personalized and effective care interventions tailored to the needs of female persons.

### Development of a Modular Dynamic Training Platform to Increase Implementation of Preoperative Hernia Optimization

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**Introduction:** Overcoming barriers related to adherence to preoperative optimization guidelines is critical for successful implementation. Despite evidence that strategies where opinion leaders who explain complex information in easy to learn components, and teach skills modularly are effective, implementation interventions do not employ these components.

**Methods:** Our multidisciplinary team of experts in surgery, implementation science, provider behavior change, and risk communication, developed a modular dynamic training platform to promote preoperative optimization adherence for surgeons. We interviewed 8 surgeons regarding barriers to preoperative optimization and conducted usability testing with a 3-surgeon panel to iteratively refine learning objectives, animated characters, platform structure, storyboards, and graphics. We also developed a pre/post-training self-assessment in which we constructed an 8-item inventory of confidence regarding preoperative optimization paired with a 7-item previously validated scale measuring acceptability. Cognitive interviews were conducted with 2 practicing surgeons to elucidate response errors.

**Results:** Based on our results, we developed, HerOIQ (**H**ernia **O**ptimization for **I**mproved **Q**uality of **L**ife) a brief (<15 mins) modular dynamic training platform for surgeons composed of eight modules with short, animated films (featuring opinion leaders) highlighting optimization barriers related to smoking cessation, glycemic control, and weight management - integrating a novel outcomes tool that facilitates dialogue regarding optimization between surgeons and patients.

**Conclusion:** Our approach to developing a dynamic training platform featuring opinion leaders engaging in overcoming practice conformity barriers and demonstrating teachable moments related

to preoperative hernia optimization informs future implementation strategies for changing surgeon behavior related to guideline adherence that are scalable across regions and states.

### Does Frailty Impact Regret after Surgery? An Analysis of Groin Hernia Repair

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**Introduction:** Prior work has demonstrated that 10% of patients report decision regret following elective groin hernia repair (GHR). While frailty and decision regret are both associated with complications following elective GHR, the degree to which frailty influences decision regret is unknown.

**Methods:** We reviewed the Michigan Surgical Quality Collaborative Core Optimization Hernia Registry, a random sample of adult patients from over 70 hospitals. We included patients who underwent elective GHR from 2020-2021 and completed a validated survey measuring decision regret. Frailty was calculated using the validated 5-factor modified frailty index to categorize patients as not frail, moderately frail, or severely frail. The primary outcome was decision regret at 90-days. A multivariable regression model evaluated the association of frailty with decision regret.

**Results:** Among 2502 patients, 966 (38.6%) were moderately frail, and 213 (8.5%) were severely frail. Severely frail patients were older, had higher BMI, and more comorbidities than moderately frail and non-frail patients (all  $p < 0.001$ ). Severely frail patients were more likely to be approached open (47.4%) versus moderately frail (40.4%) and non-frail patients (37.0%) ( $p < 0.001$ ). There were no differences in post-operative complications ( $p = 0.22$ ). Decision regret was found in 10.8% of patients ( $n = 271$ ): 158 (11.9%) not frail, 92 (9.5%) moderately frail, and 21 (9.9%) severely frail ( $p = 0.17$ ). Neither moderate nor severe frailty was independently associated with decision regret ( $p > 0.05$ ).

**Conclusion:** Frailty is not associated with regret following GHR, despite patients with frailty being overall higher-risk surgical candidates. A more nuanced understanding of decision regret will better inform shared decision-making for GHR.

### Does Sarcopenia Affect Outcome of Major Abdominal Surgeries?

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**Introduction:** Sarcopenia is a health condition identified by decreased muscle quality and quantity. It has been found associated with increased wound complications, length of hospital stay and mortality after surgical procedures.

**Methods:** We did a prospective observational study patients undergoing abdominal surgeries. Sarcopenia was defined as PML3 less than 0.60 in female patients and 0.74 in male patients based on CT calculations, where PML3= Psoas muscle cross sectional area at level of L3/ L3 vertebral body cross sectional area. Patients were assessed for wound complications, length of hospital stay and 30 day mortality in relation to the sarcopenia.

**Results:** A total 107 patients were enrolled in our unit; 36 were sarcopenic and 71 were non-sarcopenic. The findings revealed a significantly higher SSI rate in the sarcopenic group (48%) compared to the non-sarcopenic group (19%). This association remained statistically significant ( $p = 0.012$ ) even after controlling for potential confounding factors.

**Conclusion:** The results of this study suggest that sarcopenia is an independent risk factor for SSI in patients undergoing abdominal surgeries. This highlights the importance of preoperative sarcopenia screening and implementation of targeted interventions to mitigate the risk of SSI in this vulnerable population. Further multicentric, high-powered prospective studies are needed to investigate and understand the role of sarcopenia on operative outcomes.

### Does Timing Matter? The Impact of Interhospital Surgical Transfer on Patient Outcomes in Necrotizing Soft Tissue Infections

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**Introduction:** Necrotizing soft tissue infections (NSTIs) are life-threatening and require prompt diagnosis, early surgical interventions, and complex perioperative care. Transfer to tertiary care hospitals (TCH) is often requested. We hypothesized that interhospital transfer of NSTI patients may preclude timely surgical debridement, thereby worsening outcomes.

**Methods:** We conducted a retrospective review of adult patients treated for surgically-confirmed NSTIs from 2016-2021 at a TCH. Patients were grouped by first presentation at TCH or outside hospital (OSH); the OSH patients were further divided into those who underwent index operation prior to transfer vs after. We compared patient and presentation characteristics. Outcomes included time to first surgery, total surgeries, hospital and ICU length of stay, fecal diversion, mortality, consultants, and disposition.

**Results:** 145 NSTI patients were included: 23 TCH (15.8%), 108 (74.4%) OSH/TCH first surgery, and 16 (11.0%) OSH first surgery. Demographics and comorbidities were similar between groups. There was no difference in minutes to first surgery between TCH ( $731 \pm 371$ ) and OSH patients ( $867 \pm 498$ );  $p = 0.22$ . There was no difference in ICU days for patients who presented at TCH ( $M = 4.52$ ,  $SD = 5.10$ ) and those transferred from OSH ( $M = 3.74$ ,  $SD = 5.68$ );  $p = 0.56$ . Those who started at TCH had more surgeries

than OSH patients ( $4$  vs  $2.8$ ,  $p = 0.02$ ). Mortality was unchanged between groups. There was no difference in other outcomes.

**Conclusion:** These findings suggest that transfer status does not independently predict the outcomes for NSTI patients. Transfer to TCHs for NSTI management before or after first surgery can be safely done within regional hospital networks.

### Effect of Drains on the Efficacy of Enhanced Recovery after Surgery (ERAS) in the Perioperative Management of Peptic Perforation - the Interim Analysis of a Randomized Control Trial

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**Introduction:** The use of intraperitoneal drains conventionally is more pre-emptive than for any evidence-based purposes. Although some studies have suggested the drains could themselves be hazardous like becoming sources of ascending infections, few opt to abandon them, especially when it is for an emergency surgery like peptic perforation. In the ERAS path of perioperative care minimizing the use of drains is suggested to enhance recovery, although its impact has hardly been objectively studied. Hence, we planned this study on the impact of usage vs non-usage of abdominal drains following surgery for peptic perforation.

**Methods:** A single-center randomized clinical trial was planned on 84 patients of peptic perforation after the omental patch repair with 1:1 allocation to the randomized arm (ERAS or Conventional).

**Results:** On interim analysis of 44 cases, 22 were in the "drain" arm and 22 others in the "no drain" arm. There was no statistical difference in the length of hospital stay, which was the primary objective of the study ( $4.00$  days vs  $3.00$  days,  $p$ -value:  $0.373$ ). The return of functional parameters in the form of resolution of ileus and ingestion of liquid & solid diet was similar in both the groups of patients. The net effect of the complications, which was compared according to the Clavien Dindo classification, was not statistically significant between the arms. The complication rates were also independent of the duration of presentation and the intraoperatively amount of contamination.

**Conclusion:** Abdominal drains do not provide any benefit in the management of patients with peptic perforation.

### Effective Treatment of Experimental Purulent Wounds with a Solution of Copper Nanoparticles and Low-Frequency Ultrasound

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**Introduction:** Successful treatment of purulent wounds remains a key issue in modern surgery. Increasing resistance of microorganisms

significantly slows down the healing of purulent wounds. Copper nanoparticles (CuNPs) have demonstrated high antibacterial activity, but further study of their wound-healing properties *in vivo* is required, especially in combination with enhancing therapy, such as low-frequency ultrasound (LFUS).

**Methods:** The experimental purulent wounds ( $S = 150 \text{ mm}^2$ ) were simulated on Wistar rats with a mixture of multiresistant microorganisms *Staphylococcus aureus*, *Escherichia coli*, and *Pseudomonas aeruginosa* at a concentration of  $5 \times 10^9$  CFU/ml. A solution of CuNPs (concentration - 250  $\mu\text{g/ml}$ ) along with LFUS (26,5  $\pm$  1,98 kHz) was used in the 1<sup>st</sup> group (24 rats), and for control, 0.05% Chlorhexidine solution along with LFUS was used in the 2<sup>nd</sup> group (24 rats). Morphometric, histological, and microbiological parameters of healing were assessed during the treatment.

**Results:** Complete epithelialization of wounds in the CuNPs group occurred on day 11.3  $\pm$  1.4, while in the control group - on day 15.6  $\pm$  1.6 ( $p \leq 0.05$ ). In the 1<sup>st</sup> group, the wounds cleared from purulent-necrotic tissues on day 2.9  $\pm$  0.7, in the 2<sup>nd</sup> group - on day 5.4  $\pm$  0.9. The wound surface reduction rate was 13.3  $\pm$  1.6  $\text{mm}^2/\text{day}$  in the CuNPs group and 9.6  $\pm$  1.5  $\text{mm}^2/\text{day}$  in the second group. The elimination of bacteria in the first group occurred on day 7.6  $\pm$  1.9, while in the second group - on day 11.3  $\pm$  2.1.

**Conclusion:** The combination of CuNPs with LFUS significantly reduces the healing time of experimental purulent wounds in comparison to treatment with Chlorhexidine solution along with LFUS. Supported by grant 0124U000540.

### Equal Access to Surgical Care: An Educational Framework for Integrating Robotics into Acute Care Surgery (ACS)

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**Introduction:** Acute Care Surgery (ACS) comprises a unique subset of patients, acutely ill, highly complex, and consistently suffer from increased morbidity, mortality, and readmission rates. While surgeons use of robotic technology expands, adoption in ACS lags considerably. Repeated robotic studies show consistency and repetition generate improved patient outcomes. Meanwhile, ACS has developed in response to inconsistent and unpredictable presentations of surgical patients. To approach robotic technology systematically in this field, an educational ACS robotic framework was developed.

**Methods:** Systematic review of ACS surgeons' case history identified 8 different procedures within which, 8 key skills emerged. Using this framework, we analyzed prospective ACS scheduled operations.

**Results:** Review revealed consistent and repeated use of the 8 skills. Some operations required performance of multiple procedures. No additional procedures were identified, and all the employed robotic skills observed were illustrated within the framework. Not all skills were utilized in every case, but these skills were repeatedly encountered in the prospective ACS cases.

**Conclusion:** This framework simplifies the complex field of ACS into 8 primary procedures (encompassing ~96% of emergent general surgery case volume), all of which can be approached robotically with 8 key surgical skills. These skills are repeatedly encountered in the ACS setting, providing the consistency and repetition shown to drive improved patient outcomes in other surgical populations. The framework simplifies a surgical field littered with uncertainty. Adoption of this framework could provide structure necessary for robotic technology (and its associated improved outcomes) to reach this uniquely complicated subset of patients.

### Evaluating QuALity of Feedback: Is Artificial Intelligence Better Than Humans?

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**Introduction:** High quality and effective feedback is essential for trainee development. However, production of such feedback is often challenging due to time constraints. In this study, we objectively evaluated the quality of AI-generated feedback compared to human-generated.

**Methods:** We created a custom AI tool to summarize individual feedback narratives. Using a natural language processing model, individual evaluations for 14 students were assessed with the QuAL score. Each evaluation was scored from 0-5 based on level of detail, suggestion for improvement, and its concordance with the feedback. These evaluations were then entered into the AI tool to create a narrative summary, which was then assessed with the same QuAL score model. Average scores of individual narratives were then compared to scores of the AI-generated summary.

**Results:** On average, students received 7 evaluations. Mean QuAL score of all individual evaluations ( $n = 92$ ) was 3.3/5. There was no difference in mean QuAL score per student ( $p = 0.93$ ). Of the 92 individual evaluations, 79 (86%) achieved "high" level of detail and 27 (29%) provided suggestion for improvement, 18 (67%) of which also demonstrated concordance between suggested improvement and behavior described. Mean QuAL score of AI-generated summaries ( $n = 14$ ) was significantly higher at 4.7/5 ( $p < 0.0001$ ). Of the 14 AI-generated summaries, 12 (88%) achieved the highest level of detail and provided suggestions linked to the behaviors described.

**Conclusion:** Quality of AI-generated feedback summaries were objectively higher than the individual narrative evaluations. This study highlights that AI can improve quality of student evaluations by creating high quality summative evaluations.

### Experimental Study on UVC Treatment in *Helicobacter pylori* Infection in Rat Stomach

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**Introduction:** *Helicobacter pylori* (HP) is a kind of digestive bacteria that is widely infected and easily causes a variety of digestive



tract diseases. The effectiveness of traditional antibiotic strategies has recently been challenged due to the spread of antibiotic resistant strains. Short wavelength ultraviolet C (UVC) light (200 nm-280 nm wavelength) has unique advantages for resistant HP that can be non-invasively used for endoscopically access to parasitic sites in the stomach.

**Methods:** We evaluated the effectiveness of irradiation with different radiation energy of UVC-LED (254/265/275 nm) in killing multidrug-resistant HP. Moreover, we examined the safety and effectiveness of UVC-LED in vivo, and the impact on gastric motility after UVC-LED treatment.

**Results:** UVC-LED (254/265/275 nm) exhibit significantly antibacterial properties against multi-drug-resistant bacteria, the 254 nm and 265 nm were weaker than 275 nm for the inactivation of multidrug-resistant HP. UVC treatment has achieved better therapeutic effects than current conventional antibiotic treatment methods in multidrug-resistant HP. UVC treatment can effectively kill Gastric parasitic HP but did not completely eradicate. At same time, 275 nm can barely cause DNA damage and apoptosis in gastric mucosa. UVC treatment does not affect rat gastric motility.

**Conclusion:** Our data revealed that UVC treatment could effectively kill the multidrug-resistant HP both in vitro and in vivo, and this therapeutic effect also confirmed to be safe in vivo. UVC treatment as form of physical therapy could be used as a supplement for the treatment of resistant HP.

### Founding the Association of Native American Surgeons (NASA)

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**Introduction:** Historically, the American Indian/Alaskan Native (AI/AN) population in the United States (US) has been severely underrepresented in medicine and in the field of surgery. Few studies have attempted to determine where to focus efforts that can specifically impact and increase the number of practicing AI/AN surgeons and surgical trainees in this country.

**Methods:** A literature review examining publicly available data, organizational reports, and published academic literature on diversity and AI/AN representation in surgery was performed. The current landscape of what is known, and potential knowledge gaps and interventions were identified.

**Results:** Overall, the proportion of those who identify as AI/AN in the surgical workforce is 0.28%. The severe underrepresentation of this group in medicine has persisted for decades; and is particularly true among the surgical subspecialties. Few published works highlight efforts and interventions aimed at increasing the number of AI/AN surgeons specifically. The most recent data suggest that only 0.18% of matriculates to US medical schools, 0.09% of surgical residents and 0.19% of academic surgical faculty identified as AI/AN.

**Conclusion:** The state of AI/AN representation in the field of surgery can be described as a crisis. Advocating for policy change, curriculum

development, and promoting an understanding of the political status of AI/ANs is imperative to address the group's lack of representation and disparities in health. Given the findings of this work, a group of Native surgeons, surgical residents, and medical students have founded the first ever Association of Native American Surgeons.

### Fragility Analysis of Randomized Control Trials (RCTs) of Prophylactic Mesh in the Prevention of Post-Operative Incisional Hernias

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**Introduction:** Several RTCs suggest the use of prophylactic mesh (PM) for hernia prevention during elective laparotomy decreases the risk of hernia occurrence postoperatively. Our aim was to evaluate the fragility of these studies.

**Methods:** A detailed search for RCTs comparing PM use to primary closure of elective, midline laparotomies was performed. The Fragility Index (FI) (calculation of the number of individual outcomes that would need to change to make a significant result insignificant using Fisher's Exact Test) and fragility quotient (FQ) (percentage of FI to the sample size) were calculated for significant outcomes, and the Reverse FI (RFI) and reverse fragility quotient (RFQ) were calculated for studies with negative outcomes.

**Results:** Twelve of the 14 RCTs were positive. Their overall median FI was 2.0 (0, 7.5), FQ was 0.025 (0.000, 0.027) or 2.5%. Eight (66%) reported more patients lost to follow up (LTFU) than their FI. Interestingly, 4 FI values were 0, meaning the study would no longer be significant if a different statistical test was used. Of negative studies, RFI was 9 (8, 10), and RFQ was 0.027 (0.026, 0.028). The median number of patients LTFU among all RCTs was 3 (0.0, 53.5), and 6 (43%) RCTs reported >10% (0-26%) LTFU. There was no correlation between the FI and journal impact factor ( $p = 0.458$ ).

**Conclusion:** Fragility analysis of prophylactic mesh RTCs for hernia prevention demonstrates a marked lack of robustness. Further study is required to understand the utility of prophylactic mesh placement.

### Higher Rates of Colon Cancer in Delayed Appendectomy Patients

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**Introduction:** Colon cancer is a major health concern, as it is the second leading cause of cancer deaths in the United States. Many lifestyle factors are strongly associated with the development of colon

cancer. Additionally, many studies in the literature have shown an increased risk of developing colon cancer in patients who have had acute appendicitis. This study further investigates the association between indolent appendicitis and the subsequent development of colon cancer.

**Methods:** The diamond network within the TriNetX database was queried for patients who underwent a latent appendectomy (Cohort 1) and primary appendectomy (Cohort 2). The outcome criteria were defined as a diagnosis of malignant neoplasm (ICD10:C18) of the colon on the same day or after the appendectomy. Analysis was performed before and after propensity score matching.

**Results:** After propensity score matching there were 19,242 patients in each group. Average age was 52, 68% were female, 32% were male. The frequency of colon cancer in cohort 1 and cohort 2 were 1,125 (6.2%) and 324 (1.7%) respectively. The odds ratio of having colon cancer in cohort 1 was OR 3.81 (3.36-4.32) when compared to cohort 2.

**Conclusion:** Latent appendectomy patients were associated with a fourfold increase of having colon cancer. Future work will elucidate the primary reason for surgery in these latent appendectomy patients to better understand the pathophysiology of this increased risk for colon cancer.

### Impact of Enhanced Recovery after Surgery (ERAS) Protocol Implementation in Emergency Perforated Peptic Ulcer Repair: A Comparative Retrospective Analysis

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**Introduction:** ERAS for perforated peptic ulcer (PPU) is still not consistently practiced. Our Institution established an ERAS protocol for PPU in January 2023. We aim to evaluate length of stay (LOS), 30-day readmission and mortality rate before and after the protocol.

**Methods:** Patients undergoing emergency surgery for PPU between 01/2020 and 12/2023 were retrospectively enrolled. Exclusion criteria: ulcer dimension >2cm, gastric resection, previous gastric surgery, ICU stay >2 days, death within post-operative day (POD) 7. Population were divided into two Groups: Group A (after protocol-01/2023-12/2023), Group B (before protocol-01/2020-12/2022). The groups were compared for demographic (age, sex, BMI), pre-operative (white blood cell count, C reactive protein, ASA score), intraoperative (surgical approach-laparoscopic vs open; operative time; ulcer location; surgical technique; abdominal contamination; abdominal drain placement) and post-operative (complications, 30-day mortality and readmission, LOS, POD of gastric tube (GT) removal, oral feeding, gastric tube repositioning) characteristics.

**Results:** Out of 60 patients, 45 matched the criteria and were enrolled (Group A: 15; Group B: 30). No statistically significant differences were found for LOS (Group A 6 days, range 4-19; Group B 8, range 4-44,  $p = 0.14$ ), 30-day readmission (Group A 1 (6.7%);

Group B 0;  $p = 1.00$ ) and mortality (Group A 1 (6.7%); Group B 2 (6.7%),  $p = 1.00$ ). The two Groups differ for ASA score, higher for Group B ( $p = 0.004$ ), use of a double-layer repair (Group A 2 (13.3%); Group B 15 (50%);  $p = 0.02$ ); POD of GT removal (Group A 1, range 1-6; Group B 4, range 0-15;  $p < 0.01$ ), POD of liquid (Group A 2, range 1-7; Group B 5, range 3-16;  $p < 0.01$ ) and solid (Group A 3, range 2-7; Group B 6, range 4-16;  $p < 0.01$ ) feeding. No differences were found for GT replacement ( $p = 0.60$ ).

**Conclusion:** ERAS protocol for PPU is feasible. Early GT removal with refeeding do not contribute to complications during hospitalization.

### Impact of the Drain Placement Following Incisional Hernia Repair: A Systematic Review and Meta-Analysis

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**Introduction:** The benefit of using drain tubes to reduce surgical complications following incisional hernia repair is uncertain. The use of the drain widely varies among surgeons and studies are discordant in the outcomes reported. Therefore, we performed a systematic review and meta-analysis to evaluate the impact of the drains.

**Methods:** PubMed and Embase databases were searched for studies comparing drain vs. no drain use in patients undergoing incisional hernia repair. Primary end-points were infection, seroma formation, length of hospital stay, and readmission rate. Odds ratios (ORs), Mean difference, and their 95% confidence intervals (CIs) were computed using a random-effects model for high heterogeneity and fixed-model for low heterogeneity.

**Results:** A total of 802 patients were included from 5 eligible studies, of which 315 patients used drain tubes, and 487 had no drains. There was no difference between the groups in infection rate (OR 1.52; 95% CI 0.74-3.12;  $p = 0.26$ ) seroma formation (OR 1.03; 95% CI 0.71-1.49;  $p = 0.89$ ), and readmission rate (OR 0.98; 95% CI 0.58-1.66;  $p = 0.95$ ). However, the length of hospital stay was higher in the drain group (MD 2.66; 95% CI 0.81-4.52;  $p = 0.005$ ).

**Conclusion:** This comprehensive systematic review and meta-analysis suggest that drain tube usage does not significantly reduce surgical complications following incisional hernia repair. Further prospective randomized studies are required to confirm these findings.

### Increasing the Use of Language-Concordant Discharge Instructions: A Resident-Led Quality Improvement Initiative

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**Introduction:** A lack of language-concordant discharge instructions (LC-DCI) for patients with limited English proficiency (LEP) contributes to disparities in post-discharge outcomes, in part due to reported difficulty understanding their medical care. When verbal instructions are paired with written LC-DCI, there are fewer post-discharge errors. However, many hospitals do not translate discharge instructions (DCI) into patients' primary languages.

**Methods:** In a resident-led quality improvement project, we surveyed general surgery residents and advanced practice providers (APP) about their experiences discharging patients with LEP. Using survey data, we created LC-DCI for patients who have undergone seven common general surgery procedures.

**Results:** Roughly half of respondents (n = 20/44) reported having provided LC-DCI to a patient with LEP, often translating DCI themselves using Google Translate. Many respondents expressed concern that instructions translated informally may relay inaccurate information. We identified key stakeholders (patients, nurses, APPs, and faculty) who contributed to the creation of patient-facing DCI. English DCI were translated into Spanish and Chinese, and made into templates in the electronic health record available to all providers. Data collection is ongoing, but preliminary data (November 2023-January 2024), demonstrate more than half of qualifying patients (85/145) have received the revised, translated, and validated DCI.

**Conclusion:** We identified an opportunity to improve the discharge process for patients with LEP. Our ongoing resident-led collaboration aims to increase the provision of LC-DCI for surgical patients. Further work will seek to increase utilization of LC-DCI, expand this initiative to additional languages and procedures, and evaluate how our LC-DCI impact patient outcomes.

### Influence of Imaging Studies' Conclusions in Surgical Outcomes of Acute Appendicitis

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**Introduction:** Computed Tomography (CT) and Ultrasound (US) possess high diagnostic accuracy in acute appendicitis (AA) when used properly. Their conclusions often refer as a yes/no diagnosis, although radiologists may opt to suggest a different imaging study to further analyze in cases of doubt. These suggestions might have an impact on AA's surgical outcomes if attended or not. Therefore, we aim to determine surgical outcomes of acute appendicitis whenever an US suggests further analysis with CT.

**Methods:** A cross-sectional study was performed analyzing imaging diagnosis pathways in aa in a third-level hospital from 2021 to 2023. Biopsies of patients who underwent appendectomy for diagnostic suspicion of AA and who also had undergone an imaging study such as CT or US were included. Diagnosis and suggestions of each imaging study were recorded, and surgical outcomes were analyzed. Diagnostic accuracy of different pathways was obtained.

**Results:** Among 361 patients, 150 warranted a CT scan, but only 45 were performed, with 24.4% negative and 75% positive for appendicitis. Conversely, among 105 patients without CT scans, 81% were diagnosed with appendicitis. Ultrasound-guided CT scenarios exhibited 60% sensitivity and 35% specificity, with PPV of 79.7% and NPV of 17.1%. When ultrasound suggested CT but was not performed, sensitivity dropped to 20.6%, specificity at 81.8%, PPV of 77.8%, and NPV of 25%.

**Conclusion:** Utilizing CT after ultrasound suggestion of appendicitis increased diagnostic accuracy by 19.6%. This pathway should be considered to reduce misdiagnosis rates in appendicitis management.

### Is Abdominal Wall Thickness a More Accurate Predictor of Surgical Site Infection (SSI) in Abdominal Surgeries?

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**Introduction:** SSI is a significant cause of illness and death, accounting for around 20% of healthcare-associated infections. Existing measures for identifying obesity as a risk factor for SSI, such as BMI and waist-hip ratio, have limitations. Our study aimed to assess whether abdominal wall thickness can predict SSI.

**Methods:** Patients who underwent abdominal surgeries at our unit, with various classes of wound were included. Ultrasonography is used to measure abdominal wall thickness, specifically from the skin to above the rectus sheath. Six pre-determined points were chosen: in midline between xiphisternum and umbilicus, 2 cm below the umbilicus, and at the same level at midclavicular line on both right and left sides. The occurrence of SSI in relation to AWT were assessed.

**Results:** 184 patients were enrolled, which included class I (42%), class II (31%), class III (27%). The mean AWT was 1.7 cm (range 0.9-2.2 cm). The study observed a significant association between AWT and SSI rates. Patients with AWT > 1.8 cm had a substantially higher SSI rate (27%) compared to those with AWT < 1.8 cm (7%) (p-value < 0.001), indicating a strong association with Odds ratio of 3.18 (with a 95% CI) developing SSI in patients with higher AWT (>1.8 cm) compared to those with lower AWT (≤1.8 cm).

**Conclusion:** This study provides evidence for a positive correlation between higher AWT and increased risk of SSI. AWT can serve as a reliable indicator for predicting SSI, however multicentric studies with large sample size is required.

## It Is Not Easy Being Green: A National Survey Understanding “Climate-Smart” Actions in the Operating Room

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**Introduction:** Operating rooms (OR) produce significant greenhouse gas (GHG) emissions, creating substantial opportunities for environmental sustainability efforts. The aim of this study was to identify climate smart actions that are a priority to surgeons and their perceived feasibility.

**Methods:** Respondents consisted of surgeon members of the American College of Surgeons (ACS) Board of Governors (BoG) as well as the ACS Young Fellows Association (YFA) and Resident and Associate Society (RAS). Surgeons were asked about current sustainability efforts, desire to be a part of sustainability, and to rank the importance and their perceived feasibility of 15 climate-smart actions.

**Results:** Of 607 respondents (response rates: BoG: 98%, YFA/RAS: 84%), only 68 (11.2%) are involved in institutional sustainability efforts, however 293 (48.2%) expressed a desire to take on leadership roles in this space. While most ranked all 15 climate-smart actions as important, areas of high importance but lower perceived feasibility include: waste sorting, energy efficient building strategies, GHG emission reporting, and OR heating/ventilation/air condition cycling. Equipment power downs and reusable items & devices were perceived as having high feasibility and importance.

**Conclusion:** Surgeons find climate-smart actions to be important and desire to lead OR sustainability efforts. Areas deemed important, but noted to have challenges in feasibility may benefit from endorsement from societies and hospital-level leadership to implement achievable solutions. Areas that have both high perceived feasibility and importance should be targets for hospitals beginning their sustainability practices.

## Large Language Model-Derived Clinical Practice Guideline for the Surgical Management of Appendicitis

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**Introduction:** Large Language Models (LLMs) may enhance the efficiency behind surgical guideline development, with growing

interest in their ability to provide clinical recommendations. The Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) recently completed a guideline update to synthesize the evidence for the surgical management of uncomplicated and complicated appendicitis.

**Methods:** ChatGPT-4 & Google Gemini were queried with standardized prompts on February 21<sup>st</sup>, 2024, to generate all sections of the guideline while following the GRADE approach. ChatGPT-4 performed data analysis for key questions on nonoperative versus operative management, timing of surgery, the role of routine drain placement, and the need for short-term versus long-term antibiotics for complicated appendicitis. Reporting standards were appraised using AGREE-S, while clinical accuracy was evaluated using the SAGES guideline update.

**Results:** Three of five LLM-generated guideline recommendations aligned with the SAGES guideline. The LLM guideline recommended nonoperative intervention for uncomplicated acute appendicitis, conflicting with the SAGES guideline. The need for additional antibiotics was considered a harm by the LLM guideline at 25 more per 1000 patient, but a benefit in the SAGES guideline at 9 fewer per 1000 patients. Recommendations regarding the operative management, drain placement, and duration of post-operative antibiotics in complicated appendicitis were concordant between the LLM-generated guidelines and SAGES guidelines. AGREE-S scores were 144/168 and 130/168 for the LLM and SAGES guidelines, respectively.

**Conclusion:** Clinicians, researchers, and policymakers should note that LLMs can produce surgical guidelines with robust reporting standards. Data analysis by LLMs is efficient, but requires clinician oversight for patient safety.

## Long-Term Outcomes of Pauli Parastomal Hernia Repair: A Single-Center Study

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**Introduction:** Surgical management of parastomal hernias remains challenging due to high inherent recurrence rates and significant operative morbidity. Pauli Parastomal Hernia Repair (PPHR) leverages the benefits of a sublay retromuscular repair while simultaneously allowing lateralization and wide mesh overlap of the stoma bowel in a Sugarbaker configuration. Long term outcomes of this repair are lacking.

**Methods:** We retrospectively reviewed data prospectively-collected from 2015-2022 in an IRB-approved single-center database. All patients who underwent open parastomal hernia repair utilizing PPHR technique were included. Patient, hernia and operative characteristics were analyzed, including post-operative complications and recurrences.

**Results:** Forty-three patients meet inclusion criteria (mean age 63 ± 14, 54% Male, mean BMI 32.8 ± 4.4 kg/m<sup>2</sup>). Most hernias were recurrent (60.5%), most had a concomitant midline component

(74%) and 32.5% had mesh in situ at the time of PPHR. Mean defect size was 250 cm<sup>2</sup> (range 14-589 cm<sup>2</sup>). At 25 months (range 0.8-86 months) follow-up, there were 6 parastomal hernia recurrences (14%). Three patients were managed expectantly. Obstructive symptoms necessitated surgery in 2: one elective robotic IPUM, and one emergent primary repair. One asymptomatic recurrence was repaired with mesh-suture during an unrelated operation. Average time to recurrence was 14.6 ± 15.0 months. Mechanism of recurrence included 4 insufficient lateralization and two central mesh fracture. There were no mesh infections, erosions or bowel obstructions related to the retromuscularization of the stoma bowel loop.

**Conclusion:** PPHR is a safe and effective method with acceptable short and long-term recurrence rates and post-operative complications.

### Long-Term Patient Reported Outcomes after Ventral Hernia Repair: A Population-Based Study

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**Introduction:** Ventral hernias affect one in five adults and impact quality of life by causing pain and functional limitations. Although surgery is intended to improve these symptoms, long-term outcomes are not well-characterized.

**Methods:** Using validated instruments, we assessed patient-reported hernia recurrence, pain, and abdominal wall function up to 2-years following surgery across 72 hospitals. Recurrence was evaluated using the Ventral Hernia Recurrence Inventory, pain was evaluated using the PROMIS Pain 3a Intensity Instrument, and function was evaluated using the Hernia-Related Quality-of-Life Survey (HerQLes; scale 0-100, lower scores = worse quality-of-life). Weighting was performed based on demographic, clinical, and hernia characteristics to adjust for differences between survey respondents, the population, and nonrespondents.

**Results:** Among 1,688 respondents with complete data, mean age was 55.2 (13.9) years and 803 (47.6%) were female. Most repairs were elective (92.5%), with mesh (78.1%), and an open approach (58.8%). Median hernia size was 2.0 cm (IQR 1.5-4.0). At a mean follow-up of 1.5 years, 405 (24.0%) respondents reported a recurrence or bulge, 544 (32.2%) reported pain at the site (mean PROMIS score 42.1 (9.5)), and mean HerQLes score was 62.6 (21.8). Prior hernia repair, younger age, female sex, and higher patient acuity were associated with worse patient-reported outcomes, whereas mesh was protective for recurrence.

**Conclusion:** In this population-based study, a quarter of patients reported hernia recurrence, a third reported pain, and a significant proportion of patients reported poor abdominal wall function. These findings highlight the importance of understanding and improving patient selection and operative technique.

### Minimally Invasive Stapled Abdominal Wall Repair (miSAR): A New Technique for Incisional Hernia's Repair

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**Introduction:** The reconstruction of the midline is an important surgery goal in ventral hernia repair. Several open techniques have been described for the reconstruction of the midline, on the other hand a few minimally invasive techniques do exist. miSAR® (minimally invasive abdominal wall reconstruction) is a laparoscopic Rives Stoppa technique. The study aims to demonstrate a low recurrence rate using this minimally invasive technique.

**Methods:** Between April 2019 and January 2024, 70 patients with incisional hernias were treated with miSAR® technique. The technique is a stapled midline reconstruction from the arcuate line until the xiphoid process. The stapling of the midline creates a retromuscular pocket where a mesh is placed; if it is necessary, a bilateral Transversus Abdominal Release (TAR) can be performed. A running suture is placed on the anterior line and the umbilicus is inverted. Before starting midline reconstruction, an accurate adhesiolysis could be performed.

**Results:** The dimension of the incisional hernias ranged from 3 to 10 cm (mean width 5,8 ± 2,8 cm). The average operating time was 120 minutes. In 38 patients a Transversus Abdominal Release (TAR) was performed. Three postoperative complications occurred: two retromuscular hematomas and one retromuscular seromas. The overall recurrence rate was 2,8% (two patients).

**Conclusion:** miSAR® and miSAR® with TAR are feasible and effective techniques and show promising results in the treatment of incisional hernia. Multicentric analysis is needed to validate the technique, and longer follow-up is required to assess the recurrence rate.

### Negative Pressure Wound Therapy and Mesh-Mediated Fascial Traction (VAWCM) for Temporary Closure in Open Abdomen: A Single-Arm Meta-Analysis

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**Introduction:** Open abdomen (OA) therapy is used in the management of patients who require surgery for severe abdominal conditions. This meta-analysis aims to evaluate the VAWCM technique regarding short and long-term outcomes.

**Methods:** PubMed, Embase, and Cochrane Central were systematically searched for studies that analyzed VAWCM therapy in OA. Primary outcomes were complete fascial closure rate and mean duration of VAWCM. Statistical analyses were performed using R statistical software.

**Results:** Seven studies comprising 535 patients were included. We found a complete fascial closure rate of 77.31 per 100 patients (80.08%; 95% CI 59.57-88.75;  $I^2 = 76\%$ ), with an overall mortality of 30.3 per 100 (33.48%; 95% CI 9.28-19.43;  $I^2 = 78\%$ ). The pooled mean duration of VAWCM was 15.18 days (95% CI 11.14-19.22;  $I^2 = 75\%$ ), while the mean length of hospital stay was 45.25 days (95% CI 25.12-65.39;  $I^2 = 96\%$ ), and the mean duration of OA treatment was 14.35 days (95% CI 9.28-19.43;  $I^2 = 94\%$ ). As additional outcomes, we found an enteroatmospheric fistula rate of 5.65 per 100 patients (5.42%; 95% CI 2.27-13.34;  $I^2 = 45\%$ ) and incisional hernia rate of 34.74 per 100 (34.62%; 95% CI 28.90-41.09;  $I^2 = 0\%$ ). The subgroup analysis of mesh material (polypropylene or polyglactin) showed a higher complete fascial closure rate for the polyglactin (89.13% vs. 66.56%;  $p = 0.02$ ).

**Conclusion:** Our findings showed that VAWCM is a viable option for OA treatment, successfully reaching complete fascial closure, with a low duration of VAWCM.

#### Open vs Minimally Invasive Surgery: Risk of New Persistent Opioid Use

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**Introduction:** New persistent opioid use (NPOU) after surgery may represent a societal problem that adversely affects health outcomes and long-term patient survival. We sought to characterize the risk of NPOU relative to surgical approach among different surgical procedures.

**Methods:** Patients who underwent either open (OS) or minimally invasive (MIS) pneumonectomy, pancreatectomy, and colectomy between 2013 and 2020 were identified from IBM-Marketscan database. NPOU was defined as two subsequent opioid refills within 3- and 6-months following surgery among opioid naïve patients. Multivariable logistic regression was applied to characterize association between surgical approach and risk of NPOU.

**Results:** Among 45,757 patients who underwent surgery (pneumonectomy:  $n = 3,467$ , 7.6%; pancreatectomy:  $n = 3,249$ , 7.1%; colectomy:  $n = 39,041$ , 85.3%), median age was 54 years (IQR: 48-60). Most individuals were female ( $n = 23,580$ , 51.5%) and had malignant indication ( $n = 30,797$ , 67.3%). Overall, 50.7% ( $n = 23,204$ ) of patients underwent OS whereas 49.3% ( $n =$

22,553) had MIS. Subsequently, 4.8% ( $n = 2,194$ ) of patients developed NPOU. The likelihood of NPOU was higher among patients who had undergone open versus MIS (5.9% vs. 3.6%;  $p < 0.001$ ). Patients who had OS had higher median milligram equivalent dose (OS: 250, IQR 135-600 vs. MIS: 200, IQR 100-421), and days of opioid use over 6 months (OS: 7, IQR 3-15 vs. MIS: 5, IQR 3-10) (both  $p < 0.001$ ). Relative to OS, MIS was associated with 35% lower odds of NPOU (0.65, 95% CI 0.59-0.71).

**Conclusion:** Around 1 in every 20 patients undergoing surgery experienced NPOU. MIS was associated with fewer days of opioid use and lower dosages which translated into lower NPOU following surgery.

#### Operate Now or Later? A Comparison of Treatments for Complicated Appendicitis

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**Introduction:** The role of early appendectomy in the management of complicated appendicitis remains controversial. This study was undertaken to compare initial operative vs non-operative management (NOM).

**Methods:** Adult patients with complicated acute appendicitis were retrospectively identified at a single hospital (2016-2021), defined as evidence of gangrene, perforation, abscess and/or phlegmon on the initial CT scan. Patients with surgeries within 48 hours were defined as operative, with all others classified as NOM, including those with percutaneous drainage, or surgery after 48 hours. Outcomes were compared by treatment strategy, including total length of stay (LOS), defined as LOS for the index admission plus unplanned readmissions within 30 days.

**Results:** 123 patients with complicated appendicitis were included, with 67% undergoing NOM. There was no significant difference in rates of unplanned return to operating room within 30 days ( $p = 0.218$ ), unplanned readmission within 30 days ( $p = 0.185$ ), partial colectomy ( $p = 0.111$ ), or need for abscess drainage ( $p = 0.195$ ). The median total LOS was 4 days (IQR 2-7), with no significant difference between treatment cohorts by univariate analysis ( $p = 0.112$ ). After adjusting for patient age, presence of fever, appendicolith and the AAST appendicitis severity, operative intervention was associated with a mild reduction in total LOS (IRR 0.776, 95% CI 0.651 - 0.925,  $p = 0.005$ ).

**Conclusion:** NOM was the most common treatment strategy for patients with complicated appendicitis and had similar clinical outcomes compared to initial operative management. Surgeon judgement and patient-related factors should be used to individualize initial treatment.

### Optimizing Postoperative Pain Management: Efficacy of Low Dose Oxycodone Prescriptions in Minimizing Emergency Department Visits and External Opioid Prescriptions

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**Introduction:** The opioid epidemic is a grave public health crisis, marked by escalating substance use disorder rates and devastating consequences. Health Care Professionals are pivotal in addressing this challenge through responsible prescribing practices and patient education. We hypothesize that a standard regimen of five tablets of 5 mg oxycodone after an uneventful laparoscopic appendectomy or cholecystectomy would provide adequate pain control.

**Methods:** We performed a retrospective review over three consecutive months from October to December 2023 for all patients who underwent either laparoscopic appendectomy or cholecystectomy urgently as part of our ED-to-OR outpatient surgery pathway. The Prescription Drug Monitoring Program (PDMP) data for each patient was accessed for all 50 states. The Morphine Milligram Equivalent (MME) was determined.

**Results:** A total of 138 patients were evaluated, with 51% undergoing laparoscopic appendectomy and 49% cholecystectomy. Patients received a median 37.5 [37.50-60.00] MME at discharge from the post anesthesia care unit (PACU). There were 19 (14%) unplanned Emergency Department (ED) visits, of which seven (5%) were due to postoperative pain and three (2%) required an additional opioid prescription. Only two patients (1%) had opioids prescribed by an outside provider during the 30-day post-operative period.

**Conclusion:** Patient education, multi-modal pain control with over-the-counter medications, and limiting post-operative opioid prescriptions is associated with a low rate of unplanned ED visits for uncontrolled pain. Patients are not seeking care and additional opioid prescriptions from outside providers and very few patients require opioids in addition to those prescribed at discharge.

### Patients at Increased Risk for Emergent Ventral Hernia Surgery: A National Multicenter Cohort Study

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**Introduction:** Optimization strategies, including weight loss, smoking cessation, and controlling blood glucose may delay ventral hernia repairs and result in emergent surgery. While emergent hernia repairs are associated with poor outcomes, characteristics of patients who undergo emergent vs. elective hernia surgery have not been well described. This study aimed to determine the demo-

graphic factors, insurance types, and comorbidities associated with undergoing emergent hernia surgery.

**Methods:** The ACS National Surgical Quality Improvement Program 2022 semiannual report data were queried for ventral hernia repairs by CPT codes. Patient demographics, payor type, and comorbidities were evaluated for their association with surgical acuity using univariate analysis and multiple logistic regression. The primary outcome was surgical acuity. Emergent included urgent or emergent cases.

**Results:** Of the 41,325 patients included, 8.6% underwent emergent surgery. All factors evaluated including age, sex, ethnicity, race, payor type, BMI, comorbidities, smoking, and functional status were significant in univariate analysis. In logistic regression adjusting for all evaluated factors, age  $\geq 75$  years, female sex, Hispanic ethnicity, Asian and Black race, BMI  $\geq 40$  kg/m<sup>2</sup>, ASA class  $\geq$  III, ascites, heart failure, smoking, albumin  $< 3.5$  g/dL, dependent functional status, and non-private insurance were associated with emergent surgery. Patients with diabetes on oral medications had lower odds of undergoing emergent surgery.

**Conclusion:** A number of patient factors, some unlikely modifiable in a reasonable timeframe, were associated with emergent hernia surgery. Understanding the socially and physiologically vulnerable population undergoing emergent surgery provides an opportunity to improve the standards around optimization that can effect access to care.

### Perceptions of Health Care Providers about the Functioning, Use, and the Efficacy of Incentive Spirometry: A Survey Study

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**Introduction:** Incentive spirometry is costly and widely used to address pulmonary complications. However, evidence supporting the use of IS remains scarce and controversial. We aim to determine providers' beliefs and understanding of IS.

**Methods:** Closed, web-based survey of physicians, advanced practice providers, and respiratory therapists across departments at a large urban academic medical center conducted in 2023. Survey was voluntary, incentivized, anonymous, and single-enrollment accessible for 30 days. Anticipated minimum-response rate was 20%. Used adaptive questioning, email distribution, and four reminders to nonrespondents over the study period. Data included demographics and responses on functioning, use, and efficacy of IS.

**Results:** Surveyed 1,445 subjects with a response/completion rate of 35.36% and 93.08% respectively, yielding 511 complete

responses. 98.63% respondents were familiar with IS. Musclet-training and mucociliary-clearance were the most cited mechanisms of action. Majority believed IS was indicated for post-operative patients (97.62%) and prevents post-operative atelectasis (97.82%). 67.06% of RTs believed IS was indicated in both inpatient and outpatient settings. Most RTs believed IS was primarily therapeutic and not diagnostic, compared to other providers ( $p < 0.001$ ). Compared to other providers, fewer RTs reported IS promoted noticeable improvement ( $p < 0.001$ ), considered IS useful ( $p < 0.001$ ) and recommended use of IS (71.11% vs. 93.77%).

**Conclusion:** Among prescribing practitioners, IS was perceived as a useful tool in the treatment and prevention of pulmonary complications. However, the impact of IS was more scrutinized amongst respiratory therapists. Despite widespread use, there remains a lack of consensus on the mechanism of action, efficacy, and indications of IS across providers.

### Platelet-Rich Plasma: A Promising Strategy for Minimizing Postoperative Pain and Surgical Site Complications

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**Introduction:** Postoperative recovery process remains a significant challenge in surgeries, as critical procedures. Platelet-rich plasma (PRP) is an autologous concentrate, which contains higher concentration of platelets, growth factors, and bioactive component; hence receiving considerable attention as a potential adjuvant therapy to promote tissue healing. Its use in several medical fields, has shown promising results in accelerating healing process and reducing pain due to its anti-inflammatory properties.

**Methods:** A prospective cross-sectional study of patients, eleven of which underwent elective surgery in a public hospital between November 2023- April 2024, were divided into two groups: six as experimental group, to whom intraoperative PRP was applied, and five as control group or conventional management, both were randomly selected. In both groups, postoperative pain was evaluated using the Visual Analog Scale at 0, 3, 6, 12, and 24 hours, and it was specified if patient needed analgesics during this period. Follow-up was assessed at 7, 15, and 30 days to identify surgical site complications and Clavien-Dindo classification. The study is still under recruitment.

**Results:** The preliminary results of this investigation demonstrate that experimental group ( $n = 6$ ) reported either no pain or mild pain. Therefore, non-inflammatory medications (paracetamol) were sufficient to manage postoperative pain. In postoperative follow-up, no complications presented. In contrast, the control group ( $n = 4$ ) reported moderate postoperative pain, requiring the administration of NSAIDs or opioids. In postoperative follow-up ( $n = 3$ ), this group presented seromas.

**Conclusion:** Due to the ongoing nature of the research, we withhold the conclusions until the completion of the study.

### Prognostic Value of Presepsin, Visfatin and Soluble Program Death: Ligand 1 (sPD-L1) in Emergency General Surgery

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**Introduction:** Presepsin (PSP), Visfatin and sPD-L1 have recently been proposed as potential diagnostic and prognostic biomarkers in sepsis, despite their predictive value in critical surgical patients is not yet well defined.

**Methods:** An observational, analytical and prospective study was carried out in a cohort of patients undergoing emergency abdominal surgery (EGS), who underwent determination of PSP, sPD-L1, C-reactive protein (CRP) and procalcitonin (PCT) upon admission to the emergency room. The primary outcome was the composite outcome of progression to sepsis/septic shock/in-hospital mortality. The secondary outcome was evaluated using severity scales (APACHEII, SOFA, SAPSII and Mannheim).

**Results:** 40 patients were studied, 16 had sepsis, septic shock or death and 24 were taken as controls. The most frequent cause of surgery was appendicitis  $n = 16$  (40%). In the ROC curve analysis for the primary outcome, the area under the curve values for PSP, sPD-L1, CRP, and PCT were 0.931, 0.603, 0.668, 0.842 with a  $p$  value of  $<0.001$ , 0.285, 0.081,  $<0.001$  respectively, for severity prediction defined by SOFA  $>2$ , the values were 0.944, 0.559, 0.795, 0.917 with  $p$ -values of  $<0.001$ , 0.568, 0.004,  $<0.001$  respectively.

**Conclusion:** Presepsin seems to have a predictive capacity for progression to sepsis, septic shock or death and severity defined by SOFA in patients requiring EGS superior to some other biomarkers such as CRP, PCT and sPD-L1.

### Racial Disparity in Ventral Hernia Repair Outcomes and Management in Recent Years

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**Introduction:** Black patients have increased post-op morbidity, higher readmission, and discharge to a facility across various surgical procedures. For ventral hernia repairs, being Black was associated with higher emergent repair rates. No disparities in morbidity and mortality were seen in a 2010 small sample study. This will be the first large national database study to analyze ventral hernia outcomes by race.

**Methods:** 2020-2022 National Surgical Quality Improvement Program (NSQIP) database was used to analyze post-operative morbidity and mortality stratified by race. Only cases completed by General and Plastics Surgeons were included. Patients with mixed or unknown race, and surgeries performed in less than 10 minutes were excluded. Analyses were completed using Chi-squared and logistic regression.



**Results:** 60,076 patients met the inclusion criteria. 76% of patients were White. Black, Hispanic, and Asian patients had lower incidence of surgical site infections and were more likely to be discharged to a facility rather than home ( $p < 0.05$ ,  $p < 0.001$ ). Asians were less likely to be readmitted ( $p = 0.04$ ). Black patients were higher risk for pulmonary embolisms ( $p = 0.02$ ). In the 2022 subgroup analysis, Hispanics were more likely to have unplanned laparoscopic to open conversions ( $p < 0.001$ ). Mortality and reoperation were not significantly different among racial groups. Black patients had the lowest percentage of cases performed minimally invasively (32%)  $p < 0.001$ .

**Conclusion:** Prior studies have shown racial disparities among the Black population in surgical outcomes. This analysis confirms some of those disparities, but also introduces previously unidentified disparities in outcomes and surgical approaches in marginalized groups.

### Results of Using the MOIST (Moist Balance, Oxygen Balance, Infection Control, Support, Tissue Management) Principle in Chronic Wound Management

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**Introduction:** Chronic wounds are a burden problem in our ageing population. In this study. The objectives of this study are to identify the wound healing rate within 6 months & factor associated with wound healing after using the MOIST concept (balanced moist healing environment, topical oxygen therapy, regular cleansing & debriding, supportive wound environment to stimulate healing, & wound bed preparation) in the treatment of chronic wounds.

**Methods:** The step of factors selection was analyzed using logistic regression for final model. Wound healing rate was estimated using log-rank test & presented by Kaplan-Meier curve.

**Results:** Sixty patients, 20 of diabetic foot wounds (DM), 20 chronic venous ulcer (VU), & 20 of grade IV pressure ulcers (PS) were included. The wound healing rate within 6 months was 83% with median time to heal of 2.0 months. Among them, the wound healing rate of DM, VU, & PS were 85%, 95%, & 70% with the median time of wound healing of 2.1, 0.6, & 4.1 months, respectively. The factors associated with the wound healing rate in univariate were BMI, Hemoglobin, received Granudacyn regimen, use Top-ABT, use normal saline, use Providone Iodine/Chrohexidine, & received Nutrition support. After final step of model selection, factors associated with the wound healing rate were received Granudacyn regimen & use Top-ABT with OR 35.61 (95% CI; 1.38, 913.79) & 0.005 (95% CI; 0.0001, 0.17), respectively.

**Conclusion:** This study provides evidence of how the MOIST concept has been successfully applied in the treatment of chronic wounds.

### Revolutionizing Health Literacy: The Power of Artificial Intelligence in Simplifying Surgical Patient Education

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**Introduction:** Generative artificial intelligence (AI) dialogue platforms may help mitigate gaps in surgical health literacy. This study aimed to compare the ability of popular AI platforms to simplify online laparoscopic cholecystectomy (LC) patient education materials (PEMs) to meet recommended reading skill levels by the American Medical Association (AMA).

**Methods:** Online PEMs were collected from Google after searching for "Laparoscopic Cholecystectomy." Four AI chatbots (ChatGPT-3.5, ChatGPT-4, Gemini, and Claude-2) were prompted to rewrite PEMs to the 5th-grade reading level or below. Readability was assessed before and after AI conversion using four validated measures: Flesch Reading Ease, Flesch-Kincaid Grade Level (FKGL), Simple Measure of Gobbledygook Index, and Gunning-Fox Index.

**Results:** PEMs from 12 websites were gathered. Pre-conversion mean readability scores showed somewhat difficult readability at the 10-12th-grade level. Three of four AI platforms significantly improved readability scores across all four measures, with ChatGPT-4, Gemini, and Claude-2 generating text at the 6-7th-grade, 6-8th-grade, and 7-9th-grade levels, respectively. At the same time, ChatGPT-3.5 did not alter reading levels. Based on the FKGL, ChatGPT-4, ChatGPT-3.5, Gemini, and Claude-2 successfully converted 100%, 0%, 92%, and 67% of PEMs to recommended reading skill levels, respectively. ChatGPT-4 demonstrated significantly more favorable post-conversion readability scores across all measures than ChatGPT-3.5, Claude-2, and Gemini (all  $p < 0.001$ ).

**Conclusion:** This study of four popular chatbots shows the potential of AI in enhancing the readability of PEMs for patients undergoing LC, with ChatGPT-4 demonstrating superior performance to other chatbots. Further investigation into patient preferences for AI-modified versus original texts is essential.

### Risk of Adverse Outcomes by Plug and Flat Mesh after 89,255 Open Inguinal Hernia Repairs

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**Introduction:** Inguinal hernia repairs are one of the most common surgeries performed worldwide. Despite published guidelines, there is high variability in technical aspects of the procedure, including mesh shape. We evaluated risk for reoperation, recurrence, and chronic groin pain following open inguinal hernia repair with a plug versus flat mesh.

**Methods:** We conducted a cohort study including 89,255 adult patients who underwent elective open inguinal hernia repair with mesh within a US integrated healthcare system (1/1/2010-6/30/2023). Reoperation and recurrence were primary outcomes; 5-year postoperative groin pain was a secondary outcome. Multiple Cox regression was used to evaluate risk of primary outcomes, while multiple logistic regression was used to evaluate the secondary outcome between plug versus flat mesh, all models adjusted for confounders.

**Results:** Plugs were used in 37,158 (41.6%) repairs; plug use declined from 53.3% in 2010 to 13.8% in 2023. The 12-year incidences of reoperation and recurrence for plug versus flat mesh, respectively, were 3.5% versus 3.6% and 3.9% versus 4.1%. No difference in reoperation (hazard ratio [HR] = 1.05, 95% confidence interval [CI] = 0.94-1.19) or recurrence (HR = 0.95, 95% CI = 0.85-1.06) was found for plug compared to flat mesh after confounder adjustment. Incidence of groin pain was 5.7% and 4.9% for plug and flat mesh, respectively. In adjusted analysis, plugs had higher likelihood of groin pain (odds ratio = 1.09, 95% CI = 1.01-1.18).

**Conclusion:** We found no difference in reoperation or recurrence risks following repairs with plugs versus flat mesh. The higher likelihood of chronic groin pain with plugs may account for its decreasing usage.

### Robotic vs Laparoscopic Distal Gastrectomy with D2 Lymphadenectomy for Advanced Gastric Cancer in Short-Term Outcomes

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**Introduction:** Robotic gastrectomy (RG) has shown advantages for sensitive and complicated operations compared with laparoscopic gastrectomy (LG). However, whether RG is superior to conventional LG remains to be seen for advanced gastric cancer. The aim of this study to assess the advantage of RG for patients with advanced gastric cancer.

**Methods:** Ninety-one patients who underwent radical distal gastrectomy with D2 lymph node dissection for advanced gastric cancer between 2017 and 2023 were retrospectively analyzed. The patients were divided into two groups: the LG (n = 24) and RG (n = 67) groups. The short-term outcomes of these procedures were subsequently examined.

**Results:** The RG group had significantly shorter operation time (290.9 min vs 372.2 min; P < 0.001) and shorter hospital stays (11.7 days vs 23.6 days; P = 0.033), and trended to lower intra-

operative blood loss (56.1 ml vs 105.3 ml; P = 0.122) than the LG group. The overall complication rates of over Grade III in Clavien-Dindo classification were 7.46% (5 of 63 patients) in the RG group and 8.33% (2 of 24 patients) in the LG group, respectively (P = 0.890). In addition, the number of dissected lymph node is more larger in the RG group than the LG group (39.7 vs 32.2; P = 0.008).

**Conclusion:** RG has shown advantage for operation time, blood loss, shorter hospital stays, and number of dissected lymph node, and similar complication rates compared with LG for advanced gastric cancer. RG might be a great surgical option for patients with advanced gastric cancer.

### Same-Day Anti-Reflux Surgery: A Systematic Review and Meta-Analysis

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**Introduction:** Minimally invasive anti-reflux surgery (ARS) is the standard of care for refractory gastroesophageal reflux disease (GERD). Advances in surgical techniques and perioperative management have facilitated a shift toward same-day discharge for several procedures, including colectomies. However, there is no consensus on the safety of same-day discharge for anti-reflux surgeries. This study aims to evaluate the feasibility of same-day surgery compared to inpatient procedures.

**Methods:** PubMed, Cochrane and EMBASE databases were systematically searched for studies comparing same day surgery to inpatient surgery for GERD. Inclusion criteria were full-text studies comparing ARS patients with same-day discharge to those admitted to the inpatient setting. Exclusion criteria were studies that included malignancies; concomitant bariatric procedures; studies investigating medical treatment; and single-arm studies.

**Results:** Out of 2185 screened studies, 7 met the inclusion criteria, summing 1313 same-day ARS and 7607 performed as inpatient. There were no statistical differences in readmission rates between groups. Likewise, no differences were found in postoperative complication rates (OR= 0.74; 95% CI 0.4 - 1.37; I<sup>2</sup> = 0%), reoperation (OR= 1.18; 95% CI 0.53 - 2.61; I<sup>2</sup> = 0%) and ED visits (OR= 1.19; 95% CI 0.64 - 2.19; I<sup>2</sup> = 0%). The success rate of same-day ARS was 80.2%.

**Conclusion:** Same-day ARS appears to be safe and not associated with readmissions, reoperations, or postoperative complications and can be considered in selected patients. Further high-quality research is still needed to better delineate the appropriate candidates for same-day ARS.

### Shock Index as a Mortality Predictor in Emergency General Surgery Patients

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**Introduction:** The exact physiologic tool to risk stratify Emergency General Surgery (EGS) patients remains a mystery. Existing calculators are complex or designed for an elective population and fail to capture the morbidity in the EGS population. We sought to determine if a simple pre-existing validated value like shock index (SI) would be predictive of outcomes in the operative EGS population. We hypothesized that a simple tool to assess physiology could be as predictive as published calculators.

**Methods:** A retrospective analysis of EGS patients operated on at a single institution from 7/2008-6/2021 was performed. Vitals at time of surgical consultation were used to calculate SI. To compare predictive ability, operative trauma patients over the same interval were also analyzed. ROC curves were created to assess predictive ability of SI. Operations on the same patient during one admission were treated as one data point. Patients who had an operation on an admission outside of the 30-day period were treated as a unique data point.

**Results:** A total of 10343 operative EGS patients and 1287 operative trauma patients were examined. The shock index was significantly lower in the EGS than the trauma population (.658 v.733,  $p < .001$ ). The AUC for SI and for the SI\*Age was better in the EGS population than trauma.

**Conclusion:** Shock index and Shock index\*Age perform better in EGS than trauma populations. This readily available tool performed favorably to complex tools to stratify outcomes in the EGS population.

### Small Bites Technique (SB) for Abdominal Wall Closure and the Bias of Jenkins' Rule: A Systematic Review and Meta-Analysis

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**Introduction:** Introduction: The use of slowly absorbable monofilament materials and adhering to an SL/WL ratio greater than 4:1, along with the Small Bites (SB) technique, has been linked to reduced rates of incisional hernia (IH). Non-compliance with a 4:1 SL/WL ratio triples the risk of IH. This study aims to determine if adherence to the SL/WL ratio impacts IH occurrence.

**Methods:** Methods: Original studies reporting the use of the SB technique for abdominal wall closure were sourced from six databases. The SL/WL ratio in SB versus Large Bites (LB) technique studies was analyzed through pooled analysis and meta-analysis, with statistical analysis performed using Python and R. The analysis included design parameters such as mean, SD, and sample size, comparing the proportion of patients with an SL/WL ratio below 4 and assessing heterogeneity with  $I^2$  statistics.

**Results:** Results: Five randomized controlled trials (RCTs) and three prospective cohort studies were included for meta-analysis and qualitative analysis, respectively, after excluding two RCTs and three cohort studies for lack of necessary parameters. A total of 1,722 participants (847 SB and 875 LB) were analyzed. Globally, SB patients had a lower SL/WL ratio ( $<4$ ) in 21% of cases, compared to 31% in LB,  $p \leq 0.0001$  OR 1.91 (95% CI 1.5-2.4) with significant individual study trends.

**Conclusion:** Conclusion: Overall, a higher proportion of LB technique patients had an SL/WL ratio below 4, potentially skewing the effectiveness of the SB technique in preventing IH.

### Spouses and Partners of Surgeons Support Career Decision Despite Personal and Family Impact

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**Introduction:** Little remains known about how the demands of a surgeon's career impacts their partner. The objective of this study was to explore the effect of a career in surgery on the significant others (SO) of surgeons.

**Methods:** This was a prospective cohort study of the SOs of faculty and housestaff of the department of surgery at one academic institution. Participants were asked to voluntarily respond to a series of questions assessing the impact of their partner's career on their relationship, family and personal well-being adapted from the Stanford "Impact of Work on Personal Relationships" survey.

**Results:** There were 36 responses (response rate of 55%). The majority were female (67%) with male partners (64%), with a relationship length of 10+ years (56%). Overall, the most significant impact detected was on the direct surgeon-SO relationship, with a median [IQR] impact score of 4 [3- 4] indicating a moderate-severe impact, followed by a score of 3 [2- 4] for both family life and emotional well-being, indicating moderate impact. Despite significant impact, surgeon empathy toward SOs and family needs appeared relatively preserved and 64% of SOs agreed/strongly-agreed that they would want their partner to choose a career in surgery again.

**Conclusion:** A career in surgery has a significant impact on the SOs of surgeons, including significant impact on the direct relationship, family life and personal well-being of SOs. Despite this, SOs would want their surgeon-partner to choose a career in surgery again.

### Strategies to Promote Resiliency (SPRY): A Randomized Embedded Multifactorial Adaptive Platform (REMAP) Clinical Trial to Study Interventions to Improve Recovery after Surgery in High-Risk Patients

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**Introduction:** As our population ages, patients are increasingly frail requiring an emphasis on treatments to counteract their diminished resilience, especially following the stress of surgery. The growing literature supporting metformin as an anti-aging and anti-inflammatory therapy led us to hypothesize that preoperative metformin would reduce postoperative adverse outcomes among nondiabetic adults undergoing major surgical interventions.

**Methods:** In a randomized, embedded, multifactorial, adaptive platform (REMAP) trial, older adults ( $\geq 60$  years) scheduled for elective surgical interventions were randomized to placebo ( $N=3$ ) or metformin ( $N = 1:1:1$ ; 500 mg:1000 mg:1500 mg) for short (7-28 d), intermediate (29-90 d), or long ( $>90$  d) preoperative durations to a maximum of 500 to 2000 patients, with adaptive early-stopping and randomization. Using intention-to-treat analysis, Bayesian ordinal logistic regression compared 90-day hospital free days (90-HFD) and frequentist logistic regression compared 90-day reoperation and readmission.

**Results:** We randomized 302 ( $N = 106$  placebo,  $N = 196$  metformin [ $N = 64$  500 mg,  $N = 66$  1000 mg,  $N = 66$  1500 mg]) patients. Baseline demographics were similar across groups: age  $68 \pm 6$  years, 45% female, and 92% White race; surgical interventions: spine (29%), general (38%), colorectal (13%), other (20%). Median 90-HFD were similar across groups without a difference in the odds of 90-HFD across all treatment doses and duration of metformin compared to placebo. Only one 90-HFD mortality occurred after randomized to 1000 mg Metformin. There were no differences in the odds of reintervention (OR = 1.1, [95% CI, 0.6-2.0]) or readmission (OR = 1.5, [95% CI, 0.7-2.8]).

**Conclusion:** Pretreatment with metformin did not improve postsurgical outcomes in this REMAP trial, although trial enrolment was markedly limited by the COVID-19 pandemic and is underpowered.

### The Efficacy of Combination of Sodium Hypochlorite (NaOCL)/Hypochlorous Acid (HOCL) in Wound Management: A Systematic Review and Network Meta-Analysis

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**Introduction:** Antiseptic solutions are increasing used in the treatment of various types of wounds. The successful stabilization of the combination Sodium Hypochlorite/Hypochlorous acid (NaOCL/HOCL) has been reported as an effective solution without irritating on mammal cell & no evidence that poses a carcinogenic hazard. There was no systematic review or meta-analysis to compare the effectiveness of these antiseptic solutions. In this study, we aim to investigate the role of NaOCL/HOCL in the treatment of wounds.

**Methods:** The systematic review with extended to network meta-analysis (NMA) was conducted with included NaOCL/HOCL, povidone iodine, octenidine dihydrochloride, polyhexamethylene biguanide, alcohol, & silver compared with normal saline. The primary outcome was wound healing. The direct and indirect comparisons were performed with probability being best of treatment using surface under the cumulative ranking curve (SUCRA) (PROSPERO number: CRD42019120532).

**Results:** A total of 507 studies were identified from PUBMED & SCOPUS databases. Among 29 studies were included, there were 22 RCTs and 7 cohort studies met our inclusion criteria. NaOCL/HOCL had higher chance of wound healing from 1.07 to 1.30 compared with all of regimens. The probability of being the best treatment was NaOCL/HOCL, followed by silver and octenidine with SUCRAs of 36.9, 23.1, & 21.8, respectively. Results of using it in chronic wounds management were submitted to the second abstract.

**Conclusion:** Our evidence suggests that NaOCL/HOCL had highest efficacy. It was ranked first followed by silver, octenidine, and PHMB for treatment success. Further large scale RCTs should be conducted alongside with economic evaluations.

### Treatment Patterns for Pancreatic Cancer in Octogenarians: A National Cancer Database Study

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**Introduction:** Approximately one-third of pancreatic cancer cases are diagnosed in individuals aged 80 years or older. Surgical resection is the mainstay treatment in patients with resectable disease; however, its efficacy in octogenarians is poorly understood. We sought to evaluate surgical outcomes in octogenarians presenting with resectable disease.

**Methods:** This is a National Cancer Database (NCDB) retrospective cohort study that examines surgical outcomes in octogenarian patients who presented between 2010 and 2019. Comparison groups included patients treated with surgery alone vs. neoadjuvant therapy vs. adjuvant therapy vs. chemotherapy alone. Statistical analysis was performed.

**Results:** 2,739 patients met the inclusion criteria. Chemotherapy was the most common treatment in 1,610 (59%) patients. Surgery alone was performed in 791 (29%) patients. Adjuvant therapy was used in 204 (7%), and neoadjuvant therapy was used in 124 (5%). The average age of presentation was 83.2. Octogenarians who received surgery alone had the greatest median survival (49.1 months for patients receiving surgery alone vs. 30.6 surgery and adjuvant therapy vs. 29.7 neoadjuvant therapy vs. 11.4 chemotherapy alone,  $p < .001$ ). The 90-day mortality was highest in patients who received surgery alone (72 (9%) surgery alone vs. 0 (0%) chemotherapy alone vs. 1 (.005%) surgery and adjuvant vs. 7 (5%) neoadjuvant,  $p < .001$ ).

**Conclusion:** Pancreatoduodenectomy is feasible and improves survival in octogenarians with limited utilization of neoadjuvant or adjuvant chemotherapy compared to chemotherapy alone. Further research is warranted for risk stratification in octogenarians being considered for multi-disciplinary treatment.

### What You Inject Actually Matters: Transversus Abdominis Plane Blocks During Transversus Abdominis Release Herniorrhaphy

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**Introduction:** Transversus abdominis plane blocks (TAP-blocks) are a common analgesic adjunct following transversus abdominis release (TAR) herniorrhaphy. Liposomal bupivacaine (LB) TAP-blocks demonstrate mixed results during TAR; some studies demonstrate reduced length-of-stay (LOS) and opioid requirements, while others demonstrate no difference in outcome. This study compares

patient outcomes of surgeon-performed TAP-blocks using LB or plain bupivacaine (PB) during open TAR.

**Methods:** We retrospectively analyzed prospective data from a single center of adult patients who underwent open bilateral TAR (April 2017 to December 2023) with concomitant surgeon-performed TAP-blocks utilizing LB (266 mg EXPAREL; Pacira Pharmaceuticals) or PB (7.5 mg-25 mg), based on surgeon preference and hospital availability of LB. Patients with chronic preoperative opioid use, prolonged postoperative intubation, or those requiring same-admission reoperation were excluded. The primary outcome was total opioid use (morphine milligram equivalent - MME) within the first 72 hours postoperatively. Secondary outcomes included patient-reported pain scores and hospital LOS.

**Results:** We identified 224 patients receiving TAP-blocks during open TAR (106 LB vs 118 PB). The LB group had longer operative times than the PB group. In the first 72 hours after surgery, opioid utilization between the groups was similar; however, there were significant reductions in postoperative pain scores and LOS in the LB Group.

**Conclusion:** In the first 72 hours after TAR, patients receiving LB or PB TAP-blocks used similar amounts of opioids. Despite 110 minutes of extra operative time, the LB group had significantly lower pain scores and shorter LOS when compared to the PB group.