The Department of Surgery at Dartmouth-Hitchcock Medical Center

THE NINTH ANNUAL *STARS*

(SURGICAL TRAINEES ADVANCING RESEARCH SYMPOSIUM)

Ord.	Time	Presenting Author	Title
1	6:30	Robert D. Shaw, MD	Mental Health Diagnosis not PRO is Predictive of ERAS Failure Following Elective Colon Resection
2	6:37	Mark A. Eid, MD	Effect of a Decision Aid on Alignment of Patient Preference and Repair Type for Abdominal Aortic Aneurysm
3	6:44	Sadia Ilyas, MD	Sex and Racial Differences in Thrombotic Events Among Adults Hospitalized with COVID-19
4	6:51	Kunal Mehta, MD, MS	Trends in Patient Characteristics, Medications, and Mortality Among Medicare Patients Diagnosed with Peripheral Artery Disease
5	6:58	Aravind Ponukumati, MD	Stress Testing Prior to AAA Repair: What is Our Return on Investment?
6	7:05	Jennifer A. Wylie, BA	Opioid Dependence and Overdose After Surgery: Rate, Risk Factors and Reasons
7	7:12	Amanda J. Bastien, BA	Office Laryngoscopy in the Time of the Covid-19 Pandemic: Is it Aerosol-Generating?
8	7:19	Eleah D. Porter, MD	National Estimate of Surgery Prescription Opioid Misuse and Diversion in US Adults and Associated Risk Factors
9	7:26	Sarah Y. Bessen, MPH	An Effective Strategy for School-Based Hearing Screening in Rural Nicaragua Using Community Health Workers and Mobile Health Technology
10	7:33	Mary M. Leech, BA	Increased Cost Sharing Associated with Delayed and Complicated Presentation of Acute Appendicitis and Diverticulitis
11	7:40	Libby Copeland-Halperin, MD	Oral Cancer Patients Undergoing Resection with Free Flap Reconstruction: Predictors of Gastrostomy Tube Placement
12	7:47	Chiamaka L. Okorie, BSc	Using Electronic Health Records to Streamline Provider Recruitment for Implementation Science Studies
13	7:54	Charles Burney, MD	Impact of Rurality on Geriatric Emergency General Surgery Patients in New Hampshire
14	8:01	Imad S. Khan, MD, MBBS	Transfer Status as a Predictor of Increased Mortality in Patients Needing Ventricular Shunt Surgery
15	8:08	Casey R. Lamb, MD	Medical Students Recognize Different Qualities in Excellent Resident and Attending Teachers: A Qualitative Analysis of Nominations for Surgical Clerkship Teaching Awards
16	8:15	George Sanchez, BS	Patient's Age as a Prognostic Factor of Visual and Surgical Outcome After Surgical Repair of Primary Macula-Off, Rhegmatogenous Retinal Detachment
17	8:22	Naomi A. Cole, BS	Breast Cancer in Male-to-Female Transgender Patients: Multidisciplinary Considerations

Co-Directors: Philip P. Goodney, MD, MS and Kari M. Rosenkranz, MD

Judges: Eileen Duggan, MD; Philip Goodney, MD, MS; Vernon M. Pais, MD; Kari Rosenkranz, MD; David Soybel, MD; David H. Stone, MD; Matthew Z. Wilson, MD, MSc; Andrea B. Wolffing, MD; Sandra L. Wong, MD, MS; Asha M. Zimmerman, MD

1. Robert D. Shaw

Mental Health Diagnosis not PRO is Predictive of ERAS Failure Following Elective Colon Resection

Robert D. Shaw, MD[1]; Jackson T. Read, BS[3]; Mark A. Eid, MD[1,2]; Matthew Z. Wilson, MD, MSc, FACS, FASCRS[1,3]; Srinivas J. Ivatury, MD, MHA, FACS, FASCRS[1,3]

[1] Department of Surgery, Dartmouth-Hitchcock Medical Center, Lebanon, NH
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[3] Geisel School of Medicine, Hanover, NH

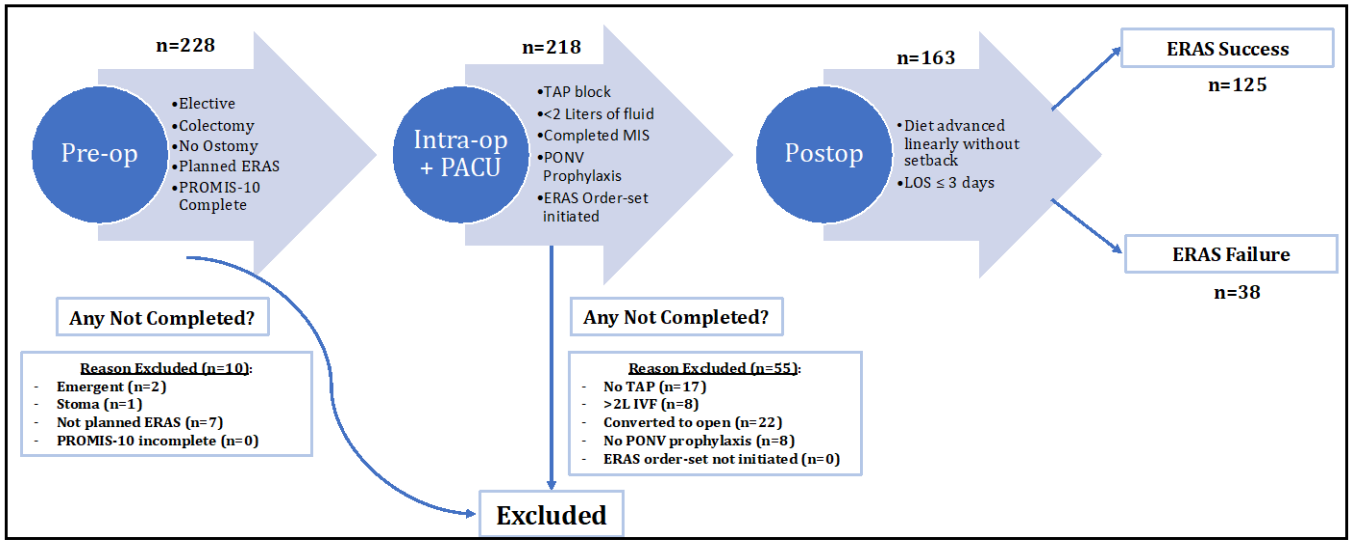
Introduction:
Early Recovery After Surgery (ERAS) protocols have demonstrated decreased complication rate and length of stay (LOS). However, the influence of mental health on ERAS success is unknown.

Methods:
A retrospective study of prospectively collected patient-reported outcomes for physical and mental health. We included patients that underwent elective minimally invasive colon resections, who completed the Patient-Reported Outcomes Measurement Information System 10 (PROMIS-10) questionnaire pre-operatively, and who had successful implementation of perioperative ERAS components. We evaluated the predictors of ERAS success using a multiple logistic regression, controlling for baseline patient characteristics, history of a mental health diagnosis, and pre-operative PROMIS-10 scores. (FIGURE 1)

Results:
163 patients met inclusion criteria, of which 23% failed ERAS, and 32% had a pre-operative mental health diagnosis. The most common reason for ERAS failure was length of stay (55.3%) followed by post-operative ileus (31.6%). Age, sex and pre-operative PROMIS-10 scores were not significantly different between those who failed or succeeded ERAS, whereas LOS was typically longer for those who failed ERAS (5.7d failure vs. 2.2d success, $p<0.001$). Patients with a previous mental health diagnosis, where depression and anxiety were most common, had significantly lower odds of ERAS success (OR of 0.22, 95% CI: 0.09-0.52, $p=0.001$).

Conclusion:
Patients with a mental health diagnosis have a lower likelihood of success with ERAS protocols. The majority of these patients self report normal mental and physical health pre-operatively, indicating that even well controlled mental health diagnoses have a negative impact on ERAS success.

Figure 1. Determination of ERAS Success and Inclusion/Exclusion



Abbreviations: ERAS (Early Recovery After Surgery), PROMIS-10 (Patient-Reported Outcomes Measurement Information System 10), TAP (Transversus Abdominis Plane), MIS (Minimally Invasive Surgery), PONV (Post-Operative Nausea/Vomiting), LOS (Length of Stay)

Effect of a Decision Aid on Alignment of Patient Preference and Repair Type for Abdominal Aortic Aneurysm

Mark A. Eid[1], Jonathan A. Barnes[1], Kunal Mehta[1], Zacharay Wanken[1], Jesse Columbo[1], Ravinder Kang[1], Karina Newhall[1,9], Vivienne Halpern[16], Joseph Raffetto[7], Panos Kougias[11], Peter Henke[8], Gale Tang[9], Hasan Dosluoglu[5], Leila Mureebe[10], Jason Johanning[12], Edith Tzeng[21], Salvatore Scali[14], David Stone[1], Bjoern Suckow[1], Eugeen Lee[6], Shipra Arya[13,17], Kristine Orion[15], Jessica O'Connell[18], Benjamin Brooke[4], Daniel Ihnat[19], Wei Zhou[22], Peter Nelson[20,24], Emily Spangler[3], Michael Barry[23], Brenda Sirovich[1], Philip Goodney[1]

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3. Birmingham VA, Birmingham, Alabama
4. Salt Lake City VA, Salt Lake City, Utah
5. Buffalo VAMC, Buffalo, New York
6. Sacramento VAMC, Mather, California
7. West Roxbury VA, Boston, Massachusetts
8. Ann Arbor VAMC, Ann Arbor, Michigan
9. Seattle VAMC, Seattle, Washington
10. Durham VAMC, Durham, North Carolina
11. Houston VAMC, Houston, Texas
12. Omaha VAMC, Omaha, Nebraska
13. Atlanta VAMC, Atlanta, Georgia
14. Gainesville VAMC, Gainesville, Florida
15. West Haven VAMC, West Haven, Connecticut
16. Phoenix VAMC, Phoenix, Arizona
17. Palo Alto VAMC, Palo Alto, California
18. Los Angeles VAMC, Los Angeles, California
19. Minneapolis VAMC, Minneapolis, Minneapolis
20. Muskogee VAMC, Muskogee, Oklahoma
21. Pittsburgh VAMC, Pittsburgh, Pennsylvania
22. Tucson VAMC, Tucson, Arizona
23. Massachusetts General Hospital Center for Shared Decision Making, Boston, Massachusetts
24. Tampa VAMC, Tampa Bay, Florida

Introduction:

Patients considering abdominal aortic aneurysm (AAA) repair can be treated with endovascular (EVAR) or open repair with significant tradeoffs between their options. We hypothesized that a decision aid designed to help patients choose between these tradeoffs would improve the concordance between patient preference and the type of AAA repair they receive.

Methods:

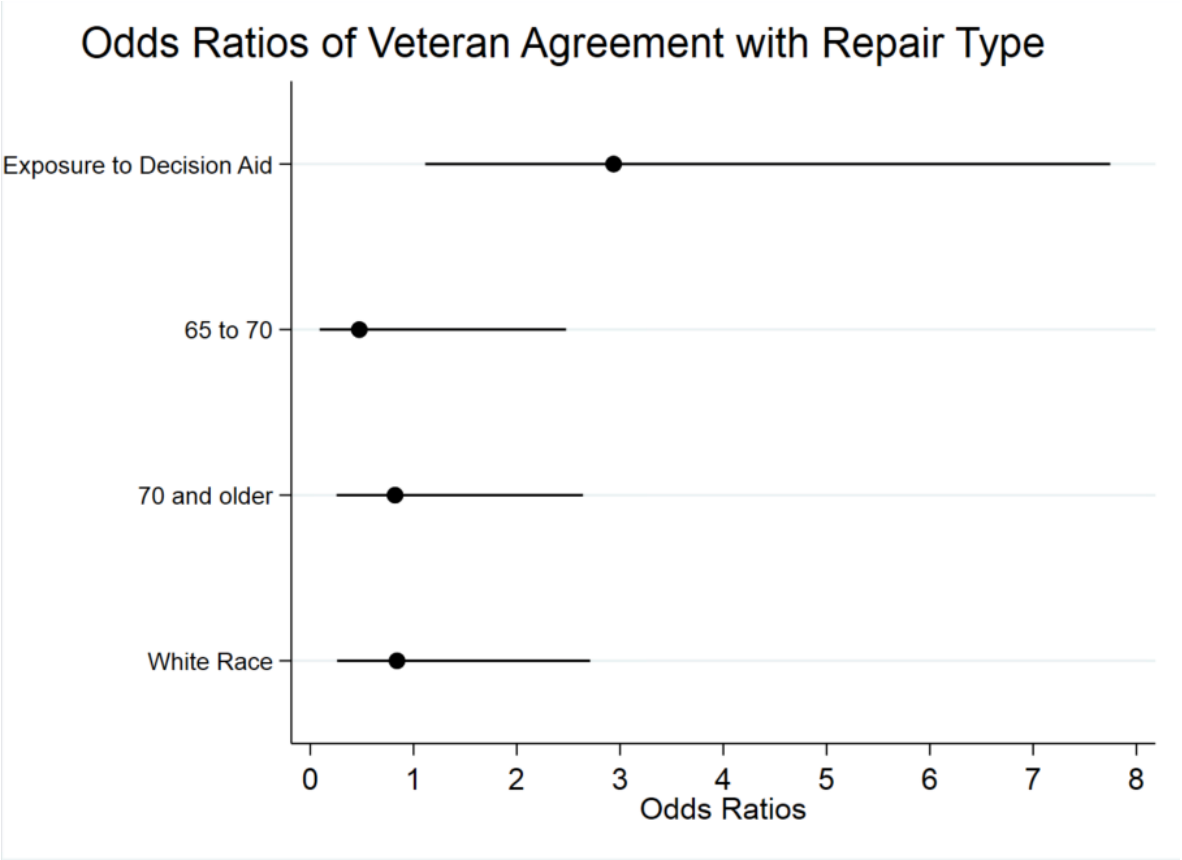
We performed a cluster-randomized trial where 12 vascular clinics in the decision aid arm counseled patients considering AAA repair using a decision aid and then administered a survey eliciting the type of repair they preferred (EVAR versus open repair); 11 vascular surgery clinics in the control arm collected the same survey without administering the decision aid. Eligible patients had AAAs which were at least 5.0 cm in diameter and

were candidates for both EVAR and open repair. Our main outcome measure was the agreement between the repair type preference expressed by the patient and the repair type they ultimately received.

Results:
A total of 235 patients were randomized: 126 in the decision aid group and 109 in the usual care group. Patients were demographically similar between the decision aid and control groups in terms of age, gender, aneurysm size (5.7 versus 5.7, p=0.63), iliac artery involvement (14% versus 10%, p=50), Charlson comorbidity score (4.0 versus 4.2, p=0.68), and the proportion of patients treated with EVAR (84% decision aid, 80% usual care, (p=0.48). Of the 192 (82%) patients who proceeded with AAA repair within at least a year after study enrollment, those in the decision aid group were more likely to receive a repair type concordant with their preference (95% concordance in decision aid group, 86% concordance in the control group, (p=0.03, Fig 2). After adjustment, patients exposed to a decision aid had nearly three times the odds of alignment between patient preferences and operation type (OR 2.93, 95% CI:1.11-7.74).

Conclusions:
Administration of a decision aid was associated with improved concordance between patient preference and repair type for patients treated for abdominal aortic aneurysm.

Figure 1. Odds ratios of Veteran Agreement with Repair Type.



3. Sadia Ilyas

Sex and Racial Differences in Thrombotic Events Among Adults Hospitalized with COVID-19

Ilyas S, Henken S, Martinez-Camblor P, Suckow BD, Beach JM, Stone DH, Goodney PP, Ebinger JE, Creager MA, Columbo JA

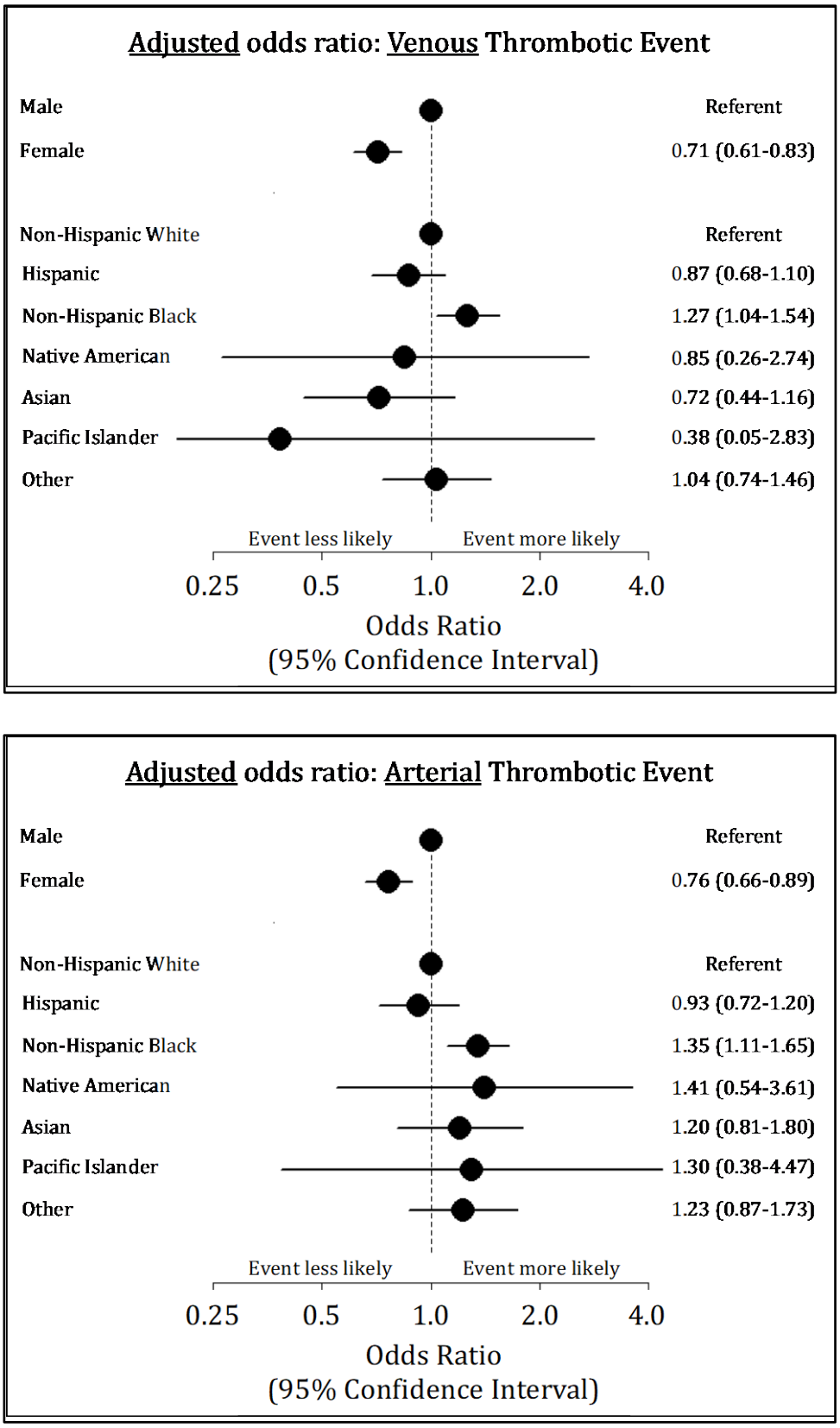
Introduction:
Patients hospitalized with COVID-19 may have a proclivity for thrombotic events. The impact of sex or race on these events remains unknown. Our objective was to study the association between sex and race on the likelihood of venous and arterial thrombotic events among adults hospitalized with COVID-19.

Methods:
The American Heart Association Cardiovascular Disease COVID-19 registry was used to study thrombotic outcomes among hospitalized adults. The registry captures demographic, clinical, and outcome data on adults hospitalized with COVID-19 at participating centers. Our primary exposures were sex and race, as defined by the registry. Primary outcomes were Venous Thrombotic Events (VTE), a composite of deep vein thrombosis or pulmonary embolism, and Arterial Thrombotic Events (ATE), a composite of myocardial infarction, ischemic stroke, acute limb ischemia, and left ventricular thrombus. We used logistic regression to adjust for baseline clinical characteristics and medications.

Results:
We studied 21,528 hospitalized adults with COVID-19 across 107. Of this cohort, 30.7% required intensive care, and 15.4% died during hospitalization. The overall rate of VTE and ATE was 3.7% and 3.9%, respectively. Compared to males, females were less likely to suffer VTE (adjusted odds ratio [aOR]: 0.71, 95% confidence interval [95CI]: 0.61-0.83) and ATE (aOR: 0.76, 95CI: 0.66-0.89). Compared to non-Hispanic Whites, non-Hispanic Blacks had the highest likelihood of VTE (aOR: 1.27, 95CI: 1.04-1.54) and ATE (aOR: 1.35, 95CI: 1.11-1.65). Hispanic race was protective against VTE in the unadjusted model, but not after risk adjustment (unadjusted VTE OR: 0.74, 95CI: 0.61-0.90; adjusted VTE OR: 0.87, 95CI: 0.68-1.10) with similar findings for ATE. The interaction between sex and race was not statistically significant.

Conclusions:
Male and non-Hispanic Black adults hospitalized with COVID-19 appear to have an elevated likelihood of venous and arterial thrombotic events. These subgroups may represent an at-risk population more susceptible to thrombotic COVID-19 complications.

Figure 1: Adjusted odds ratios of venous and thrombotic events.



Trends in Patient Characteristics, Medications, and Mortality Among Medicare Patients Diagnosed with Peripheral Artery Disease

Kunal Mehta, MD, MS[1]; Mark A. Eid, MD[2]; Barbara Gladders, MS[1]; Andrea M. Austin, PhD[3]; Mark A. Creager, MD[1]; Philip P. Goodney, MD, MS[1,3]

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Introduction:
Peripheral artery disease (PAD) is a known risk factor for mortality, but few large-scale studies have examined secular trends in mortality over time for these patients. In this study we characterize trends in mortality in patients with PAD and examine factors associated with mortality.

Methods:
We performed a retrospective cohort study using Medicare claims records for PAD from 2006 to 2018. We identified all patients with ICD-9 or ICD-10 diagnosis codes indicative of PAD. The primary outcome of interest was all-cause mortality rate at 1 year. Kaplan-Meier survival analysis was used to characterize time to death stratified by patient characteristics, with the log-rank test used to assess differences in survival. Multivariate regression was used to identify factors which predict mortality at 1 year.

Results:
The analytic cohort consisted of 4,012,445 Medicare beneficiaries with PAD. These patients were typically elderly (mean age 77 years), female (61.6%), and Caucasian (81.1%). A total of 488,613 patients died within one year of their PAD diagnosis, for an overall one-year all-cause mortality rate of 12.2%. From 2006 to 2017, there was a 32.3% reduction in 1-year all-cause mortality and a 46.2% reduction in mortality associated with a preceding cardiovascular event **(Figure 1)**. Factors associated with increased odds of death at 1 year included age ≥ 85 years (OR 3.72; 95% CI: 3.69 – 3.76) and the presence of congestive heart failure (OR 2.09; 95% CI 2.07 – 2.10). Factors which appeared protective against mortality included Asian race (OR 0.60; 95% CI 0.59 – 0.62) and adherence to statin medications (OR 0.34; 95% CI 0.33 – 0.35).

Conclusion:
In this study we describe a reduction in mortality among US Medicare beneficiaries with PAD over the past decade. This reduction in mortality is multifactorial, but appears driven by patients' younger age at diagnosis, their co-morbidities, and adherence to key medications.

4. Kunal Mehta

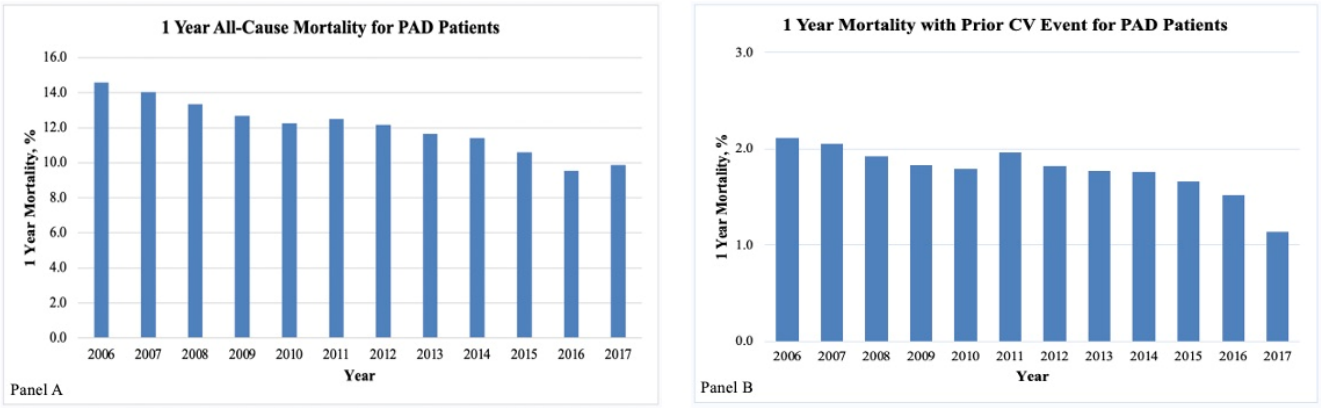

Figure 1. This figure demonstrates one-year all-cause mortality rates (panel A, left) and one-year mortality rates associated with a prior cardiovascular event (panel B, right) for patients with PAD based upon the year they entered the analytic cohort. From 2006 to 2017, there was a 32.3% reduction in all-cause mortality and a 46.2% reduction in mortality with a preceding cardiovascular event at one year.

Stress Testing Prior to AAA Repair: What is Our Return on Investment?

Aravind Ponukumati, MD[1]; Jesse Columbo, MD, MS[1]; Stanislav Henkin, MD, MPH[1], Bjoern Suckow, MD, MS[1]; Jocelyn Beach, MD, MS[1]; Phillip Goodney, MD, MS[1]; Salvatore Scali, MD[2]; Mark Conrad, MD[3]; Richard Powell, MD[1]; David Stone, MD[1]

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[2]University of Florida Health, Gainesville, FL, USA.
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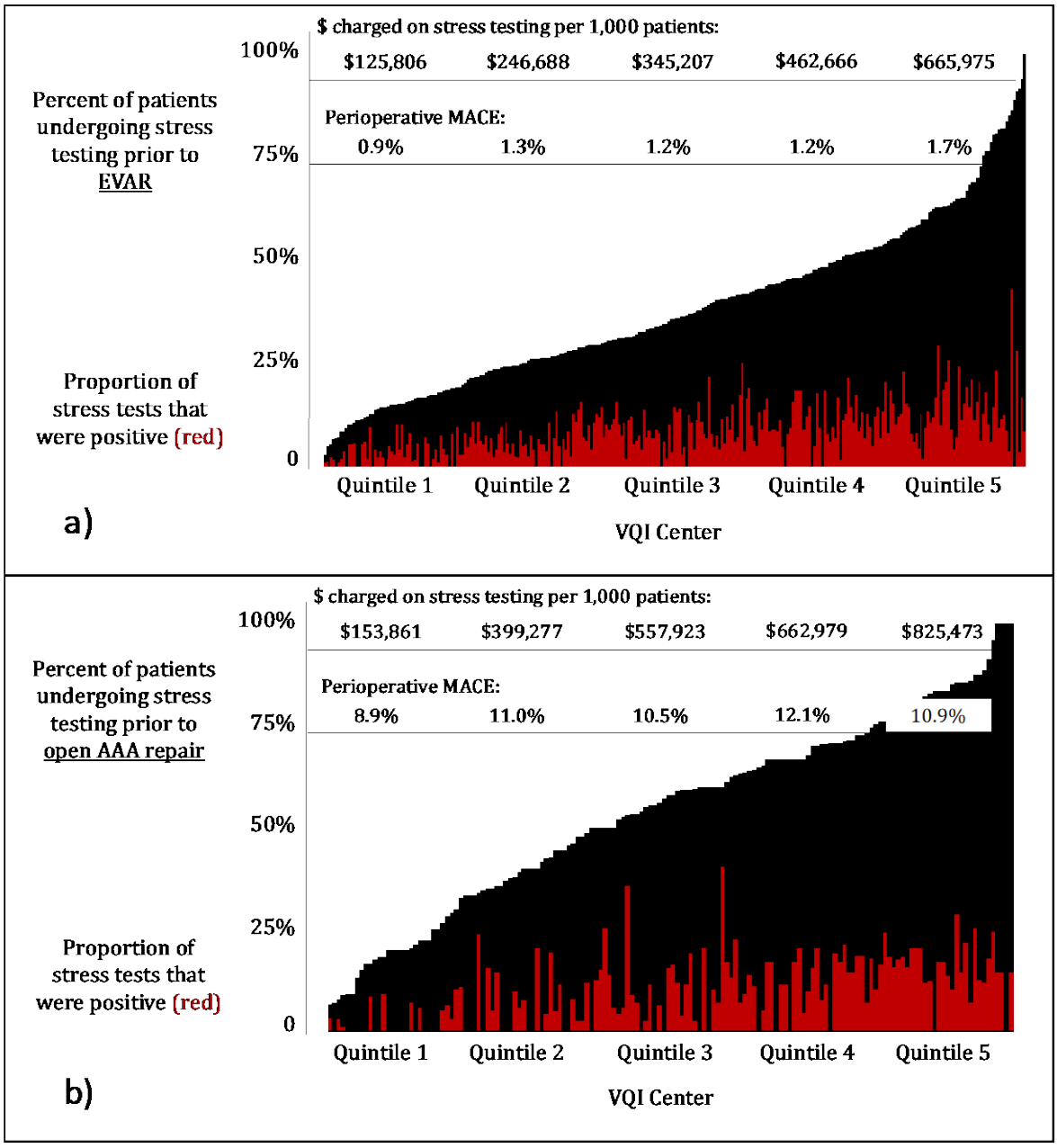
Introduction:
The utilization and cost-effectiveness of stress testing prior to abdominal aortic aneurysm (AAA) repair remains highly variable and insufficiently studied. We sought to examine the financial implications of stress testing and its impact on adverse cardiac events.

Methods:
We studied patients who underwent elective endovascular (EVAR) or open AAA repair at Vascular Quality Initiative centers from 2015–2019. We grouped centers into quintiles by their frequency of preoperative stress testing. We calculated rates of major adverse cardiovascular events (MACE), a composite of in-hospital myocardial infarction, stroke, heart failure, or death, for each quintile. We obtained the subtypes and charges for stress tests at our institution in 2019 and applied these trends to the study population to calculate expected charges per 1,000 patients.

Results:
We studied 27,978 patients who underwent EVAR (mean age:73.5±8.5 years, 81.7% male) and 4,481 patients who underwent open AAA repair (mean age:69.5±8.1 years, 75.1% male). Stratifying by quintile, stress test utilization ranged from 13.0%-68.6% (mean:37.9%) among EVAR patients and 15.9%-85.0% (mean:52.8%) among open repair (Figure). The overall rate of MACE was 1.4% for EVAR and 10.2% for open AAA repair. MACE after EVAR increased with frequency of stress testing, at 0.9% among 1st quintile centers versus 1.7% among 5th quintile centers (p-trend=0.033). Conversely, there was no association between MACE and stress testing for open repair (p-trend=0.192). The estimated financial charges for stress testing prior to EVAR were $125,806 per 1,000 patients at 1st quintile centers, and $664,975 at 5th quintile centers, while charges prior to open AAA repair were $153,861 per 1,000 patients at 1st quintile centers, and $825,473 at 5th quintile centers.

Conclusions:
More frequent stress testing is associated with substantial cost without a reduction in MACE. This lack of return on investment highlights the need for more judicious stress test utilization prior to surgery.

Figure 1: Stress test utilization prior to EVAR (a) and open AAA repair (b). Frequency of stress testing across VQI centers, the proportion of those stress tests that were positive for myocardial scarring, ischemia, or both, rates of perioperative MACE, and dollars charged for stress testing per 1,000 patients treated.



6. Jennifer A. Wylie

Opioid Dependence and Overdose after Surgery: Rate, Risk Factors and Reasons

Jennifer A. Wylie[1], Lixi Kong[2], Richard J. Barth Jr.[3]

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[2]Dartmouth-Hitchcock Medical Center Analytics Institute, Lebanon, NH
[3]Department of Surgery, Dartmouth-Hitchcock Medical Center, Lebanon, NH

Introduction:
Patients receiving opioids after surgery are at risk of experiencing harmful opioid-related adverse events. The objective of this study is to determine incidence of "*opioid never events" (ONE)*, defined as the development of opioid dependence or overdose in a patient who is opioid naïve, has surgery, and is prescribed opioids post-operatively. We also sought to identify risk factors predicting *ONE*.

Methods:
A retrospective electronic medical record (EMR) review was conducted for all opioid naïve patients who underwent surgery at a single academic institution between 1/1/2015 and 12/31/2018 and followed through 3/31/2020. *ONE* were determined by ICD-9 and -10 codes and EMR review.

Results:
39,551 opioid naïve surgical patients received opioids post-operatively. *ONE* occurred in 0.17% (67/39,551) of surgical patients. Normalized *ONE* rates were 0.22% in 2015, 0.25% in 2016, 0.27% in 2017 and 0.20% in 2018. Ten of the 67 *ONE* patients overdosed on opioids; 57 developed opioid dependence without overdose. Mean and median times to *ONE* were 1.9 and 1.6 years, respectively. The *ONE* rate was significantly higher in patients 25-34 years of age, thoracic surgery patients and patients whose primary payor was Medicaid. Patients receiving an opioid prescription 90-180 days after surgery were more likely to develop an *ONE* (0.98% vs 0.14%, $p < 0.0001$). Well defined reasons (eg. cancer related pain) were identified for 52% of *ONE*; 48% of patients developed *ONE* for non-specific reasons. Twelve of the 67 *ONE* patients progressed to IV drug use; 4 attempted suicide.

Conclusions:
Postoperative opioid dependence or overdose is a significant health problem, affecting roughly 2 of every thousand opioid-naïve patients prescribed an opioid after surgery. Reasons for opioid dependence or overdose are non-specific in half of these patients. Risk factors for development of *ONE* include patient age, surgical procedure, insurer and filling an opioid prescription 90-180 days after surgery.

Office Laryngoscopy in the Time of the Covid-19 Pandemic: Is it Aerosol-Generating?

Amanda J. Bastien[1], Kwame Wiredu[1,3], Andrew Y. Lee[1], Mason T. Hinchcliff [1,2], Joseph A. Paydarfar[1,2]

1. Geisel School of Medicine at Dartmouth, Hanover, NH, USA 03755.
2. Section of Otolaryngology, Department of Surgery, Dartmouth-Hitchcock Medical Center, Lebanon, NH 03766.
3. Department of Quantitative Biomedical Sciences, Geisel School of Medicine at Dartmouth, Hanover, NH, USA 03755.

Introduction:

There remains uncertainty about whether common in-office otolaryngology procedures are aerosol-generating, thereby potentially increasing the risk of SARS-CoV-2 transmission. These concerns have led to the implementation of safety precautions limiting the number of patients seen in clinic without evidence demonstrating the necessity of these changes. Our goal was to investigate whether laryngoscopy is an aerosol-generating procedure to help inform clinical practices.

Methods:

Patients seen at Dartmouth-Hitchcock's Otolaryngology Clinic from February to March 2021 who underwent flexible laryngoscopy or rigid nasal endoscopy were selected for inclusion. The optical particle sizer (OPS) instruments were located approximately 12 inches from the patient's nares with minimal instrument movement. Measurements were taken every 30 seconds throughout the entire patient encounter. Two OPS instruments, detecting particles ranging from 0.02µm to 5µm, were utilized. The time of topical spray administration, start/end of laryngoscopy, and other potential aerosol-generating events (e.g. coughing, sneezing) were recorded. We performed trend analysis to establish baseline particle counts for each visit. The data was then analyzed using the Wilcoxon Signed-Rank test.

Results:

Thirty-six flexible scopes and nine rigid scopes were included. A cumulative analysis of particles 0.02-1µm in size detected a significant change in particle counts in both rigid ($p<0.009$) and flexible scopes ($p<0.001$). Furthermore, there was a significant increase in particles <1µm, but no significant change in particles 1-5µm during flexible laryngoscope visits. There was also a significant increase in particles ≤2µm during the rigid nasal endoscopy visits (**Table 1**).

Conclusion:

Given the concern for airborne transmission of SARS-CoV-2, our preliminary analysis supports that the flexible laryngoscopy and rigid nasal endoscopy processes may be aerosol-generating. Future analysis will include assessment of potential confounders including mask use, room ventilation, and the number of individuals present. The nuanced understanding of particle generation in common otolaryngology procedures will guide safe and efficient clinical practices.

Table 1: Median differences between baseline particle counts and peri-scope particle counts stratified by particle size.

	Flex		*Rigid*		*Overall*	
Aerosol Size	**Median Difference**	**p value**	**Median Difference**	**p value**	**Median Difference**	**p value**
p Trak						
< 0.3	65.5	<0.001*	92	0.009*	76	<0.001*
Aero Trak						
0.3	1771025.0	<0.001*	2685512	0.009*	2002827	<0.001*
0.5	24028.5	<0.001*	33923	0.009*	25442	<0.001*
0.7	183746.0	0.004*	260072	0.009*	212014	<0.001*
1	4240.5	0.379	65018	0.009*	12720	0.037*
2	-4947.0	0.729	63606	0.044*	4241	0.426
5	-6360.5	0.446	21201	0.076	-1413	0.861

Note: * p values are based on Wilcoxon signed rank test with continuity correction

National Estimate of Surgery Prescription Opioid Misuse and Diversion in US Adults and Associated Risk Factors

Eleah D. Porter, Olivia A. Sacks, Niveditta Ramkumar, Brenda Sirovich, Richard J. Barth Jr.

Introduction:
There is currently limited data to support the assumption that opioids prescribed after surgery are linked with prescription (Rx) opioid misuse and diversion. This study estimates national rates of these outcomes and associated risk factors.

Methods: We administered a 40-question survey to US adults aged >17 years on Amazon Mechanical Turk, an online crowd-sourcing worksite. Eligible participants had undergone a surgical procedure within the last 5 years and were prescribed opioids for pain control. We assessed for incidence of opioid misuse, defined as taking pills in a way other than instructed by a provider, and diversion, defined as having pills shared, sold, or stolen. Multivariable logistic regression identified risk factors associated with misuse or diversion.

Results:
966 participants met final inclusion. Respondents were from all 50 states, 52% were male, 43% were aged 30-39 years, and 79% self-identified as white. The most common surgery type was dental (56%), followed by abdominal (11%), orthopedic (11%), and gynecologic/urologic (10%). Overall, 31% (n=299) kept leftover unused opioids pills. Regarding misuse, 34% (n=333) reported misusing their surgery Rx opioids. Independent risk factors for misuse included working in healthcare, scoring high risk on the Opioid Risk Tool (ORT), experiencing an elevated mood after taking opioids, refilling an opioid Rx, and keeping unused opioid pills. Diversion of surgery Rx opioids was reported in 22% (n=212) and risk factors included working in healthcare, undergoing plastic surgery, scoring high risk on the ORT, and keeping unused pills.

Conclusion: Within a sample population of US adults, one in three reported misuse and one in five reported diversion of their recent surgery Rx opioids. Several common risk factors were identified such as keeping of unused pills. Efforts to improve pill disposal and incorporating risk stratification into prescribing may help mitigate surgery associated Rx opioid misuse and diversion.

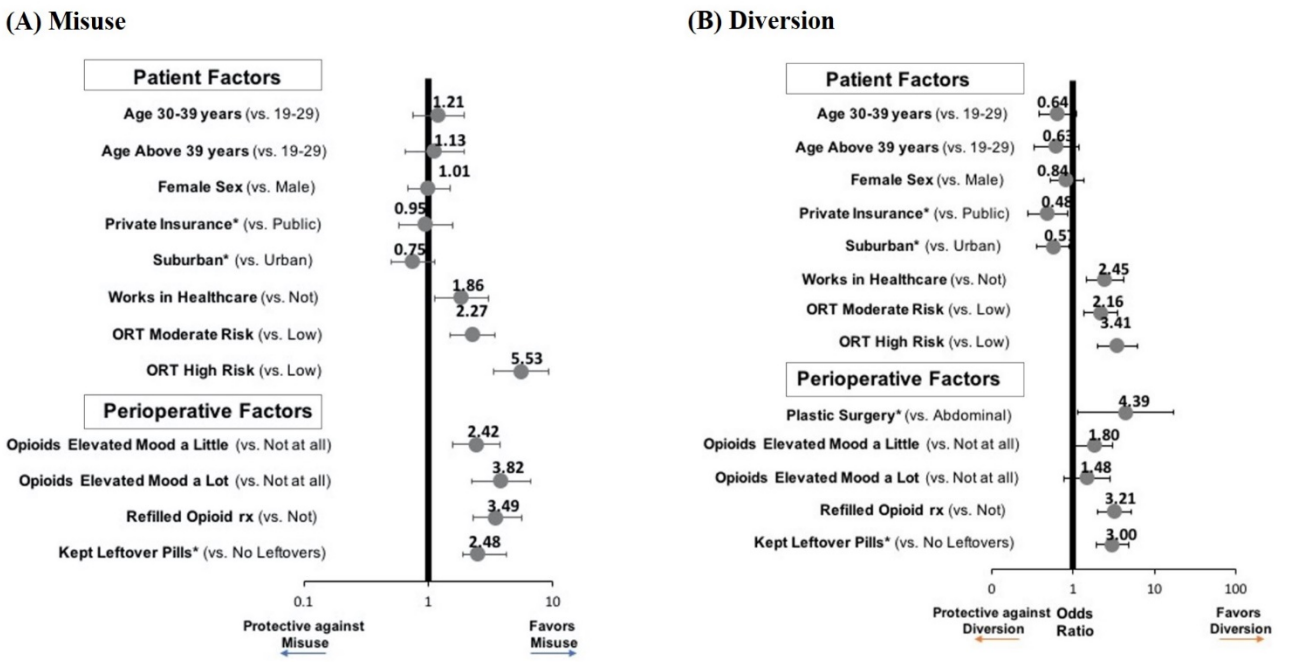

Figure. Forest plot of risk factors associated with surgery prescription opioid misuse (A) and diversion (B) from multivariable analyses. *Plots only show subcategories of categorical variables with statistically significant ($p<0.05$) effects. *ORT* opioid risk tool, *rx* prescription.

An Effective Strategy for School-Based Hearing Screening in Rural Nicaragua Using Community Health Workers and Mobile Health Technology

James E. Saunders, MD; Sarah Y. Bessen, MPH; Isabelle Magro, MD; Devin Cowan; Marvin Gonzalez, PhD; Karen Mojica-Alvarez, MD; Denoso Panalba; Catherine Reike, AuD; Abigail Fellows; Jay A. Buckey, MD

Introduction:
The majority of children with disabling hearing loss live in low- and middle-income countries, where widespread screening of school-aged children is challenged by a lack of resources, cultural and geographical barriers, as well as high levels of ambient noise. Automated threshold audiometry (ATA) with telehealth evaluation offers an alternative method to provide rapid assessments integrated with electronic record-keeping in order to identify hearing loss and facilitate effective follow-up.

Objective:
To investigate the utility and effectiveness of a tablet-based audiometric system integrated with asynchronous telehealth evaluations to screen Nicaraguan schoolchildren for hearing loss, reduce unnecessary referrals, and increase adherence with follow up testing.

Methods:
3398 Nicaraguan school children were screened for hearing loss by minimally-trained community health workers (CHW) using an electronic tablet-based audiometer with noise-attenuating headphones. A two-step protocol combining ATA and confirmatory manual audiometry was used to determine need for asynchronous telehealth evaluation (including field otoscopy and tympanometry) and clinic evaluation, and clinical examination. ATA was performed twice in a subset of 807 children to assess test-retest variability of automated audiometry and to identify factors that affect the reliability of this technology.

Results:
CHW successfully screened children with ATA (40.7% referral rate) followed by manual audiometry as needed (6.4% referral rate, 98.5% validity). Ambient noise levels did not affect referral rates. Repeatability of automated audiometry measurements was significantly impacted by participant behavioral testing patterns. Following detailed telehealth and clinical examination, cerumen impaction was identified as the cause of hearing loss referral for 35 children.19 of 67 (28.4%) referred children had confirmed hearing loss in the clinic after cerumen removal. The estimated prevalence of hearing loss (all types) in this cohort was 15.8 per 1,000 children.

Conclusions:
Tablet-based hearing screening using a noise-attenuating wireless audiometer is feasible and effective in a rural low resource environment. A two-step audiometric screening protocol administered by CHWs resulted in much lower referral rates, but the optimal completion of otoscopy and tympanometry require additional training. Repeatability between ATA measurements was good overall, but significantly impacted by behavioral testing patterns. Overall, the confirmed hearing loss rate in school children is higher than reported in the United States, but comparable to reports from other low-income countries.

Increased Cost Sharing Associated with Delayed and Complicated Presentation of Acute Appendicitis and Diverticulitis

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Introduction:
This cohort study evaluated the influence of high cost sharing insurance plans on the presentation and surgical management of acute appendicitis and diverticulitis. The primary outcome was presenting with early, uncomplicated disease at the time of diagnosis. Secondary outcomes were receipt of optimal surgical care and minimally invasive surgery if undergoing an operation.

Methods:
Commercially insured patients ages 18-64 presenting with acute appendicitis or diverticulitis (identified using ICD-9 and ICD-10 codes) from 2013-2017 in the Health Care Cost Institute Claims Data Set were included. Total cost share was defined as the sum of the deductible, copayments, and coinsurance and categorized into quartiles, with high versus low cost sharing defined as quartile 4 (>$3,082 USD) versus quartile 1 ($0-$502 USD). The association of total cost share with early uncomplicated presentation, optimal surgical care, and minimally invasive surgery was assessed by multivariable logistic regression models adjusted for patient characteristics, community-level socioeconomic factors, and geographic location.

Results:
Among the 151,852 patients studied, higher cost sharing was associated with lower odds of early, uncomplicated disease presentation (Odds Ratio (OR): 0.63, 95% Confidence Interval (CI): 0.61-0.65). Patients with higher cost sharing were less likely to receive optimal surgical care (OR: 0.96; 95% CI: 0.96-0.99) or minimally invasive surgery (OR: 0.89; 95% CI: 0.84-0.95). As a sensitivity analysis, similar results were found for those with high deductible plans.

Conclusion:
This research demonstrates higher cost sharing is associated with later presentation of acute appendicitis and diverticulitis and with reduced odds of receiving optimal or minimally invasive surgery. Clinical implications include longer hospitalizations, increased readmission risk, higher morbidity, and worse quality of life. From a policy perspective, attention must be given to the impact of care delays on patient presentation and subsequent management costs as policy makers debate the role of patient cost sharing in both public and private insurance plans.

Oral Cancer Patients Undergoing Resection with Free Flap Reconstruction: Predictors of Gastrostomy Tube Placement

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Introduction:
Oral cancer treatment often includes surgical resection with free flap reconstruction. Many patients require a gastrostomy tube (G-tube) during treatment, but predicting who remains challenging. This study examines potential predictors of G-tube placement in this patient population to guide clinical decision-making.

Methods:
Institutional Review Board approval was obtained. Retrospective chart review was performed of oral cancer patients who underwent resection with immediate free flap reconstruction at a tertiary care hospital from 2011-2019. Patients with tumors not involving the oral cavity, who underwent non-free flap or delayed reconstruction, or with 7-day postoperative mortality were excluded. Patient and tumor characteristics, surgery type, need for preoperative or postoperative G-tube within 3 months postoperatively, and 30-day complications were analyzed. Univariate analysis with logistic regression was conducted followed by selection of the best multivariable model using the best subsets regression method after grouping clinically relevant predictors.

Results:
108 patients were included (mean age 60 years). The most common tumor location was oral cavity (76.36%). Reconstruction was most commonly performed with anterolateral thigh (ALT) (41.82%), radial forearm (RF) (21.82%), and fibula (30.91%) free flaps. Sixty-nine patients required pre- or post-operative G-tube; 72.46% of these were placed postoperatively. Univariate analysis identified pre-operative BMI > 30 (p=0.022), nodal stage > N1 (p=0.018), subtotal/total glossectomy (p=0.012), maxillectomy (p=0.015), radial forearm reconstruction (p=0.048), and tracheostomy (p=0.000) as associated with any G-tube placement. On multivariable analysis, maxillectomy (p=0.023) and tracheostomy (p=0.000) were associated with G-tube placement.

Conclusion:
Failure-to-thrive is a concern in patients with oral cancer undergoing resection with immediate free flap reconstruction. Gastrostomy tubes are not without risk and determining who requires a G-tube remains a clinical dilemma. Initial analysis indicates patients undergoing maxillectomy and/or tracheostomy placement more likely require a G-tube. Additional research is underway to develop a decision-making algorithm to guide a multi-disciplinary approach.

Using Electronic Health Records to Streamline Provider Recruitment for Implementation Science Studies

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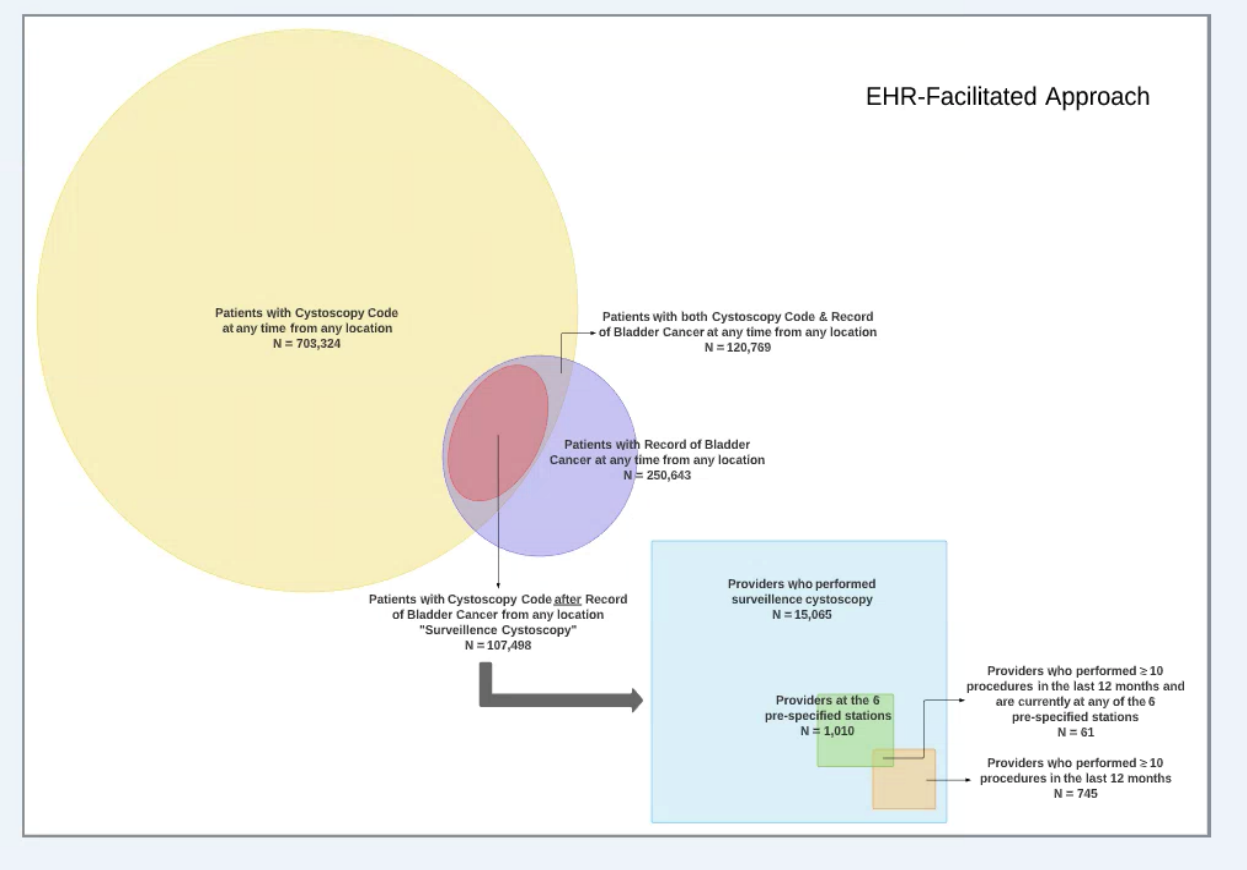
Introduction:
Healthcare providers are often targeted as research participants, especially for implementation science studies evaluating provider- or system-level issues. Frequently, provider eligibility is based on both provider and patient factors. Manual chart review and self-report are common recruitment strategies, but demand substantial time, effort, and resources. Electronic health record (EHR) data may streamline provider identification. As an example, we describe recruitment methods for a Department of Veterans Affairs (VA)-funded study focused on implementing risk-aligned surveillance for bladder cancer patients.

Methods:
Our goal was to identify providers at six pre-specified sites who performed ≥10 surveillance cystoscopy among bladder cancer patients in the year prior to recruitment. Using the VA's Corporate Data Warehouse, we identified patients with record of cystoscopy after their bladder cancer diagnosis (i.e., surveillance procedure) using CPT procedure codes and ICD10 diagnosis codes. Procedures were linked to VA staff data to determine the provider of record and their current location. Only providers who performed ≥ 10 procedures in the prior 12 months and currently practiced at a pre-specified site were selected. To validate this approach, we performed chart review of 105 procedures performed by a random sample of selected providers. The proportion of correctly identified procedures was calculated (positive predictive value), along with binomial 95% confidence intervals (CI).

Results:
There were 708,324 cystoscopy procedures performed in the observation period, but only 107,498 (15%) were surveillance procedures. Of the 15,065 providers who performed surveillance cystoscopy, 61 performed ≥ 10 procedures in the previous year and were currently practicing at one of the 6 pre-specified sites (Figure). The random chart review of 7 providers found 102 of 105 surveillance procedures (97%; 95% CI: 92% to 99%) were performed by the selected provider on the given date. (Figure 1).

Conclusions:
We show that EHR data can be used for efficient and accurate identification of healthcare providers meeting patient- and provider-level inclusion criteria. While these data are from VA, administrative codes and provider identifiers are collected in all EHRs for billing purposes. As such, our approach can likely be translated to provider recruitment in other healthcare systems.

12. Chiamaka Okorie



Impact of Rurality on Geriatric Emergency General Surgery Patients in New Hampshire

Charles Burney, Laura Baumann, Heather Carlos, Alexandra Briggs

Introduction:
Geriatric patients requiring Emergency General Surgery (EGS) have significant risk of morbidity and mortality. In addition to patient comorbidities and frailty, hospital and surgeon volumes have been implicated in outcomes. Little is known about patterns and outcomes of care for rural geriatric EGS patients. We sought to investigate the burden of EGS care among geriatric New Hampshire residents and the influence of rurality on their care.

Methods:
Retrospective cohort analysis of the NH Uniform Healthcare Facility Discharge Dataset from 2012-2015. Patients 65 years-old and older with urgent/emergent admission who underwent one of 7 EGS procedures were included. Patients were categorized as rural or urban based on county of origin, as zip codes were unavailable.

Results:
Of 2,445 geriatric patient discharges, 40% of patients were from rural counties, with similar demographics to urban patients. Rural patients were more likely to present as a hospital transfer (21% vs 2.6%), receive care at a critical access hospital (24% vs 1.0%), receive care outside their home county (32% vs 13%), and be transferred to another hospital after surgery (6.2% vs 1.4%). Rural patients were less likely to receive care in an urban hospital (11% vs 95%). Rural patients underwent similar procedures to urban patients, with similar length of stay, cost of index hospitalization, and mortality (Table 1).

Conclusions:
Rural geriatric patients in NH are more likely to undergo transfer and receive care outside of their home county, despite being demographically similar to their urban counterparts. While cost of care was similar, rural patients may have additional expenses including transfer and secondary hospitalization that we were unable to account for in our analysis. Further investigation is merited to determine which patients require transfer versus care in hospitals closer to home in order to optimize care and costs for the rural geriatric population.

Table 1: Procedures and Outcomes of Geriatric EGS Patients

Characteristic	Rural Patients N = 986[1]	Urban Patients N = 1,459[1]	p-value[2]
Procedure			0.06
Appendectomy	88 (8.9%)	129 (8.8%)	
Cholecystectomy	371 (38%)	639 (44%)	
Excision of Large Intestine	235 (24%)	287 (20%)	
Excision of Small Intestine	120 (12%)	165 (11%)	
Laparotomy	34 (3.4%)	41 (2.8%)	
Lysis of Adhesions	113 (11%)	154 (11%)	
Suture of Ulcer	25 (2.5%)	44 (3.0%)	
Treated at Critical Access Hospital	238 (24%)	15 (1.0%)	<0.01
Treated Outside of Home County	320 (32%)	187 (13%)	<0.01
Length of Stay (Days)	7.0 (4, 12)	7.0 (4, 11)	<0.01
Cost of Hospitalization ($1,000s)	50.5 (35.0, 80.7)	49.4 (35.2, 74.4)	0.3
Mortality	45 (4.6%)	81 (5.6%)	0.3

[1] N (%); Median (IQR)

[2] Pearson's Chi-squared test; Wilcoxon rank sum test

Transfer Status as a Predictor of Increased Mortality in Patients Needing Ventricular Shunt Surgery

Khan IS, Pomponio MK, Hong J

Introduction:
Inter-hospital transfer plays an important role in providing patients appropriate care in a timely fashion. However, the impact of transfer on the outcomes of patients requiring ventricular shunt surgery is unclear.

Methods:
We analyzed data from the Nationwide Inpatient Sample (NIS) from 2009 to 2018 to determine if the likelihood of mortality was associated with being transferred non-electively for a ventricular shunt procedure. We used multivariate logistic regression analysis with acute-to-acute care facility transfer status as our main exposure and inpatient mortality as the primary outcome. To prevent double-counting, we excluded all patients who were transferred out for further care. Our model controlled for patient demographics, hospital characteristics, and severity of illness.

Results:
Out of 63,242 patients requiring non-elective shunt surgery, 9,578 were transferred (15.1%) to another acute care hospital. The patients who were transferred were older (51.4 vs. 48.3 years, p-value <0.001), more likely to be female (51% vs. 48%, p-value 0.02) and Black (18% vs. 13%, p-value <0.001). Patients who were transferred also differed in terms of insurance status, size and location of the hospital, and disease severity scores (all p-values <0.001). After controlling for patient- and hospital-related confounders, patients transferred for a ventricular shunt procedure had a 55% higher likelihood of inpatient mortality - adjusted odds ratio - 1.55 (95% CI 1.16, 2.07).

Conclusion:
For patients requiring non-elective ventricular shunt surgery, transfer status is independently associated with an increased likelihood of inpatient mortality. Further work in understanding how the transfer status affects patient-outcomes in this patient population will help identify areas for improvement.

Table 1: Multivariate regression analysis of the Nationwide Inpatient Sample (2009-2018) assessing the relationship between Transfer status and Inpatient Mortality.

	Multivariate Logistic Regression*				
	OR	**95% CI**			**P**
Transfer	1.55	1.16	to	2.074	0.003
Age	1.02	1.01	to	1.03	0.001
Gender					
Male	Reference				
Female	1.20	0.95	to	1.51	0.120
Race					
White	Reference				
Black	1.71	1.18	to	2.47	0.004
Hispanic	1.39	0.87	to	2.22	0.168
Asian	1.34	0.70	to	2.59	0.377
Other	1.88	1.02	to	3.48	0.043
Income Quartile					
1	Reference				
2	1.08	0.76	to	1.53	0.680
3	0.93	0.63	to	1.38	0.725
4	0.76	0.49	to	1.17	0.219
Insurance					
Medicare	Reference				
Medicaid	1.07	0.73	to	1.57	0.728
Private	0.91	0.64	to	1.29	0.589
Self Pay	2.09	1.16	to	3.73	0.013
No Charge	7.51	2.32	to	24.30	0.001
Other	1.59	0.78	to	3.26	0.204
Patient NCHS Urban-Rural Code					
"Central" counties of metro areas of >=1 million population	Reference				
"Fringe" counties of metro areas of >=1 million population	0.70	0.49	to	1.00	0.051
Counties in metro areas of 250,000-999,999 population	0.98	0.65	to	1.47	0.911
Counties in metro areas of 50,000-249,999 population	0.87	0.52	to	1.44	0.596
Micropolitan counties	0.68	0.36	to	1.29	0.241
Not metropolitan or micropolitan counties	0.52	0.23	to	1.17	0.116
Hospital Control					
Government, nonfederal	Reference				
Private, not-profit	0.84	0.54	to	1.31	0.446
Private, invest-own	0.91	0.47	to	1.75	0.778

Hospital Region					
Northeast	Reference				
Midwest	0.89	0.59	to	1.32	0.552
South	0.53	0.35	to	0.80	0.002
West	0.51	0.31	to	0.82	0.006
Hospital Bedsize					
Small	Reference				
Medium	1.19	0.59	to	2.39	0.623
Large	1.11	0.58	to	2.15	0.739
Hospital Location and Teaching Status					
Rural	Reference				
Urban, nonteaching	0.88	0.34	to	2.25	0.784
Urban, teaching	0.74	0.30	to	1.83	0.520
APDRG Risk Mortality					
1	Reference				
2	5.17	1.68	to	15.89	0.004
3	7.76	2.25	to	26.7	0.001
4	122	36.9	to	402.89	<0.001
APDRG Severity					
1	Reference				
2	0.52	0.228	to	1.21	0.131
3	0.63	0.486	to	0.837	0.001

*adjusted for all variables listed in table

Medical Students Recognize Different Qualities in Excellent Resident and Attending Teachers: A Qualitative Analysis of Nominations for Surgical Clerkship Teaching Awards

Casey R. Lamb, MD; Sylvia Guerra, BA, MTS; Meredith J. Sorensen, MD, MS

Introduction:
Effective teaching has a significant positive impact on student experience during the surgical clerkship. However, the qualities which make surgical educators most effective in their roles are not well-understood. In this study, we sought to better understand how medical students characterize excellent surgical educators, and how these characteristics may differ between residents and attendings.

Methods:
Nominations by third-year medical students for a surgical resident and attending surgeon teaching award were examined for thematic content using conventional content analysis. We analyzed 179 resident nominations and 110 attending nominations voluntarily submitted by 76 out of 79 students over the course of five eight-week clerkship blocks at a single institution.

Results:
Six major themes were identified which described the qualities viewed as hallmarks of excellent and effective surgical educators by third-year medical students. Of these themes, residents were far more frequently commended for making students feel included as valuable members of the team, prioritizing student education, and involving students in procedures and technical skills training. Both residents and attendings were equally recognized for utilizing effective educational methods, providing mentorship, and role modeling, although the way in which they were characterized in these roles differed.

Conclusion:
In identifying exemplary surgical educators, students placed the greatest emphasis on the educator's role in fostering a positive learning environment where student education is prioritized. Residents were more often recognized for the qualities which students valued most. Furthermore, students identified a greater variety of characteristics in excellent resident teachers in comparison with attendings. These insights may help to better inform training for resident and attending educators in their respective roles.

Patient's Age as a Prognostic Factor of Visual and Surgical Outcome After Surgical Repair of Primary Macula-Off, Rhegmatogenous Retinal Detachment

George Sanchez, BS; Ashley H. Sohn, BA; Jacob P. McGinnis, BS; Dimosthenis Mantopoulos, MD, PhD

Introduction:
Previous studies have demonstrated mixed results regarding the effect of age on visual acuity following a primary macula-off rhegmatogenous retinal detachment (RRD). Therefore, we performed a retrospective, observational study to determine how age affects the postoperative best-corrected visual acuity (BCVA) following macula-off RRD repair with pars plana vitrectomy (PPV) ± scleral buckle (SB).

Methods:
Retrospective, consecutive case series. The medical records of patients who presented with RRD and underwent surgery with PPV ± SB were reviewed. The subjects who met inclusion criteria were divided into three age groups: (A) ≤60 years-old, (B) 61-75 years-old, and (C) ≥76 years-old. Differences in postoperative BCVA between these age groups were assessed. The postoperative central retinal thickness (CRT) was measured using optical coherence tomography.

Results:
From the 412 patients that were screened, 86 met the inclusion criteria. Sixty-two of them were male. Twenty-nine of them were in group A, 39 were in group B, and 18 in group C. The mean age ± SD was 66.3 ± 9.9 years-old. The mean follow-up period ± SD was 22.1 ± 18.1 months. The mean pre-operative and post-operative logMAR (Snellen) BCVA was 1.5 ± 0.8 (20/630) and 0.5 ± 0.5 (20/60), respectively. At final follow-up, logMAR (Snellen) BCVA was significantly different at 0.25 (20/35), 0.57 (20/74) and 0.62 (20/83) in group A, B, and C, respectively ($p < 0.05$ between each subgroups). The SSSR was 93.1% (27/29), 84.6% (33/39), and 77.8% (14/18) for groups A, B, and C, respectively ($p > 0.05$). The final CRT was 316.9 µm, 313.2 µm, and 310.2 µm in groups A, B and C, respectively ($p > 0.05$).

Conclusion:
Age had a negative correlation with postoperative BCVA after successful surgical repair of macula-off primary RRD. The differences in the SSSR and CRT between different age subgroups were not statistically significant.

17. Naomi A. Cole

Breast Cancer in Male-to-Female Transgender Patients: Multidisciplinary Considerations

Naomi A. Cole, BS; Libby R. Copeland-Halperin, MD; Nina Shank, MD; Joseph M. Rosen, MD; Vidya Shankaran, MD

Background/Purpose:
The incidence of breast cancer in male-to-female (MtF) transgender patients remains unclear. The first case of breast cancer in MtF transgender patients was reported in 1968; there have been only 20 cases of breast cancer in this population since. As the medical and surgical treatment options for MtF transgender patients blossom, clinicians must recognize the risk of breast cancer and develop multi-disciplinary treatment approaches in this population. We describe a case of invasive ductal carcinoma in a MtF transgender patient requiring neoadjuvant endocrine therapy, mastectomy, and implant-based breast reconstruction.

Methods/Techniques:
This case report details the diagnosis and treatment of a MtF transgender patient with ER+/PR+/HER2- invasive ductal carcinoma. Our patient is the oldest reported case of breast cancer in a MtF transgender patient with the shortest length of time on estrogen hormone therapy.

Results/Complications:
This is a 70-year-old MtF transgender patient of Ashkenazi Jewish descent who began her transition in 2018. Her daily medication regimen included 1.8 mg conjugated estrogen and spironolactone. She documented longstanding breast asymmetry (left > right) with home photography. Her baseline mammogram screening in 2019 showed no evidence of malignancy. Roughly 5 months after her first mammogram, she noticed progressive right nipple inversion. Repeat mammography in 2020 showed a 1.8 cm lobulated, spiculated mass in the right retroareolar region without evidence of axillary adenopathy. Ultrasound-guided biopsy revealed ER+/PR+/HER2- invasive ductal carcinoma. Tamoxifen therapy and orchiectomy were recommended to both decrease testosterone conversion to estrogen and to combat reversal of progress made during her transition. However, due to her interest in undergoing vaginoplasty in the future, the patient declined orchiectomy. Shortly after initiating Tamoxifen, she underwent bilateral nipple-sparing mastectomy with subpectoral tissue expander and acellular dermal matrix placement. Ultimately, the patient plans to undergo implant-based reconstruction to a C-cup breast size.

Conclusion:
Breast cancer occurrence in MtF transgender patients is rare and is an area for continued research and exploration. Available literature on breast reconstruction in this population is lacking. A multi-disciplinary approach is required given the complex physiologic and psychosocial factors involved with this diagnosis. Further research should explore the anatomic and psychologic considerations of breast reconstruction in this population.