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Adverse surgical outcomes linked to co-occurring smoking and risky alcohol use among general surgery patients

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STRUCTURED ABSTRACT

Objective: To assess associations between co-occurring preoperative smoking and risky alcohol use on the likelihood of adverse surgical outcomes.

Summary Background Data.—Risky alcohol use and smoking are known surgical risk factors with a high co-occurrence and additive adverse effects on multiple organ systems that impact surgical health, yet no research has evaluated the impact of co-occurrence on surgical outcomes.

Methods: This investigation analyzed 200,816 patients from the Michigan Surgical Quality Collaborative database between 7/1/2012 to 12/31/2018. Patients were classified based on past year risky alcohol use (>2 drink/day) and cigarette smoking into four groups: 1) risky alcohol and smoking, 2) risky alcohol only, 3) smoking only, and 4) no risky alcohol/smoking. We fitted logistic regression models, applying propensity score weights incorporating demographic, clinical, and surgical factors to assess associations between alcohol and smoking and 30-day postoperative outcomes; surgical complications, readmission, reoperation, and emergency department (ED) visits.

Results: Risky alcohol and smoking, risky alcohol only, and smoking only were reported by 2,852 (1.4%), 2,840 (1.4%), and 44,042 (22%) patients, respectively. Relative to all other groups, the alcohol and smoking group had greater odds of surgical complications, readmission, and reoperation. Relative to the no alcohol and smoking group, the alcohol only group higher odds of reoperation and smoking only group had higher odds of ED visits.

Conclusions: The combination of smoking and risky drinking conferred the highest likelihood of complications, readmission, and reoperation before surgery. Co-occurring alcohol and smoking

at the time of surgery warrants special attention as a patient risk factor and deserves additional research.

Mini Abstract

General surgery patients who smoke cigarettes and drink alcohol (>2 drinks/day) before surgery have higher odds of experiencing adverse surgical outcomes compared to patients who only smoke, only drink, or do neither.

Introduction

Each year 14% of Americans meet criteria for an alcohol use disorder and 13% smoke cigarettes.^{1,2} In surgical populations, the prevalence of these behaviors is higher, with as many as one in four surgical patients smoking and/or drinking alcohol at risky levels.^{3,4} In fact, smoking and risky alcohol use (defined as consuming >2 drinks per day) prior to surgery are two of the most common risk factors for poor outcomes after surgery.⁵ Individuals who smoke cigarettes have increased odds of general infections, unplanned intubation, cardiopulmonary complications, surgical site infections, and other adverse outcomes following surgery.⁶⁻¹² Risky alcohol use is associated with a nearly two-fold increase in the likelihood of postoperative infections, pulmonary complications, prolonged hospital stay, and admission to the intensive care unit.^{13,14} Smoking- and alcohol-associated surgical complications are not specific to certain operations or subpopulations, but are evident across a range of operations even after controlling for relevant covariates.^{6,13-16} The causal relationship between smoking, alcohol consumption, and surgical complications is further evidenced by studies linking short-term preoperative abstinence to lower likelihood of surgical complications in randomized controlled trials.^{17,18}

Although numerous studies have evaluated the relationship between smoking or risky alcohol use on surgical outcomes in isolation, no study has evaluated surgical outcomes among those who both drink alcohol at risky levels and smoke cigarettes. Such an analysis is especially important given the very high co-occurrence of smoking and risky alcohol use¹⁹⁻²¹ and well-documented additive or even multiplicative deleterious effects of co-use on multiple organ systems that impact surgical health.²²⁻²⁵ Knowledge of the combined impact of risky alcohol use and smoking before surgery has the potential to aid conversations between patients and surgical teams when considering the risks of undergoing operations as well as to potentially motivate interventions to encourage reduction and abstinence of both behaviors.

This study used quality improvement data from a state-wide consortium (Michigan Surgical Quality Collaborative; MSQC), to compare the incidence of adverse post-operative outcomes among general surgical patients who drink at risky levels (> 2 drinks/day), smoke tobacco cigarettes in the past year, do both, or do neither. Outcomes include presence of 1 surgical complication, post-operative readmission, reoperation, or emergency department (ED) visit in within 30 days of surgery. We hypothesized that individuals who both smoke and drink at risky levels would have a higher likelihood of adverse surgical outcomes and events, relative to the individuals who do not smoke tobacco or drink more than 2 drinks a

day or do either in isolation, and this likelihood would be highest among individuals who both smoke and drink alcohol at risky levels.

Methods

Patients who underwent general surgeries included in the MSQC registry from 7/1/2012 to 12/31/2018 were included in this retrospective study. MSQC is a sanctioned Patient Safety Organization with the Agency for Healthcare Research and Quality. It includes 69 hospitals in the state of Michigan. At each site, trained nurse reviewers collect data related to patient characteristics, intraoperative processes of care, and 30-day postoperative patient outcomes utilizing a sampling algorithm that minimizes selection bias in accordance with established policies and procedures. Regular data audits ensure registry data quality and validity.^{26,27} Data collection for MSQC is Institutional Review Board (IRB) exempt at participating hospitals, and the current study was reviewed and considered exempt by the Michigan Medicine IRB.

Cohort selection

In total, there were 272,820 adult surgical patients identified in the MSQC database between 7/1/2012 to 12/31/2018 who had a complete 30-day follow up (Figure 1). After excluding those who underwent hysterectomy surgery, vascular surgery, or had missing data, 200,816 general surgery cases remained and comprised the study cohort. This included all general surgeries collected through MSQC representing eleven procedure groups: appendectomy, cholecystectomy, bowel, esophagectomy, gastrectomy, hepatectomy, hernia, pancreatectomy, thyroidectomy, adrenalectomy, and splenectomy. (See Supplemental Table 1 for all surgery CPT codes). Hysterectomy was excluded because it is performed on individuals of female sex only, and the primary analysis adjusted for sex as a covariate. Vascular surgery was excluded because of the differential effects of smoking and risky alcohol use on cardiovascular surgeries that may differ from general surgeries.

Variables

The primary dependent variables included: 1) risky alcohol use, defined as >2 drinks/day in the two weeks prior to admission; 2) smoking; defined as any tobacco cigarette smoking in the past year; 3) both smoking and risky alcohol use, and 4) no risky alcohol/smoking. Presence/absence of smoking and risky alcohol use determinations were made by trained MSQC chart reviewers based on review of patient electronic health records. Tobacco use is defined by MSQC as tobacco cigarette smoking only and excludes cigars, electronic cigarettes, and marijuana.

Covariates included patient sex, race, age group, insurance status, American Society of Anesthesiologists (ASA) classification, comorbidities (obese, diabetes, chronic obstructive pulmonary disease (COPD), sleep apnea, hypertension, transfusion in 72 hours prior to surgery, renal failure requiring dialysis, steroid, sepsis, peripheral vascular disease, bleeding disorder, 10% loss of body weight 6 months prior to surgery, coronary artery disease, ascites, congestive heart failure, pneumonia), open wound, wound classification, surgical approach and procedure group.

Outcomes

We evaluated four surgical outcomes: surgical complications, reoperation, readmission, and ED visits.

Surgical Complications: Surgical complications were defined as presence of one or more complications in the 30 days following surgery (excluding those present prior to surgery). The complications included cardiac arrest requiring cardiopulmonary resuscitation, cardiac dysrhythmias, C-difficile infection, central line-associated bloodstream infection, deep vein thrombosis requiring therapy, myocardial infarction, pulmonary embolism, pneumonia, sepsis, septic shock, severe sepsis, deep incisional surgical site infection (SSI), organ/space SSI, superficial incisional SSI, stroke/cerebrovascular accident, transfusions within first 72 hours postop, unplanned intubation, catheter associated urinary tract infection, and non-catheter associated urinary tract infection.

Reoperation: Reoperation was defined as returning back to the operating room after the principal procedure, for any reason, related to the principal procedure or not.

Readmission: Readmission was defined as an inpatient (surpasses 2 consecutive midnights) acute care hospitalization at any hospital within 30 days of surgery.

ED visit: ED visits were defined as any visits where patient was treated and then discharged directly from the ED, urgent care clinic, or observation unit after being there less than 2 midnights within 30 days of operation date.

Statistical Analyses

First, descriptive statistics were calculated for demographic and clinical characteristics. Chi-square tests were used to compare the categorical variables among the four smoking/alcohol groups. Next, logistic regression models with the smoking and risky alcohol use groups as the only independent variable were fitted to estimate the odds of the different surgical outcomes of interest (surgical complication, readmission, reoperation, ED visit). Lastly, we fitted the logistic regression models applying propensity score weights.^{28,29} The goal of using propensity score weighting was to better balance the four groups on demographic variables, comorbidities, surgical approach, and procedure group.³⁰ Propensity scores were derived from a multinomial logistic regression model, which regressed the four groups on covariates listed above. From this model, propensity score weights were then calculated as the inverse of the propensity scores, and also reflected the sample size for each of the four groups. In primary analyses, the no risky alcohol/smoking group was used as the reference. We also repeated the models with smoking only and risky alcohol only, respectively, as reference groups to test whether estimates for the risky alcohol and smoking group were significantly different from the estimates for these two groups. All statistical tests were 2-tailed and statistical significance was set at $p < 0.05$. Analyses were performed with SAS 9.4.

Results

Among the final cohort of general surgical patients, 2,840 (1.4%) were classified with risky alcohol use only, 44,042 (21.9%) with smoking only, 2,852 (1.4%) with both risky alcohol and smoking, and 151,082 (75.2%) with neither smoking or risky alcohol use.

The study cohort was majority female (54.4%), Non-Hispanic white (75.3%), and the median age was 56 (Table 1). Surgical priority groups included elective (63.8%), urgent (18.2%), and emergent (18.1%). The most common procedure types included cholecystectomy (28.9%) and hernia repair (26.8%) (Supplemental table 2). All participant and surgery characteristics and comorbidity prevalence differed significantly between risky alcohol and smoking groups. Incidence of 30-day surgical complications, hospital readmission, reoperation and ED visits are presented in Table 2.

Reoperation

In the propensity score weighted model (Figure 2), the odds of reoperation were significantly higher in the risky alcohol and smoking group (OR 1.77, 95% CI 1.53–2.06) relative to the no risky alcohol or smoking group (Table 3). The estimate for the risky alcohol and smoking group was also significantly different from either of the estimates for the smoking only or risky alcohol only groups. The odds of reoperation were significantly higher in the risky alcohol only group (OR 1.29, 95% CI 1.09–1.53), and smoking only group (OR 1.15, 95% CI 1.10–1.22) in the propensity score weighted model.

Hospital Readmission

In the propensity score weighted model, the odds of hospital readmission were higher in the risky alcohol and smoking group (OR 1.28, 95% CI 1.12–1.46) relative to the no risky alcohol/smoking group. The odds of hospital readmission were significantly higher in the smoking only group (OR 1.08, 95% CI 1.04–1.128) and the risky alcohol and smoking group (OR 1.46, 95% CI 1.28–1.66) in the unadjusted model only.

Surgical complications

In the propensity score weighted model, the odds of surgical complications were higher in the risky alcohol and smoking group (OR 1.37, 95% CI 1.21–1.54) relative to the no risky alcohol/smoking group. The estimate for the risky alcohol and smoking group was also significantly different from either of the estimates for the smoking only or risky alcohol only groups. The odds of surgical complications were significantly higher in the risky alcohol only group (OR 1.31, 95% CI 1.17 – 1.46) and risky alcohol and smoking group (OR 2.091, 95% CI 1.90–2.30) in the unadjusted model only.

ED visit

In the propensity score weighted model, the odds of ED visit were significantly higher in the risky alcohol and smoking group (OR 1.15, 95% CI 1.01–1.30) relative to the no risky alcohol or smoking group. In the propensity score weighted model, the odds of a ED visit were significantly higher in the smoking only group (OR 1.25, 95% CI 1.21–1.30) relative to the no risky alcohol or smoking group.

Discussion

In this investigation of more than 200,000 surgical patients, the combination of both risky alcohol use (> 2 drinks/day) as well as a history of smoking cigarettes in the past year was associated prospectively with increased odds of 30-day adverse events after surgery. This is the first study to evaluate the likelihood of adverse post-operative outcomes based on the combination of both risky levels of alcohol use (> 2 drinks/day) as well as a history of smoking cigarettes in the past year; prior research has only examined these two health behaviors in isolation, despite their high co-occurrence. We found increased odds of reoperation, readmission, surgical complications, and ED visits among those with co-occurring risky alcohol use and smoking prior to surgery relative to those who do not drink alcohol at risky levels or smoke even after applying propensity score weights that included a host of relevant covariates. In the propensity score weighted models, odds of reoperation were 77% higher among those with co-occurring risky alcohol use and smoking relative to those who do neither, while the odds of complications were 37% higher, the odds of readmission were 28% higher, and the odds of ED visits were 15% higher.

After applying propensity score weights that included relevant clinical variables, those with co-occurring risky alcohol use and smoking also had the highest odds of reoperation, readmission, and surgical complications relative to those who *only* smoked or *only* drank alcohol at risky levels, highlighting the compounding risks of these two behaviors on surgical health. Risky alcohol use and smoking are already well-documented surgical risk factors,^{13,31–37} associated with increased healthcare utilization and costs after surgery,³⁸ and even post-operative mortality.^{13,14} This study extends this literature by demonstrating the combined risks of these two behaviors. Careful consideration of surgical candidacy should precede scheduling elective surgeries for those who drink at risky levels and smoke. Those with both risk factors should be offered preoperative education and intervention to reduce both risk factors prior to surgery. This should ideally include counseling and pharmacotherapy, leveraging surgery as a unique point for behavior change to address acute, salient surgical health risks.^{39–41} Preoperative alcohol and smoking screening and intervention are important and often overlooked tools in surgical healthcare.^{17,42,43} Key surgical and anesthesia groups recommend alcohol and tobacco screening prior to surgery,⁴⁴ yet alcohol screening in particular is often sub-optimal and biased.^{43,45–47} Furthermore, empirically-supported alcohol and tobacco interventions decrease the likelihood of surgical complications when delivered at appropriate time points,^{17,39} but are rarely implemented, particularly in the case of alcohol interventions. Interventions that address both risky alcohol and smoking concurrently prior to surgery appear to increase cessation of both substances, but their efficacy in preventing surgical complications has yet to be demonstrated.⁴⁸ The broader literature supports the efficacy of behavior change interventions that address these two behaviors simultaneously.⁴⁹ Additional attention and research is needed on multiple behavior interventions in the context of surgical health optimization.

It is important to note that only 2.8% of patients in this sample were identified as drinking more than 2 drinks/day on average, which is likely a substantial under-ascertainment. The population prevalence of past-year alcohol use disorders in the United States is approximately 14%,¹ and is generally elevated in surgical populations.³ Past research

highlights sub-optimal alcohol screening practices in surgical settings that results in under identification of risky alcohol use.^{47,50} All of this suggests under-ascertainment of alcohol use in the present sample, which would bias our findings towards the null. It is likely that many patients who drink alcohol at risky levels were included in the reference group in analysis. Thus, the estimated effect of risky alcohol use on surgical health outcomes might be significantly higher than our findings suggest, and further detailed research on this topic is warranted.

This study has several limitations in addition to the potential misclassification of risky alcohol use discussed previously. The sample was from a single state in the United States, and was predominantly White and non-Hispanic. Surgical outcomes were evaluated through 30 days after surgery, thus adverse outcomes occurring in subsequent months could not be evaluated. The data on ED visits and readmission outcomes could have included events unrelated to the surgery of record, as MSQC did not track whether ED visits and readmission were definitively linked to the surgery until 2020. Under ascertainment of alcohol likely biased findings towards the null. In addition, the time from for smoking and alcohol-related risks overlap but differed in length (past year smoking vs past two week alcohol use). Despite limitations this study has many strengths including a large sample from a large midwestern state including rural and urban hospitals. Variables were extracted from medical records by trained chart abstractors with standardized protocols and oversight.

Conclusions

Co-occurring risky alcohol use and smoking appear to confer the highest risks of adverse post-surgical events, more so than either alcohol use or smoking alone. Additional attention to co-occurring alcohol and tobacco use in patients undergoing general surgery is warranted, including improvements to screening and intervention practices.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Conflicts of Interest and Source of Funding:

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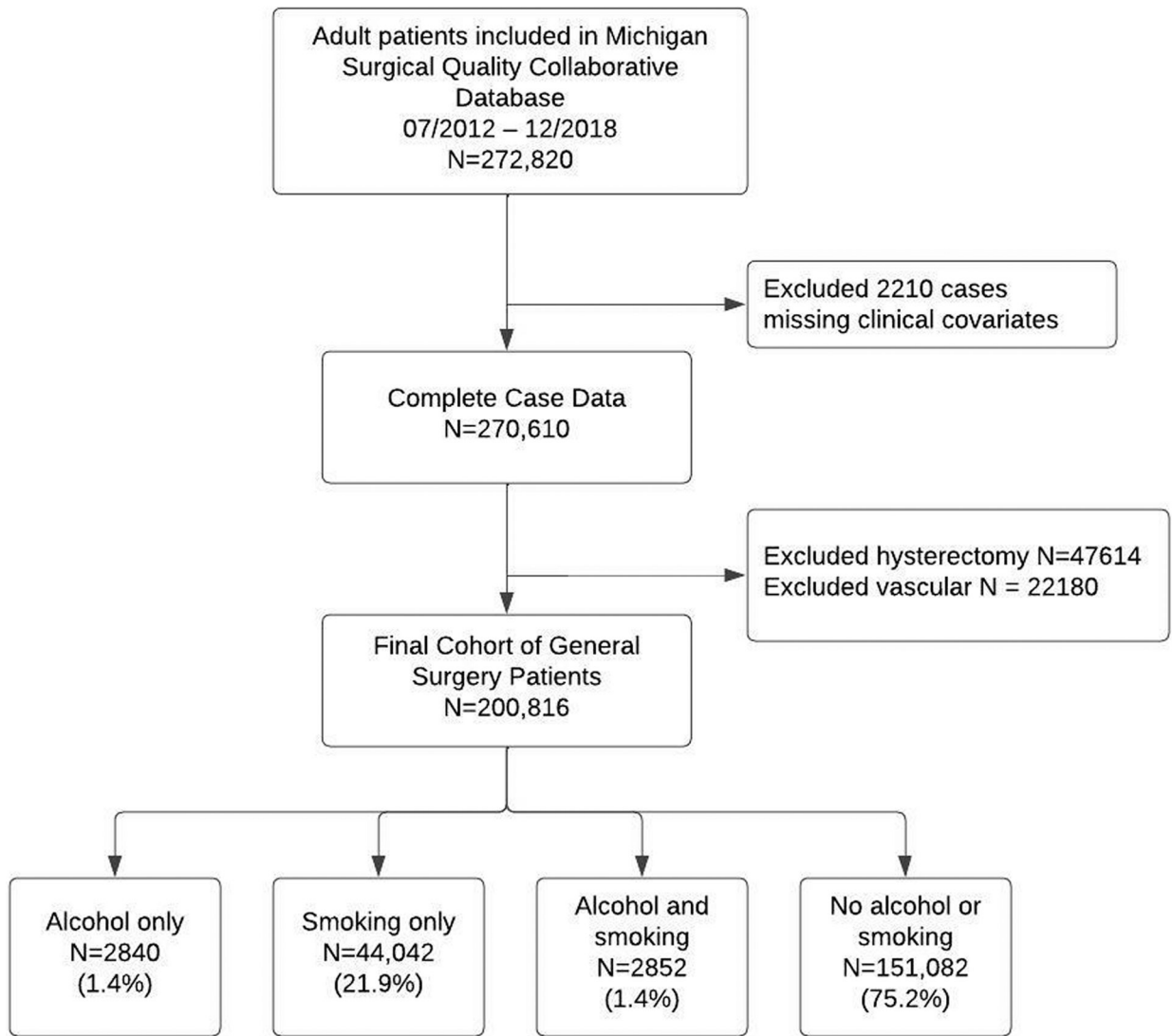


Figure 1.
Cohort Flowchart

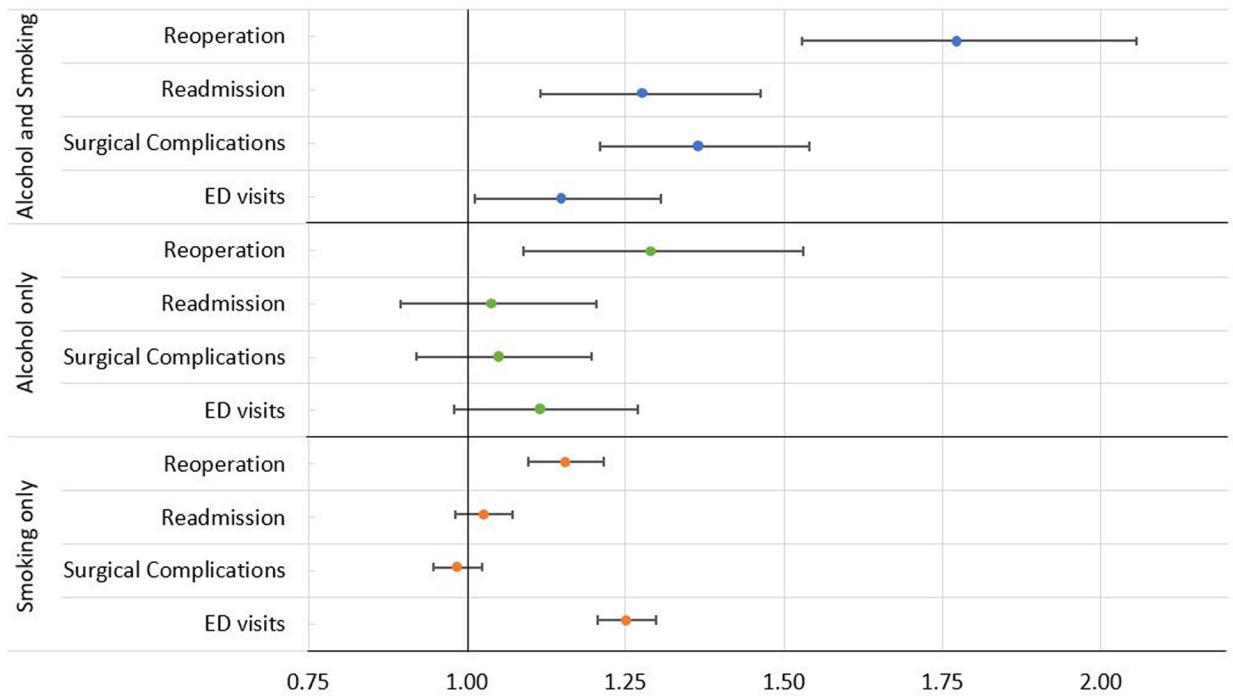


Figure 2.
Odds of adverse surgical outcomes by alcohol and smoking status

Table 1.

Characteristics of Study Sample

	Overall Cohort n=200,816	No Risky Alcohol or Smoking n=151,082 (75.2%)	Risky Alcohol Only n=2,840 (1.4%)	Smoking Only n=44,042 (21.9%)	Risky Alcohol and Smoking n=2,852 (1.4%)	P-value
Female	109344 (54.4)	84300 (55.8)	525 (18.5)	23789 (54.0)	730 (25.6)	<0.0001
Race/Ethnicity						<0.0001
Non-Hispanic White	151187 (75.3)	114643 (75.9)	2293 (80.7)	32240 (73.2)	2011 (70.5)	
Other	49629 (24.7)	36439 (24.1)	547 (19.3)	11802 (26.8)	841 (29.5)	
Age Group						<0.0001
<45	56104 (27.9)	39030 (25.8)	363 (12.8)	16113 (36.6)	598 (21.0)	
45–64	81551 (40.6)	57584 (38.1)	1350 (47.5)	20842 (47.3)	1775 (62.2)	
65+	63161 (31.5)	54468 (36.1)	1127 (39.7)	7087 (16.1)	479 (16.8)	
Insurance						<0.0001
Commercial Insurance (non-HMO)	71009 (35.4)	56104 (37.1)	1043 (36.7)	13076 (29.7)	786 (27.6)	
Other	129807 (64.6)	94978 (62.9)	1797 (63.3)	30966 (70.3)	2066 (72.4)	
Weight						<0.0001
Underweight	3887 (1.9)	2237 (1.5)	36 (1.3)	1448 (3.3)	166 (5.8)	
Normal	45877 (22.8)	32093 (21.2)	594 (20.9)	12068 (27.4)	1122 (39.3)	
Overweight	61534 (30.6)	46932 (31.1)	1114 (39.2)	12649 (28.7)	839 (29.4)	
Obesity	89518 (44.6)	69820 (46.2)	1096 (38.6)	17877 (40.6)	725 (25.4)	
ASA Group						<0.0001
ASA 3 or 4 or 5	88993 (44.3)	66539 (44.0)	1403 (49.4)	19411 (44.1)	1640 (57.5)	
ASA 1 or 2	111823 (55.7)	84543 (56.0)	1437 (50.6)	24631 (55.9)	1212 (42.5)	
Diabetes	28122 (14.0)	22704 (15.0)	275 (9.7)	4959 (11.3)	184 (6.5)	<0.0001
Chronic obstructive pulmonary disease	15196 (7.6)	9019 (6.0)	225 (7.9)	5517 (12.5)	435 (15.3)	<0.0001
Sleep Apnea	34675 (17.3)	27258 (18.0)	613 (21.6)	6362 (14.4)	442 (15.5)	<0.0001
Hypertension	89441 (44.5)	70185 (46.5)	1634 (57.5)	16315 (37.0)	1307 (45.8)	<0.0001
Preop transfusion any RBCs within 72 hours prior to surgery	2405 (1.2)	1791 (1.2)	56 (2.0)	465 (1.1)	93 (3.3)	<0.0001
Dialysis	1775 (0.9)	1374 (0.9)	17 (0.6)	348 (0.8)	36 (1.3)	0.0050
Steroids	7376 (3.7)	5793 (3.8)	78 (2.7)	1429 (3.2)	76 (2.7)	<0.0001
Preoperative sepsis	15036 (7.5)	10782 (7.1)	285 (10.0)	3527 (8.0)	442 (15.5)	<0.0001
Peripheral Vascular Disease	4283 (2.1)	2883 (1.9)	77 (2.7)	1205 (2.7)	118 (4.1)	<0.0001
Bleeding disorder	7606 (3.8)	5825 (3.9)	153 (5.4)	1471 (3.3)	157 (5.5)	<0.0001
10% loss of body weight 6 months prior to surgery	3845 (1.9)	2540 (1.7)	48 (1.7)	1161 (2.6)	96 (3.4)	<0.0001
Coronary Artery Disease	23599 (11.8)	18396 (12.2)	426 (15.0)	4442 (10.1)	335 (11.7)	<0.0001
Ascites	1864 (0.9)	1228 (0.8)	57 (2.0)	446 (1.0)	133 (4.7)	<0.0001
Congestive Heart Failure	1589 (0.8)	1239 (0.8)	29 (1.0)	281 (0.6)	40 (1.4)	<0.0001
Pneumonia	1377 (0.7)	972 (0.6)	27 (1.0)	310 (0.7)	68 (2.4)	<0.0001

	Overall Cohort n=200,816	No Risky Alcohol or Smoking n=151,082 (75.2%)	Risky Alcohol Only n=2,840 (1.4%)	Smoking Only n=44,042 (21.9%)	Risky Alcohol and Smoking n=2,852 (1.4%)	P-value
Open wound with or without infection	3294 (1.6)	2388 (1.6)	52 (1.8)	772 (1.8)	82 (2.9)	<0.0001
Wound classification						
Clean	49155 (24.5)	36094 (23.9)	774 (27.3)	11290 (25.6)	997 (35.0)	<0.0001
Contaminated/Infected	151661 (75.5)	114988 (76.1)	2066 (72.7)	32752 (74.4)	1855 (65.0)	
Surgical Approach						<0.0001
Open	78977 (39.3)	64655 (42.8)	1434 (50.5)	19158 (43.5)	1616 (56.7)	
Minimally invasive	121839 (60.7)	86427 (57.2)	1406 (49.5)	24884 (56.5)	1236 (43.3)	
Surgical Priority						<0.0001
Emergent	36261 (18.1)	26260 (17.4)	598 (21.1)	8581 (19.5)	822 (28.8)	
Urgent	36498 (18.2)	26986 (17.9)	501 (17.6)	8397 (19.1)	614 (21.5)	
Elective	128057 (63.8)	97836 (64.8)	1741 (61.3)	27064 (61.5)	1416 (49.6)	

Note: HMO= Health maintenance organization, RBC= Red Blood Cell

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Table 2.
Incidence of 30-day postoperative outcomes by smoking and risky alcohol use status

	Overall Cohort n=200,816	No Risky Alcohol or Smoking n=151,082 (75.2%)	Risky Alcohol Only n=2,840 (1.4%)	Smoking Only n=44,042 (21.9%)	Risky Alcohol and Smoking n=2,852 (1.4%)
Reoperation	8566	6060 (4.0)	154 (5.4)	2100 (4.8)	261 (9.2)
Readmission	13358	9822 (6.5)	193 (6.8)	3081 (7.0)	262 (9.2)
Surgical Complications	20568	15275 (10.1)	364 (12.8)	4386 (10.0)	543 (19.0)
Emergency Department visit	17279	11872 (7.9)	217 (7.6)	4907 (11.1)	283 (9.9)

Note: Readmission and Emergency Department visit wasn't specified to be related to the principal surgery prior to 2020.

Table 3.

Unadjusted and propensity score adjusted outcomes by risky alcohol and smoking status (Reference group: No risky alcohol/smoking)

	Unadjusted Models			Propensity Score Weighted Models		
	Risky Alcohol and Smoking	Risky Alcohol Only	Smoking Only	Risky Alcohol and Smoking	Risky Alcohol Only	Smoking Only
Reoperation						
Odds Ratio	2.412	1.371	1.198	1.773 ^{*†}	1.291	1.154
95% CI	[2.118, 2.746]	[1.163, 1.616]	[1.138, 1.260]	[1.529, 2.057]	[1.089, 1.531]	[1.096, 1.216]
P-value	<.0001	<.0001	<.0001	<.0001	0.003	<.0001
Readmission						
Odds Ratio	1.457	1.049	1.082	1.277 ^{*†}	1.038	1.026
95% CI	[1.281, 1.657]	[0.905, 1.215]	[1.037, 1.128]	[1.115, 1.463]	[0.895, 1.204]	[0.982, 1.071]
P-value	<.0001	0.528	<.0001	<.0001	0.622	0.249
Surgical complication						
Odds Ratio	2.091	1.307	0.983	1.365 ^{*†}	1.051	0.985
95% CI	[1.902, 2.229]	[1.169, 1.461]	[0.949, 1.019]	[1.210, 1.540]	[0.921, 1.197]	[0.948, 1.023]
P-value	<.0001	<.0001	0.354	<.0001	0.470	0.437
ED visit						
Odds Ratio	1.297	0.970	1.470	1.149	1.115	1.251
95% CI	[1.146, 1.468]	[0.844, 1.116]	[1.420, 1.523]	[1.012, 1.306]	[0.980, 1.270]	[1.206, 1.298]
P-value	<.0001	0.670	<.0001	0.030	0.098	<.0001

Note: No risky alcohol or smoking is the reference group for all analyses;

^{*} Estimate for risky alcohol and smoking group is significantly different (p < 0.05) than estimate for smoking only group;

[†] Estimate for risky alcohol and smoking group is significantly different (p < 0.05) than estimate for risky alcohol only group