



Effect of COVID-19 Pandemic Restructuring on Surgical Volume and Outcomes of Non-COVID Patients Undergoing Surgery

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Abstract

Objectives: COVID-19 has caused significant surgical delays as institutions minimize patient exposure to hospital settings and utilization of health care resources. We aimed to assess changes in surgical case mix and outcomes due to restructuring during the pandemic.

Methods: Patients undergoing surgery at a single tertiary care institution in the Deep South were identified using institutional ACS-NSQIP data. Primary outcome was case mix. Secondary outcomes were post-operative complications. Chi-square, ANOVA, logistic regression, and linear regression were used to compare the control (pre-COVID, Mar 2018-Mar 2020) and case (during COVID, Mar 2020-Mar 2021) groups.

Results: Overall, there were 6912 patients (control: 4,800 and case: 2112). Patients were 70% white, 29% black, 60% female, and 39% privately insured. Mean BMI was 30.2 (SD = 7.7) with mean age of 58.3 years (SD = 14.8). Most surgeries were with general surgery (48%), inpatient (68%), and elective (83%). On multivariable logistic regression, patients undergoing surgery during the pandemic were more likely to be male (OR: 1.14) and in SIRS (OR: 2.07) or sepsis (OR: 2.28) at the time of surgery. Patients were less likely to have dyspnea with moderate exertion (OR: .75) and were less dependent on others (partially dependent OR: .49 and totally dependent OR: .15). Surgeries were more likely to be outpatient (OR: 1.15) and with neurosurgery (OR: 1.19). On bivariate analysis, there were no differences in post-operative outcomes.

Conclusion: Surgeries during the COVID-19 pandemic were more often outpatient without differences in post-operative outcomes. Additional analysis is needed to determine the impact of duration of operative delay on surgical outcomes with restructuring focusing more on outpatient surgeries.

Key Takeaways

- Surgeries have become increasingly outpatient during the COVID-19 pandemic with shifts in case composition.
- Patients undergoing elective surgery are increasingly outpatient without changes in pLOS among inpatient surgeries.
- Patients undergoing emergent surgery during the pandemic are more likely to be septic at the time of surgery, but have similar outcomes as before the pandemic.

Introduction

COVID-19 has caused significant surgical delays across all service lines as institutions mitigate patient interaction

with hospital settings to slow the spread of the pandemic and minimize utilization of health care resources. After the American College of Surgeons recommended health systems and surgeons to “thoughtfully review” all scheduled operations to consider canceling or postponing, the United States Surgeon General Jerome Adams urged in mid-March that hospitals stop elective procedures to “flatten the curve.”¹ The goal was to minimize exposing patients to health care settings and to reduce the burden on

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hospitals as personal protective equipment, ventilators, and patient rooms were in short supply. Hospital systems created triaging systems to restructure surgical volume, including University of Chicago's MeNTS (medically necessary and time-sensitive) scoring system² to determine which surgeries to prioritize during the COVID-19 pandemic. Similar systems were established across the country with or without a scoring system, taking into account resource limitations, COVID-19 transmission risk to providers and patients, and urgency of surgery.

State-issued moratoriums on "non-essential" surgical services led to significant delays of needed surgical services, with the "essential" nature of surgery determined on a case-by-case basis by the caring physicians and operational management. However, the impact of delaying surgical management on patient outcomes is unclear.³ At our institution, elective surgeries were canceled and block times suspended on March 18, 2020. CMS Tier 2a, 2b, and outpatient Tier 1 cases were scheduled on a first come, first served basis starting on May 1. By June 1, case volume was back to pre-pandemic levels.

We aimed to assess the changes in surgical case mix and outcomes due to restructuring during the pandemic. With "non-essential" surgeries being delayed, it was hypothesized that elective surgeries would decrease before resuming baseline levels and that emergent surgeries would increase.

Methods

This study was approved by the University of Alabama at Birmingham Institutional Review Board under protocol number IRB-300005755. Patients undergoing surgery at a tertiary care institution in the Deep South from Mar 17, 2018 to Mar 18, 2021 were identified using institutional American College of Surgeons National Surgical Quality Improvement Program (ACS-NSQIP) data. American College of Surgeons National Surgical Quality Improvement Program is a nationally validated, risk-adjusted, outcomes-based program to measure and improve the quality of surgical care. Patients who had a positive pre-operative (n=25) or post-operative COVID-19 test (n=14) were excluded to focus on the effects of pandemic restructuring. Patients were grouped by surgical timing: Mar 17, 2018-Mar 17, 2020 (pre-COVID, control) and Mar 18, 2020-Mar 18, 2021 (during COVID, case), when surgical scheduling was restructured to adapt to limited OR availability and inpatient beds. Patients were compared by patient-level and procedure-level data, including race, age, BMI, comorbidities, functional status (patient level) and elective/emergent status, outpatient/inpatient status, and surgical specialty (procedure level).

Primary outcome was case mix. Secondary outcomes were case duration, length of stay (LOS), post-operative length of stay (pLOS), 30-day readmissions, and SSI.

Surgical site infections were defined the presence of superficial incisional surgical site infections, deep incisional surgical site infections, or organ/space surgical site infections, excluding those that were present at the time of surgery. Other outcomes, such as 30-day mortality, unplanned intubations, acute renal failure, pulmonary embolism, myocardial infarction, sepsis, urinary tract infection, etc. were below 2% incidence and were thus not included in the analysis. Analyses were separated by elective vs emergent surgeries. Differences between the case and control cohorts were determined by ANOVA and chi-square. Differences in case duration, pLOS, and LOS were determined by bivariate analysis and ANOVA. Differences in SSI and 30-day readmissions were determined by ANOVA and chi-square. Factors contributing to significantly different outcomes were determined with logistic and linear regression. All analyses were done in R.⁴

Results

Overall, there were 6912 patients, including 4800 from the control group and 2112 in the case group (Table 1). There was an average of 1.06 surgeries per patient (SD = .25, range = 1-4). Patients were 70% white, 29% black, 60% female, and 39% privately insured. Mean BMI was 30.2 (SD = 7.7) and mean age was 58.3 years (SD = 14.8). Most surgeries were with general surgery (48%), inpatient (68%), and elective (83%). Most patients had ASA 3 (75%), did not have diabetes mellitus (80%), did not smoke (82%), did not have dyspnea (84%), but had hypertension requiring medication (55%). Most patients had an independent functional health status at the time of surgery (98%).

On bivariate analysis of the case and control cohorts, there were no differences in age, race, sex, BMI, insurance, ASA, or comorbidities. There were fewer cases with orthopedic surgery (15% vs 17%) and more cases with general surgery (49% vs 48% and neurosurgery 10% vs 8%) ($P = .04$). More surgeries were outpatient (34% vs 31%, $P = .005$) and more were in SIRS (1.3% vs .8%), sepsis (2% vs 1%), or septic shock (.4% vs .3%) ($P = .007$) at the time of surgery. There were no significant differences in secondary outcomes between the case and control groups (Table 2).

On multivariable logistic regression, patients undergoing surgery during the pandemic were more likely to be male (OR: 1.14, 90%; CI: 1.03-1.27), in SIRS (OR: 2.07, 90%; CI: 1.32-3.26), or sepsis (OR: 2.28, 90%; CI: 1.54-3.38) at the time of surgery (Figure 1). Patients were less likely to have dyspnea with moderate exertion (OR: .75, 90%; CI: .63-.90) and were less dependent on others (partially dependent OR: .49, 90%; CI: .31-.78 and totally dependent OR: .15, 90%; CI: .03-.83). Surgeries were more likely to be outpatient (OR: 1.15, 90%; CI: 1.03-1.29) and with neurosurgery (OR: 1.19, 90%; CI: 1-1.42). Among

Table I. Characteristics of Patients During the Case and Control Period.

	Control (Mar 2018-Mar 2020) (N=4800)	Case (Mar 2020-Mar 2021) (N = 2112)	Overall (N = 6912)	P-value
Age				
Mean (SD)	58.6 (14.7)	57.9 (15.0)	58.3 (14.8)	.075
Median (min, max]	60.5 [18.3, 101]	59.9 [18.1, 96.3]	60.3 [18.1, 101]	
Race				
White	3332 (69.4%)	1440 (68.2%)	4772 (69.0%)	.207
Black	1373 (28.6%)	617 (29.2%)	1990 (28.8%)	
Other	95 (2.0%)	55 (2.6%)	150 (2.2%)	
Sex				
Female	2926 (61.0%)	1252 (59.3%)	4178 (60.4%)	.198
Male	1874 (39.0%)	860 (40.7%)	2734 (39.6%)	
BMI				
Mean (SD)	30.2 (7.71)	30.3 (7.64)	30.2 (7.69)	.79
Median (min, max]	29.1 [13.7, 90.9]	29.3 [14.0, 76.7]	29.2 [13.7, 90.9]	
Missing	15 (.3%)	16 (.8%)	31 (.4%)	
Specialty				
General surgery	2300 (47.9%)	1032 (48.9%)	3332 (48.2%)	.042
Gynecology	585 (12.2%)	264 (12.5%)	849 (12.3%)	
Neurosurgery	386 (8.0%)	204 (9.7%)	590 (8.5%)	
Orthopedics	836 (17.4%)	311 (14.7%)	1147 (16.6%)	
Thoracic	346 (7.2%)	156 (7.4%)	502 (7.3%)	
Vascular	344 (7.2%)	145 (6.9%)	489 (7.1%)	
Missing	3 (.1%)	0 (0%)	3 (.0%)	
Inpatient				
Inpatient	3327 (69.3%)	1391 (65.9%)	4718 (68.3%)	.0049
Outpatient	1473 (30.7%)	721 (34.1%)	2194 (31.7%)	
Elective				
Yes	3955 (82.4%)	1760 (83.3%)	5715 (82.7%)	.36
No	845 (17.6%)	352 (16.7%)	1197 (17.3%)	
Payor				
Private insurance	1878 (39.1%)	820 (38.8%)	2698 (39.0%)	.31
Medicare	2109 (43.9%)	901 (42.7%)	3010 (43.5%)	
Medicaid	355 (7.4%)	182 (8.6%)	537 (7.8%)	
Other	458 (9.5%)	209 (9.9%)	667 (9.6%)	
ASA				
ASA 1-2	890 (18.5%)	407 (19.3%)	1297 (18.8%)	.25
ASA 3	3596 (74.9%)	1588 (75.2%)	5184 (75.0%)	
ASA 4-5	314 (6.5%)	117 (5.5%)	431 (6.2%)	
Diabetes mellitus				
Insulin	386 (8.0%)	142 (6.7%)	528 (7.6%)	.16
No	3838 (80.0%)	1708 (80.9%)	5546 (80.2%)	
Non-insulin	576 (12.0%)	262 (12.4%)	838 (12.1%)	
Current smoker within 1 year				
No	3897 (81.2%)	1744 (82.6%)	5641 (81.6%)	.18
Yes	903 (18.8%)	368 (17.4%)	1271 (18.4%)	
Dyspnea				
At rest	10 (.2%)	3 (.1%)	13 (.2%)	.027
Moderate exertion	501 (10.4%)	135 (6.4%)	636 (9.2%)	
No	4289 (89.4%)	1515 (71.7%)	5804 (84.0%)	
Missing	0 (0%)	459 (21.7%)	459 (6.6%)	

(Continued)

Table I. Continued

	Control (Mar 2018-Mar 2020) (N=4800)	Case (Mar 2020-Mar 2021) (N = 2112)	Overall (N = 6912)	P-value
Functional health status				
Independent	4692 (97.8%)	2090 (99.0%)	6782 (98.1%)	.0024
Partially dependent	91 (1.9%)	20 (.9%)	111 (1.6%)	
Totally dependent	17 (.4%)	2 (.1%)	19 (.3%)	
Ventilator dependent				
No	4790 (99.8%)	2104 (99.6%)	6894 (99.7%)	.31
Yes	10 (.2%)	8 (.4%)	18 (.3%)	
History of severe COPD				
No	4592 (95.7%)	2022 (95.7%)	6614 (95.7%)	.94
Yes	208 (4.3%)	90 (4.3%)	298 (4.3%)	
Ascites w/in 30 days before surgery				
No	4764 (99.3%)	2094 (99.1%)	6858 (99.2%)	.77
Yes	36 (.8%)	18 (.9%)	54 (.8%)	
Congestive heart failure w/in 30 days before surgery				
No	4771 (99.4%)	2099 (99.4%)	6870 (99.4%)	1
Yes	29 (.6%)	13 (.6%)	42 (.6%)	
Hypertension requiring medication				
No	2196 (45.8%)	942 (44.6%)	3138 (45.4%)	.39
Yes	2604 (54.3%)	1170 (55.4%)	3774 (54.6%)	
Acute renal failure				
No	4794 (99.9%)	2109 (99.9%)	6903 (99.9%)	1
Yes	6 (.1%)	3 (.1%)	9 (.1%)	
Dialysis requirement				
No	4706 (98.0%)	2072 (98.1%)	6778 (98.1%)	.93
Yes	94 (2.0%)	40 (1.9%)	134 (1.9%)	
Disseminated cancer				
No	4568 (95.2%)	2015 (95.4%)	6583 (95.2%)	.71
Yes	232 (4.8%)	97 (4.6%)	329 (4.8%)	
Open wound with or without infection				
No	4641 (96.7%)	1601 (75.8%)	6242 (90.3%)	.80
Yes	159 (3.3%)	52 (2.5%)	211 (3.1%)	
Missing	0 (0%)	459 (21.7%)	459 (6.6%)	
Immunocompromised				
No	4397 (91.6%)	1932 (91.5%)	6329 (91.6%)	.90
Yes	403 (8.4%)	180 (8.5%)	583 (8.4%)	
Malnourishment				
No	4728 (98.5%)	1621 (76.8%)	6349 (91.9%)	.27
Yes	72 (1.5%)	32 (1.5%)	104 (1.5%)	
Missing	0 (0%)	459 (21.7%)	459 (6.6%)	
Bleeding disorder				
No	4527 (94.3%)	2002 (94.8%)	6529 (94.5%)	.46
Yes	273 (5.7%)	110 (5.2%)	383 (5.5%)	
Pre-operative (72 hr) blood transfusion				
No	4754 (99.0%)	2092 (99.1%)	6846 (99.0%)	1
Yes	46 (1.0%)	20 (.9%)	66 (1.0%)	
Sepsis at the time of surgery				
None	4696 (97.8%)	2036 (96.4%)	6732 (97.4%)	.0070
SIRS	38 (.8%)	27 (1.3%)	65 (.9%)	
Sepsis	53 (1.1%)	41 (1.9%)	94 (1.4%)	
Septic shock	13 (.3%)	8 (.4%)	21 (.3%)	

Table 2. Proportion of Case Volume Reduction During the Pandemic.

Month	Control	Case	Ratio of case volume during the pandemic, %
	(Mar 2018-Mar 2020) (N = 4800)	(Mar 2020-Mar 2021) (N = 2112)	
Mar	354	159	45
Apr	337	156	46
May	436	177	41
Jun	463	180	39
Jul	467	170	36
Aug	463	241	52
Sep	409	216	53
Oct	201	176	88
Nov	450	129	29
Dec	414	173	42
Jan	429	229	53
Feb	377	106	28

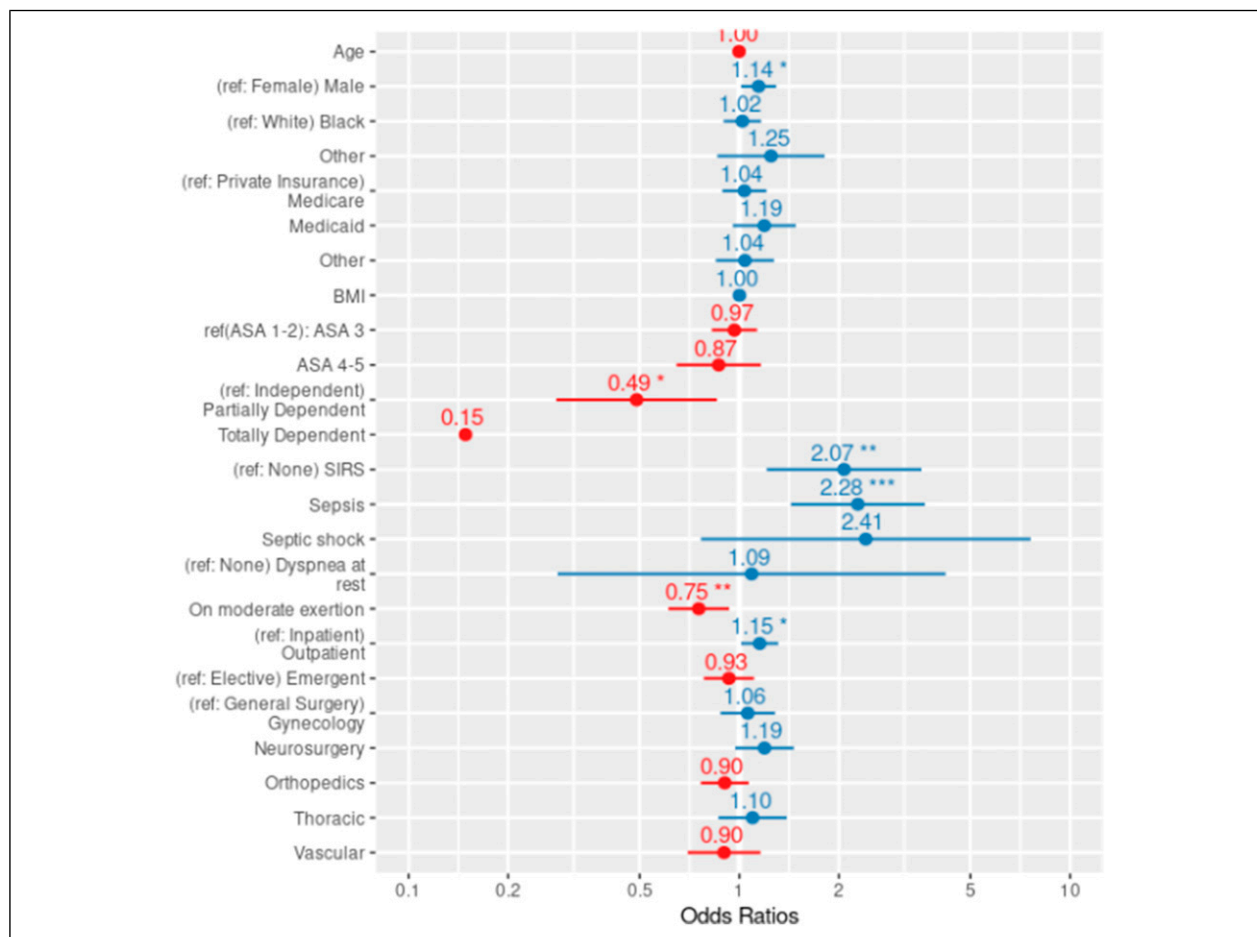


Figure 1. Factors predicting whether the procedure was done during the COVID-19 pandemic.

elective surgeries, findings were similar without significant differences in surgical specialty. Among emergent surgeries, patient sex did not contribute. There were no

changes in proportion of outpatient surgeries. More patients were in SIRS (OR: 2.11, 90%; CI: 1.33-3.36) or sepsis (OR: 2.21, 90%; CI: 1.47-3.33) at the time of surgery.

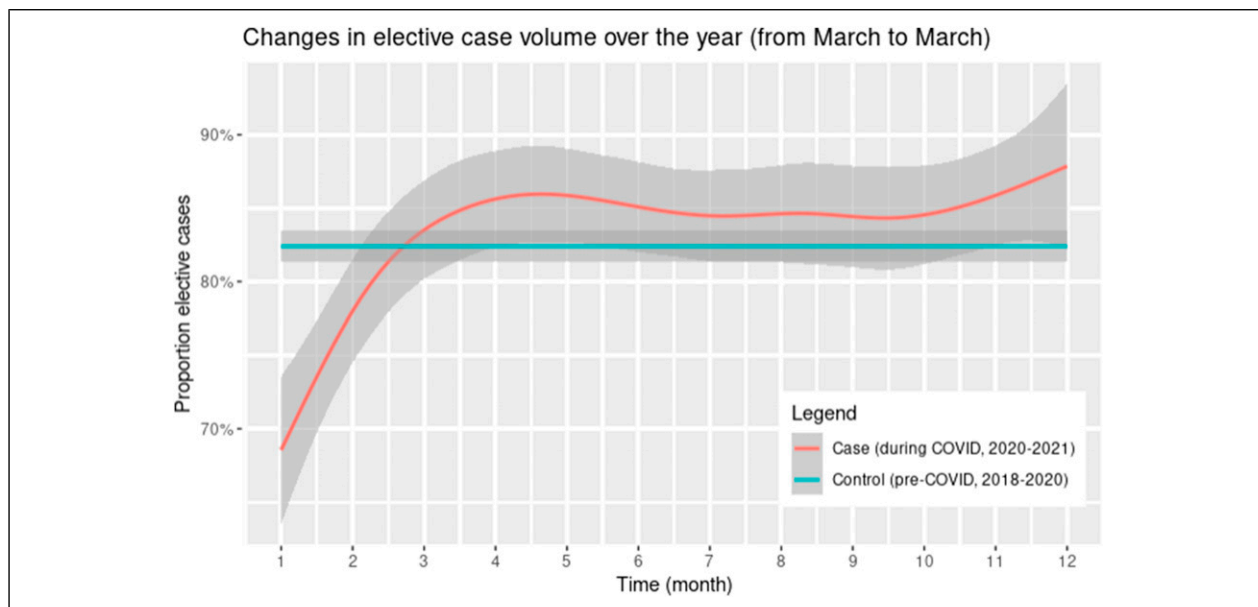


Figure 2. Increased volume of elective surgeries, decreased volume of emergent surgeries in 2020.

There was an average 13.5 cases per day in the control cohort (SD = 13.8) and 7.1 per day during the pandemic (SD = 7.42). Monthly volume during the pandemic was about 46% of the monthly volume before the pandemic (SD = 15%, range=28%-88%) (Table 2). Initially, proportion of elective cases was significantly lower during the pandemic compared to the control cohort (Month 1: 64% vs 81.4%). By the second month of the pandemic, elective volume increased (83.3% vs 82.8%), resulting in greater proportion of elective volume during the pandemic as compared to the control for 8 of the 12 months studied (Figure 2).

The secondary outcomes for the overall consisted of a mean LOS of 4 days (SD = 6.8), mean pLOS of 3.3 days (SD = 4.1), 8% 30-day readmission rate, and 5% SSI. On bivariate analysis, there were no differences in LOS, 30-day readmissions, or SSI (Table 3). Among elective surgeries, pLOS decreased from 2.86 to 2.70 days ($P = .08$), but was not significant when excluding outpatient surgery (3.95 to 3.94 days, $P = .9$). There were no differences in post-operative outcomes among emergent surgeries (Figure 3).

Among all surgeries, emergent surgeries were more likely to be for male (OR: 1.27, 95% CI: 1.1-1.5), black (OR: 1.3, 95% CI: 1.1-1.5), Medicare insured (OR: 1.8, 95% CI: 1.5-2.1), higher ASA (ASA 3 OR: 1.2, 95% CI: 1.01-1.5, ASA 4-5 OR: 3.95, 95% CI: 3.01-5.2), and more likely to dependent on others (partially dependent OR: 3.3, 95% CI: 2.2-4.9 and totally dependent OR: 11.5, 95% CI: 3.6-36.8). Emergent surgeries were less likely among higher BMI (OR: .96, 95% CI: .96-.97) and older (OR: .98, 95% CI: .98-.99) patients.

Among all elective surgeries, patients were 70% white, 28% black, 62% female, and 41% privately insured. Mean BMI was 30.5 (SD = 7.7) and mean age was 58.6 years

(SD = 14.2). Most surgeries were with general surgery (46%) and inpatient (64%). Most patients had ASA 3 (76%). Post-operative outcomes consisted of 4.8% with SSI, 7.2% with 30-day readmission, mean LOS of 3 days (SD = 6.1), and mean pLOS of 2.8 days (SD = 3.4). Undergoing surgery during the pandemic was not a contributing factor to post-operative outcomes.

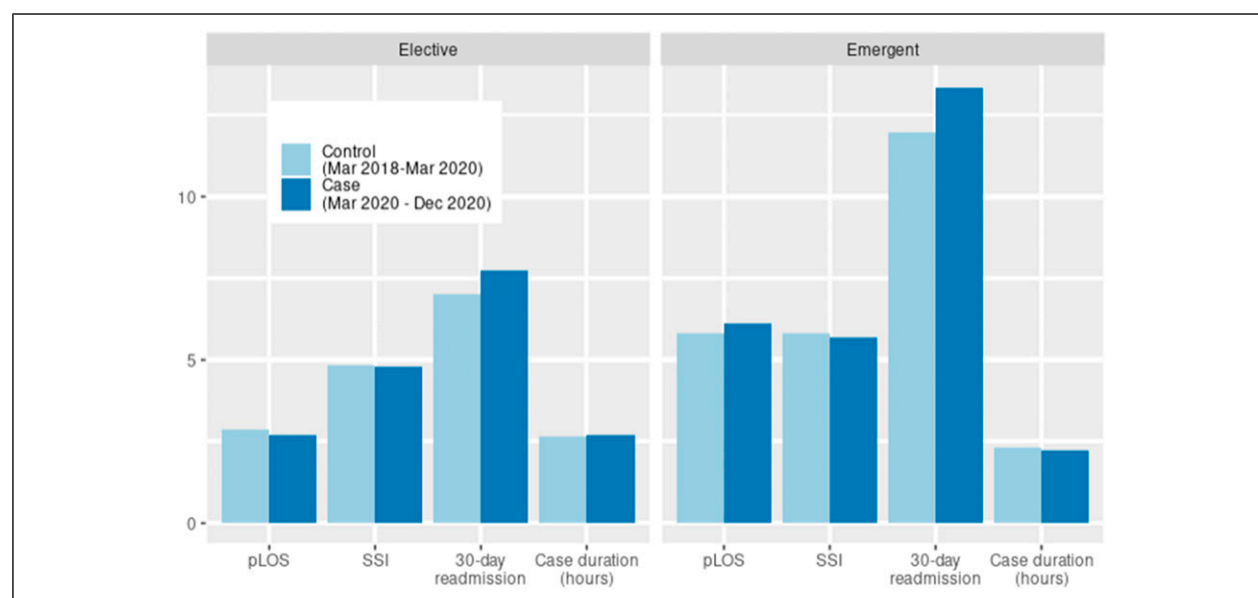
Among all emergent surgeries, patient-level variables were significantly different on bivariate analysis. Patients were younger (mean age: 57 vs 59 year, $P = .005$), more likely to be black (34% vs 28%, $P < .001$), more likely to be male (46% vs 38%, $P < .001$), had lower BMI (mean BMI: 29 vs 31, $P < .001$), were less likely to be privately insured (30% vs 41%, $P < .001$), and had worse ASA (ASA 4-5: 15% vs 5%, $P < .001$) and comorbidities ($P < .001$). Patients were also more likely to have their surgery in general surgery (58% vs 46%, $P < .001$) and as an inpatients (87% vs 64%). Mortality (3% vs .55, $P < .001$), LOS (8.8 days vs 3.0 days, $P < .001$), pLOS (5.9 days vs 2.8 days, $P < .001$), and 30-day readmission rates (12.4% vs 7.2%, $P < .001$) were significantly worse among patients undergoing emergent surgery during the pandemic as compared to the control period. Additionally, among emergent surgeries during the pandemic, there were more cases with general surgery (63% vs 55%, $P = .03$) and more patients in SIRS or sepsis (22% vs 12%, $P < .001$) at the time of surgery compared to before the pandemic.

Discussion

Surgeries during the COVID-19 pandemic were more often outpatient. Monthly volume was less than half

Table 3. Equivocal Outcomes Before and During the COVID-19 Pandemic.

	Control (Mar 2018-Mar 2020) (N = 4800)	Case (Mar 2020-Mar 2021) (N = 2112)	Overall (N=6912)	P-value
SSI				
No	4559 (95.0%)	2008 (95.1%)	6567 (95.0%)	.91
Yes	241 (5.0%)	104 (4.9%)	345 (5.0%)	
Mortality				
No	4751 (99.0%)	2094 (99.1%)	6845 (99.0%)	.60
Yes	49 (1.0%)	18 (.9%)	67 (1.0%)	
LOS				
Mean (SD)	3.98 (6.77)	3.95 (6.96)	3.97 (6.83)	.84
Median (min, max)	2.00 (0, 309)	2.00 (0, 185)	2.00 (0, 309)	
pLOS				
Mean (SD)	3.38 (4.12)	3.27 (4.18)	3.35 (4.14)	.29
Median (min, max)	2.00 (0, 30.0)	2.00 (0, 30.0)	2.00 (0, 30.0)	
30-day readmission				
No	4422 (92.1%)	1929 (91.3%)	6351 (91.9%)	.29
Yes	378 (7.9%)	183 (8.7%)	561 (8.1%)	
Case duration				
Mean (SD)	155 (98.0)	157 (100)	155 (98.6)	.39
Median (min, max)	129 (12.0, 1130)	130 (14.0, 880)	129 (12.0, 1130)	

**Figure 3.** Secondary outcomes for the control and case cohorts.

the monthly volume compared to before the pandemic. The initial decrease in proportion of elective cases during the pandemic compared to the control cohort was followed by a consistently greater proportion of elective surgeries. The increase in elective surgeries is likely due to the redirection of surgical volume to outpatient hospitals and ambulatory surgical centers in order to utilize the surgical facilities and PPE available. Decrease in the volume of emergent surgeries could be due to the increased emphasis

on non-operative management, postponement of surgical management from the patient or the provider, or reduced presentation to hospital settings. There has been significant fear of health care settings resulting in decreased patient presentations in the emergency department for a variety of clinical pathologies, including heart attacks.⁵ Almost half of the adult American population has delayed or avoided any medical care, including urgent or emergent (12%) and routine (31.5%) care.

In Spanish hospitals, acute care surgery volume decreased significantly during the COVID-19 pandemic,⁶ with a reduction from an average of 2.3 procedures per day down to .9 per day (39% of original volume). Our institution is a high volume center, where we also analyzed data across 6 major surgical departments. Daily volume was similarly reduced in half, from around 13.5 per day to 7.1 per day (52.6%). The Spanish data showed increased time from symptom onset to patient arrival in the emergency department, which is a variable we would like to include in future studies. They also found higher morbidity in patients undergoing acute care surgery with similar post-operative outcomes between their control group and the group that underwent surgery during the pandemic. This was reflected in our data as well, with sicker patients undergoing emergent surgery without significant differences in post-operative outcomes.

A prospective study in Scotland found a 58.3% reduction in admissions without significant differences in age or length of stay. Their mean operating time increased from 102.4 to 145.7 min, which was not shown in our data. This could be due to their focus on emergency general surgery, as our data extend across multiple surgical specialties. However, among emergent surgeries alone, there still is no significant difference in our data in mean operating time during the COVID-19 pandemic. Even among emergent general surgery cases alone, there was no difference in operative duration between the case (mean = 131) and control (mean = 132) cohorts ($P = .87$). Using operative duration as a proxy for operative complexity, this could suggest that despite surgical delays, patients were being seen with sufficient timeliness during the COVID-19 pandemic that their operative interventions were not significantly more complex.

Among elective and emergent surgeries, there were no differences in post-operative outcomes despite patients being more likely to be in SIRS or sepsis at the time of emergent surgery. Surgical volume changes were proportionate by race, but had more male patients being seen for elective surgery. There was an increase in outpatient surgeries without increasing the rate of 30-day readmission to the same hospital. There may be readmissions to outside hospitals that were not captured by the data in this study. Future surgical management could consider re-evaluating discharge criteria to match inpatient needs and adapt to the concept of the “home hospital.” Allowing patients to safely recover in their own home will allow them to avoid the intrusiveness of frequent vitals checks and labs, as well as reduce exposure to health care settings and the associated exposure to viruses and drug-resistant organisms.

Although post-operative outcomes were not significantly different on gross review, many factors associated with the COVID-19 pandemic likely affected outcomes. Factors such as restricted visitation may

have contributed.⁷ Among ICU patients, restricted visitation is associated with increased delirium and longer length of delirium/coma and ICU stay.⁸ Among patients undergoing surgery requiring overnight stay, those accompanied by overnight caregivers had significantly lower time to discharge.⁹ Restricted and variable patient visitation likely contributed to patient and caretaker understanding of discharge criteria, affecting post-operative management. Future studies are needed to better understand the effects of caretaker involvement during periods of restricted patient visitation and its effect on patient outcomes and patient-reported outcomes.

This study has several limitations. First, this is a retrospective cohort study only capturing perioperative data for surgeries documented with the ACS-NSQIP database. Surgical volume may not be appropriately represented due to variations in surgical specialties and specific operations not represented in this database. Second, data captured by the database are prone to human error. While the ACS-NSQIP database is nationally validated and collected by trained clinical reviewers, data are obtained from patient’s medical chart, which is prone to error in documentation. Additionally, the impact of surgical restructuring is merely approximated with known time frames. Additional analysis of floor and ICU bed, operating room, nursing, and physician availability on patient outcomes can help us determine efficient staffing and resource availability to optimize patient outcomes. Fourth, this study does not incorporate delays in operative timing of elective surgeries. Additional analysis is needed to determine the duration of delay between planned operation and actual operation on surgical outcomes and causes of the delay, as well as delay between symptom onset and definitive surgical management as analyzed by Cano-Valderrama et al. Determining if increased delay resulted in increased LOS for elective surgeries during the pandemic can help refine guidelines on surgical timing to improve patient outcomes and triage surgical care for the next pandemic. Additional analysis is needed to determine the impact of duration of operative delay on surgical outcomes, as well as appropriate candidates for outpatient surgeries to reduce inpatient burdens when bed availability is in such scarcity.

Conclusion

Patients undergoing surgery during the COVID-19 pandemic more often undergo outpatient surgery. Patients undergoing elective surgery were more likely to be male and less likely to have dyspnea or rely on a caretaker. Patients undergoing emergent surgery were similar without differences in sex and more likely to be in SIRS or sepsis at the time of surgery. Outcomes for both groups were not different. Additional analysis is needed to determine the impact of duration of operative delay on

surgical outcomes with restructuring focusing more on outpatient surgeries.

Author Note

Meeting presentation: Southeastern Surgical Congress 2021

Declaration of Conflicting Interests

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