

Surgical Outcomes During the First Year of the COVID-19 Pandemic

To the Editor:

The coronavirus disease 19 (COVID-19) has had a profound impact on our healthcare system. Surgery in particular faced significant challenges related to allocation of resources and equitable patient selection. During 2020, the volume of non-urgent and nonemergent procedures dramatically decreased in an attempt to (a) allocate valuable resources for the increasing number of infected patients, (b) protect healthcare workers and (c) protect patients from potential nosocomial infection. At that time, multiple surgical societies published guidelines

on resuming elective surgery during the pandemic, which include protective measures for healthcare workers and preoperative testing. In the preoperative period, it was reported that 0.74 to 0.93% of patients could test positive for SARS-CoV-2.^{1,2} Current evidence demonstrates that patients infected with SARS-CoV-2 have increased risk of perioperative mortality and pulmonary complications even for several weeks past the infection.³⁻⁶ Accounting for the possibility of future waves we need to be prepared and analyze our past practices to better serve our patients.⁷ We sought to analyze the national outcomes after surgery during the first year of the pandemic.

We examined the 30-day outcomes of all the procedures captured by the National Surgical Quality Improvement Program (NSQIP) from 2018 to 2020 irrespective of the type of anesthesia. Using χ^2 test we compared the 30-day surgical outcomes between 2020 and its preceding year. Results are expressed as odds ratio and 95% confidence intervals.

All statistical analyses were performed with SAS version 9.4 (SAS, Cary, NC, USA). Hypothesis test were 2-sided and evaluated at a significance level of $P < 0.05$.

A total of 2,999,923 procedures were captured by NSQIP during those years (2018 = 1,020,511; 2019 = 1,076,441, and 2020 = 902,971). The majority of the population was female (57.4%), white (66.2%), non-Hispanic (72.9%), and had general anesthesia (87.2%). Table 1 shows that there was a significant increase in 30-day complications during 2020, including mortality (24%), cardiac arrest (24%), myocardial infarction (22%), and septic shock (21%). In addition, there was a 23% increased rate of postoperative pneumonia along with other pulmonary complications (unplanned intubation and failure to wean). In addition, the rates of postoperative pneumonia when divided by quarters were similar for 2018 and 2019 but differed for 2020 (Fig. 1). Even though our data does not differentiate between etiologies of postoperative pneumonia, when the data were compared with the COVID-19 cases across the

TABLE 1. Complications by Year

NSQIP Complications	2018 (%)	2019 (%)	2020 (%)	Change ^a	Odds Ratio (95% CI) ^a
Mortality	0.97	0.88	1.09	24	1.24 (1.20-1.27)
Cardiac arrest requiring CPR	0.28	0.25	0.31	24	1.24 (1.17-1.31)
Pneumonia	1.03	1.03	1.27	23	1.24 (1.21-1.27)
Septic shock	0.75	0.72	0.87	21	1.21 (1.17-1.25)
Myocardial infarction	0.35	0.37	0.45	22	1.20 (1.15-1.26)
Fail to wean ventilator	0.78	0.74	0.85	15	1.16 (1.12-1.19)
Unplanned intubation	0.63	0.57	0.65	14	1.14 (1.10-1.18)
Acute renal failure	0.24	0.23	0.27	17	1.14 (1.08-1.20)
Transfusions	4.21	4.05	4.59	13	1.14 (1.12-1.15)
Sepsis	1.60	1.48	1.67	13	1.14 (1.11-1.16)
Organ/space SSI	1.47	1.56	1.76	13	1.14 (1.11-1.16)
Pulmonary embolism	0.31	0.32	0.36	13	1.11 (1.06-1.17)
Deep SSI	0.37	0.32	0.35	9	1.11 (1.06-1.17)
Deep vein thrombosis	0.51	0.51	0.55	8	1.09 (1.05-1.13)
Dehiscence	0.36	0.37	0.40	8	1.09 (1.04-1.14)
Stroke	0.18	0.19	0.21	11	1.09 (1.03-1.16)
Progressive renal insufficiency	0.23	0.22	0.24	9	1.09 (1.03-1.15)
Return to operating room	2.67	2.51	2.69	7	1.07 (1.05-1.09)
Reoperation	2.67	2.51	2.69	7	1.07 (1.05-1.09)
Readmission	5.00	4.90	4.98	2	1.02 (1.00-1.03)
Superficial SSI	1.30	1.75	1.76	1	1.01 (0.99-1.03)
Urinary tract infection	1.21	1.29	1.30	1	1.00 (0.98-1.03)
<i>Clostridium Difficile</i>	0.32	0.28	0.26	-7	0.95 (0.90-1.00)

^a2020 compared with the prior year.

CI indicates confidence interval; CPR, cardiopulmonary resuscitation; NSQIP, National Surgical Quality Improvement Program; SSI, surgical site infection.

The American College of Surgeons National Surgical Quality Improvement Program and the hospitals participating in the ACS NSQIP are the source of the data used herein; they have not verified and are not responsible for the statistical validity of the data analysis or the conclusions derived by the authors.

The authors declare no conflicts of interest.

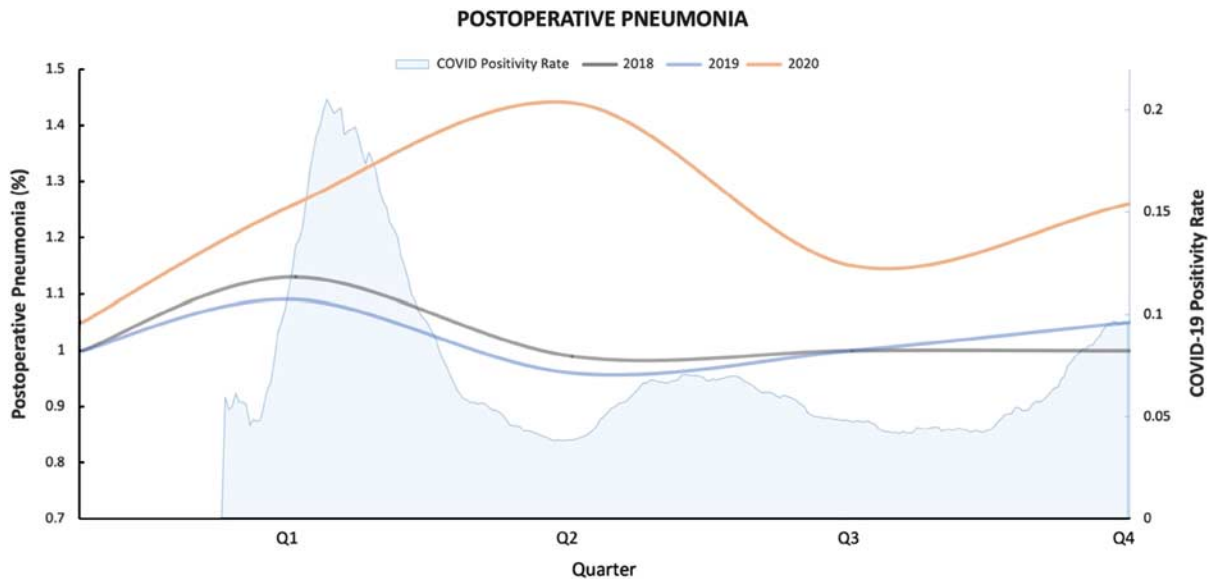


FIGURE 1. Comparison of postoperative pneumonia between years by quarters and COVID-19 positivity rate for 2020.

United States, the peaks of postoperative pneumonia seen in 2020 seem to correlate with the peaks of COVID-19 cases (Fig. 1).

Although this data cannot directly attribute all of the increased complication rates to perioperative COVID-19 infections, other complications not associated with SARS-CoV-2, such as urinary tract infection, surgical site infection, and dehiscence, remained relatively stable during the same time period. In spite of the fact that these increased complication rates seen in 2020 could be multifactorial, we must consider that these could also be a surrogate marker for perioperative SARS-CoV-2 infections. Interestingly, the rate of *Clostridium Difficile* decreased, which might be a consequence of stricter infection control protocols for COVID-19.

A prior study during the beginning of the pandemic reported a 1.8% incidence of symptomatic COVID-19 among 501 patients who underwent surgery.⁸ However, other studies have found hospital-acquired infection rates of 12 to 15% in nonsurgical patients.⁹ Given the emergence of new variants with periodic spikes in COVID-19 cases that continue to strain our health care systems, surgeons need to be cognizant of the increased risk COVID-19 poses on our patients and follow current recommendations to prevent the spread

of the virus.¹⁰ Our individual participation to stop the spread is key, as it has been shown that interrupting all “elective” cases is not a feasible solution.¹¹ Therefore we would like to make surgeons aware of these poor surgical outcomes seen during the first year of the pandemic based on an overall analysis of the NSQIP data. Further analysis of individual populations and procedures might be warranted to prepare us for future COVID-19 waves.

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