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Research Letter

Perioperative mortality in SARS-CoV-2-positive surgical patients during the first wave of the novel coronavirus pandemic

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Dear Editor

Sustaining surgical services during the COVID-19 pandemic remains challenging in terms of adjudicating the risk of viral exposure for patients and staff, maintaining stewardship for hospital resources and personal protective equipment, and assuring continued patient access to appropriate surgical care[1,2]. A significant patient safety concern relates to the notion that asymptomatic carriers of the SARS-CoV-2 virus may deteriorate in respiratory function, subsequent to endotracheal intubation for general anaesthesia, and require prolonged mechanical ventilation, which has been associated with increased mortality in COVID-19[3–5]. This study was designed to determine the perioperative mortality of patients with COVID-19 who underwent surgical procedures during the first wave of the pandemic in the USA.

A retrospective cohort study was undertaken using a multicentre data registry that includes 155 hospitals from a national healthcare system in the USA (HCA Healthcare, Nashville, Tennessee, USA). The null hypothesis was that patients with COVID-19 undergoing surgical procedures would have a similar perioperative mortality rate to surgical patients with a negative SARS-CoV-2 test. The study time window was restricted to the first wave of the COVID-19 pandemic, between 1 March and 17 May 2020. Inclusion criteria were adult inpatients aged at least 18 years of age who underwent surgical procedures for elective, urgent, or emergency indications. COVID-19 status was determined by PCR for SARS-CoV-2 mRNA during the hospital stay. The primary outcome measure was in-hospital mortality, which was stratified by logistic regression modelling for COVID-19 status, with adjustment for the following confounders: age, co-morbidities, need for and duration of mechanical ventilation, ICU admission and duration of ICU stay. This study was reviewed by the HCA Healthcare Institutional Review Board (IRB) and was deemed exempt from IRB oversight (number 2020-285).

A total of 8549 patients from the registry met the inclusion criteria during the time window of 1 March and 17 May 2002. Of these, 8336 patients (97.5 per cent) tested negative for SARS-CoV-2 mRNA and 213 (2.5 per cent) had a positive test. The groups were matched in terms of age and sex, and there was no significant difference in the duration of surgical procedures between them. Patient demographics and outcomes in the two study cohorts are shown in *Table 1*. The COVID-19-positive cohort had a significantly higher in-hospital mortality rate than the test-negative group (odds ratio 2.27; $P < 0.001$). In addition, surgical patients who tested positive for COVID-19 had a higher rate of perioperative ICU admissions (49.8 *versus* 26.1 per cent), longer ICU stay (174 *versus* 74 h), and requirement for invasive ventilation by endotracheal intubation (44.1 *versus* 10.0 per cent).

These findings are in alignment with recent data suggesting that surgical patients with COVID-19 represent a vulnerable cohort with an increased risk of perioperative death[3–5]. Interestingly, the higher mortality rate among patients with COVID-19 in the present study was independent of risk stratification for underlying co-morbidities, as determined by the

Table 1 Demographic data and outcome measures in 8549 surgical patients

	COVID-19-negative ($n = 8336$)	COVID-19-positive ($n = 213$)
Age (years)*	59.6(19.3)	61.5(17.7)
Sex ratio (F : M)	4218 : 4118	101 : 112
In-hospital death	630 (7.6)	57 (26.8)
ICU admission	2177 (26.1)	106 (49.8)
Duration of ICU stay (h)†	74 (36–164)	174 (81–376)
Invasive ventilation	832 (10.0)	94 (44.1)
Duration of invasive ventilation (days)†	5 (2–11)	7 (3–15)
Non-invasive ventilation	457 (5.5)	11 (5.2)
Duration of non-invasive ventilation (days)†	4 (2–8)	2 (2–9)
Elixhauser Comorbidity Index score†	5 (3–9)	6 (3–9)
Duration of surgery (min)†	93 (51–154)	92.5 (52–130)
Duration of hospital stay (days)†	3 (1–8)	11 (6–21)
Discharged home	6067 (72.8)	89 (41.8)
Discharged to rehabilitation	1478 (17.7)	53 (24.9)
Transferred out	161 (1.9)	14 (6.6)

Values in parentheses are percentages unless indicated otherwise; values are *mean(s.d.) and †median (i.q.r.).

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Elixhauser Comorbidity Index. In addition, there was no difference in duration of surgical procedures between the study cohorts. The increased mortality rate is likely from pulmonary complications in patients with COVID-19 secondary to invasive mechanical ventilation, which was associated with increased ICU admission rates and duration of ICU stay (*Table 1*). Arguably, asymptomatic carriers of SARS-CoV-2 are at risk of deterioration in pulmonary function secondary to invasive ventilation with general anaesthesia for surgical procedures[3]. This study is limited by the shortcomings of a retrospective registry data analysis, which preclude determination of the exact underlying causes of increased perioperative mortality. Nevertheless, the insights further support the imperative to apply stringent surgical indications in the vulnerable population of patients with COVID-19 during the current new global wave of the pandemic.

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