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Mortality & Pulmonary Complications in Emergency General Surgery Patients with Mortality COVID-19: A Large International Multicenter Study

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Media Summary: The outcomes of emergency general surgery patients (EGS) having COVID19 are unknown. Our study across 52 countries demonstrates that COVID19 patients undergoing EGS have higher mortality and pulmonary complications especially in the presence of preoperative respiratory findings.

Mention: @AnthonyGebran, @hayfarani, @aneelbhangu, @dnepo, @Apogait, @argandykov, @AnderDorken, @OsaidesserMD, @CovidSurg, @MGHSurgery, @MGH_RI

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ABSTRACT

Objectives: The outcomes of emergency general surgery (EGS) patients with concomitant COVID-19 infection remain unknown. With a multicenter study in 361 hospitals from 52 countries, we sought to study the mortality and pulmonary complications of COVID-19 patients undergoing EGS.

Methods: All patients aged ≥17 years and diagnosed preoperatively with COVID-19 between February and July 2020 were included. EGS was defined as the urgent/emergent performance of appendectomy, cholecystectomy, or laparotomy. The main outcomes were 30-day mortality and 30-day pulmonary complications (a composite of acute respiratory distress syndrome, unexpected mechanical ventilation, pneumonia). Planned subgroup analyses were performed based on presence of preoperative COVID-related respiratory findings (e.g. cough, dyspnea, need for oxygen therapy, chest radiology abnormality).

Results: A total of 1,045 patients were included, of which 40.1% were female and 50.0% were older than 50 years; 461 (44.1%), 145 (13.9%), and 439 (42.0%) underwent appendectomy, cholecystectomy, and laparotomy, respectively. The overall mortality rate was 15.1% (158/1,045) and the overall pulmonary complication rate was 32.9% (344/1,045); in the subgroup of laparotomy patients, the rates were 30.6% (134/438) and 59.2% (260/439), respectively. Subgroup analyses found mortality and pulmonary complication risk to be especially increased in patients with preoperative respiratory findings.

Conclusion: COVID-19 patients undergoing EGS have significantly high rates of mortality and pulmonary complications, but the risk is most pronounced in those with preoperative respiratory findings.

Level of Evidence: Level III

Study type: Prognostic

Keywords: COVID-19, COVIDSurg, emergency surgery, mortality, pulmonary complications.

INTRODUCTION

The coronavirus disease 2019 (COVID-19) pandemic continues to cause major disruptions to the delivery of surgical services globally. To prevent the transmission of respiratory syndrome coronavirus 2 (SARS-CoV-2) and to divert available resources towards the care of patients with SARS-CoV-2, it is estimated that more than 28 million elective surgeries were canceled in the early phases of the pandemic worldwide, and more as the pandemic persisted.[1–3] However, the majority of emergency general surgery (EGS) procedures could not be postponed or canceled, especially when non-operative alternatives were deemed unacceptable or inferior in efficacy or safety. Surgeons in general and acute care surgeons in specific were faced every day with the challenge to balance the patients' need for surgical management of their acute disease and the potential risks associated with concomitantly having or contracting perioperative SARS-CoV-2 infection.[4] In light of early reports detailing a wide spectrum of extrapulmonary thromboembolic COVID-19 manifestations and raising concerns over the risks of surgical intervention in COVID-19 patients,[5–10] major surgical societies provided pragmatic guidelines for triaging EGS patients that take into consideration patient- and disease-related factors as well as hospital resource availability.[11]

In its first international multicenter study conducted among 1,128 surgical patients with SARS-CoV-2 infection, the COVIDSurg group identified a markedly increased risk of mortality and postoperative pulmonary complications in all patients undergoing surgery with a perioperative diagnosis of COVID-19. Those rates were significantly higher than those reported in even the highest-risk surgical patients in pre-pandemic studies.[1] Similarly, the increased risk of mortality and morbidity among surgical patients with SARS-CoV-2 infection was demonstrated in Italy and

the Netherlands.[12,13] However, specific data on the postoperative outcomes of EGS patients with preoperative COVID-19 remains unclear. In addition, it also remains unclear whether the presence or absence of preoperative signs or symptoms of Covid-19 affects the outcome and impacts the prognosis in patients with COVID-19. In this study, we sought to: (1) determine the rates of 30-day mortality and pulmonary complications of EGS patients with preoperative SARS-CoV-2 infection and (2) compare the clinical outcomes of patients with and without preoperative respiratory findings of COVID-19 in this same cohort.

METHODS

Setting & Ethical Oversight

This study is reported in compliance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational cohort studies [Table S1 (Supplemental material), http://links.lww.com/TA/C366], [14] and is a secondary analysis of the COVIDSurg Cohort Study. COVIDSurg prospectively enrolled consecutive patients from February to July 2020, was led by the University Hospital Birmingham, UK and registered as a clinical audit (registration number CARMS-15986).[15] All participating centers, including the Massachusetts General Hospital as the lead US center, received ethical approval from their respective Institutional Review Board (IRB) offices and signed a Data Use Agreement (DUA) with the UK-based leading center. **Table S2 (Supplemental material)**, http://links.lww.com/TA/C367, details the number of patients contributed to the study by each participating country. Patients aged 17 years or older who were diagnosed SARS-CoV-2 infection up to 7 days before EGS based on quantitative reverse transcription-polymerase chain reaction (RT-PCR) testing, pathognomonic chest computed tomography (CT) scan, or clinical diagnosis were included. Patients diagnosed with SARS-CoV-

2 postoperatively were excluded from this analysis. The index operation was identified as the one performed closest to the time the SARS-CoV-2 infection was confirmed. For the purpose of this study, EGS was defined as urgent or emergent appendectomy, cholecystectomy, or laparotomy for any indication (e.g. bowel obstruction or perforation). Both open and laparoscopic procedures were included.

Data Collection

The medical records of each included patient were systematically reviewed to identify the following information: (1) Demographics (age and sex), (2) American Society of Anesthesiologists (ASA) physical status classification, (3) comorbidities (e.g. asthma, chronic obstructive pulmonary disease [COPD], chronic kidney disease, coronary artery disease), (4) Revised Cardiac Risk Index,[16] (5) method diagnosis of SARS-CoV-2 (RT-PCR, CT, clinical), (6) clinical symptoms at the time of hospital admission (e.g. cough, diarrhea, fever, hemoptysis) as obtained from the History and Physical (H&P), (7) preoperative vital signs (e.g. respiratory rate, heart rate, and systolic blood pressure), (8) preoperative respiratory support (none, supplemental oxygen or mechanical ventilation), and (9) operative characteristics (primary procedure, type of anesthesia).

Outcomes

The main outcomes were 30-day mortality and 30-day pulmonary complications (a composite of acute respiratory distress syndrome [ARDS], unexpected postoperative mechanical ventilation, or pneumonia). Unexpected postoperative ventilation was defined as the need for non-invasive or

invasive ventilation or extracorporeal membrane oxygenation (ECMO) after initial extubation following surgery or failure to extubate as planned after surgery.

Statistical Analyses

Descriptive statistics were used for patient characteristics and discharge outcomes. Continuous variables are presented as mean and standard deviation (SD) for those with normal distribution or median and interquartile range (IQR) for non-normal distributions. Bivariate analysis was performed using parametric (t-tests) or nonparametric tests (Wilcoxon rank-sum) depending on their distribution for continuous variables and Pearson $\chi 2$ tests or Fisher's exact tests for categorical variables as applicable. Univariate and multivariable analyses were used to identify independent predictors of 30-day mortality and 30-day pulmonary complications. Explanatory variables were selected a-priori based on clinical relevance (Age, sex, ASA, BMI, number of comorbidities, respiratory comorbidity, respiratory rate, heart rate, systolic blood pressure, white blood cell count, smoking status, preoperative respiratory findings and surgical procedure). A 2-sided P-value of less than 0.05 was considered statistically significant. The statistical software STATA, version 15.1, was used to analyze the data (StataCorp, TX).

Subgroup Analyses: Patients with and without Preoperative Respiratory Findings of COVID-19

Subgroup analyses were performed according to the presence of preoperative respiratory findings or not. This was based on respiratory symptoms at the time of hospital admission (dyspnea, cough, hemoptysis, sputum production), abnormal preoperative imaging (chest X-ray or chest CT scan), or preoperative oxygen requirement (supplemental oxygen or mechanical ventilation).

RESULTS

Patient Characteristics and Overall Outcomes

A total of 1,045 patients were included, of which 40.1% were female (n=419) and 50.0% were older than 50 years (n=523). More than half of the patients had preoperative respiratory findings of COVID-19 (n=647, 61.9%). These included specifically preoperative respiratory symptoms (n=298, 28.5%), abnormal chest X-ray (n=335, 32.1%), abnormal chest CT scan (n=438, 41.9%), need for supplemental oxygen therapy (n=280, 27.6%) and/or the need for mechanical ventilation (n=146, 14.4%). Regarding the specific surgical procedures performed, 44.1% of patients underwent an appendectomy (n=461), 13.9% a cholecystectomy (n=145) and 42.0% a laparotomy (n=439). The overall rate of 30-day mortality was 15.1% (n=158) and that of pulmonary complications was 32.9% (n=344). **Table S3 (Supplemental Material)**, http://links.lww.com/TA/C367, describes the rates of non-pulmonary complications by surgical procedure.

Univariate Analyses for Mortality and Pulmonary Complications

Tables 1 and 2 summarize the results of the univariate analyses for mortality and pulmonary complications. In summary, compared to survivors, non-survivors were more likely to be older than 50 years, more often had an ASA of 3 or more, more often had a BMI more than 30, and more often had at least one respiratory comorbidity. They were also more likely to be bradycardic, hypo-, or hypertensive preoperatively, and more likely to have at least one preoperative respiratory finding of COVID-19. They more frequently underwent a laparotomy and more often developed at least one pulmonary complication. When compared to patients who did not develop postoperative pulmonary complications, patients who did were more likely to be older than 50

years, more often had an ASA of 3 or more, and more often had at least one respiratory comorbidity. They were also more often bradycardic, hypo-, or hypertensive, more often had at least one preoperative respiratory finding of COVID-19, and more often underwent a laparotomy. They were also more likely to die within 30 days of surgery.

Multivariable Analyses for Mortality and Pulmonary Complications

Table 3 shows the multivariable analyses for mortality and pulmonary complications. In summary, the main independent predictors of 30-day mortality were age 50-69 and ≥70 (OR [95% CI]: 5.3 [1.14-24.63], 5.67 [1.17-27.48], respectively), undergoing a laparotomy (OR [95% CI]: 5.74 [2.52-13.08]), and ASA grades 4 and 5 (OR [95% CI]: 6.95 [1.4-34.45], 18.08 [3.22-101.49], respectively).

The main independent predictors of pulmonary complications were the presence of preoperative respiratory findings of COVID-19 (OR [95% CI]: 6.03 [3.44-10.6]), ASA grade 4 (OR [95% CI]: 4.67 [1.87-11.66]) and undergoing a laparotomy (OR [95% CI]: 3.24 [1.97-5.32]).

Subgroup Analyses: Patients with and without Preoperative Respiratory Findings of COVID-19

Table 4 summarizes the results of the sensitivity analyses in patients with and without preoperative respiratory findings of COVID-19. Compared to those without, patients with preoperative respiratory findings of COVID-19 had a significantly higher mortality (22.6% vs. 3.0%, p-value < 0.001). When analyzed at the individual procedure level, the same finding was noted specifically for patients undergoing cholecystectomy (19.2% vs. 0.0%, p-value < 0.001) and

laparotomy (33.0% vs. 14.3%, p-value = 0.001), but not appendectomy (2.7% vs. 1.5%, p-value = 0.385). When examining pulmonary complications, patients with preoperative respiratory findings also had a higher rate of pulmonary complications (50.1% vs. 5.0%, p-value < 0.001), and the finding was true for all 3 procedures: appendectomy (21.5% vs. 3.3%, p-value < 0.001), cholecystectomy (41.0% vs. 4.5%, p-value < 0.001) and laparotomy (65.8% vs. 14.3%, p-value < 0.001).

DISCUSSION

In this large, international, multicenter, prospective study we show that both mortality and pulmonary complication rates of patients with SARS-CoV-2 infection undergoing EGS are significantly elevated. As importantly, the risk was particularly high in patients with preoperative respiratory findings of COVID-19 such as cough, dyspnea, or imaging findings. Based on those findings, we strongly suggest that surgeons should seriously weigh the elevated risks associated with concomitant SARS-CoV-2 infection against the risks of postponing surgery and adopting alternatives to operative management, when feasible. This is especially important in patients with preoperative respiratory findings of COVID-19.

While our study lacks controls, the mortality we report among EGS patients with preoperative respiratory findings of COVID-19 is considerably higher than pre-pandemic baseline rates for EGS. A multicenter study conducted across 58 countries from high-, middle- or low- Human Development Index, reported a 30-day mortality rate of 14.9% in patients undergoing emergency laparotomy.[17] This finding approaches the rate that we identified among asymptomatic SARS-CoV-2 patients (14.3%) but is less than half the mortality rate we report in patients with

preoperative respiratory findings of COVID-19 (33.0%). Mortality was similar in cholecystectomies performed among pre-pandemic and asymptomatic SARS-CoV-2 patients (1.1% vs. 0.0%, respectively) but was much higher among patients with preoperative respiratory findings of COVID-19 (19.2%).[17] When it comes to appendectomies, postoperative mortality was higher among patients with or without respiratory findings of COVID-19 when compared to pre-pandemic rates (2.7% & 1.5% vs. 0.2%, respectively).[17]

In addition to a high mortality rate, more than half of the patients with preoperative respiratory findings of COVID-19 developed serious pulmonary complications following EGS; more than two-thirds of the patients undergoing emergency laparotomy with respiratory findings of COVID-19 developed pulmonary complications postoperatively. These rates are much higher than those reported in non-SARS-CoV-2 patients, which were reported to be as low as 8.5% in a multicenter prospective cohort study across seven US hospitals.[18] Notably, the risk of pulmonary complications was high even in the cohort of patients with preoperative respiratory findings of COVID-19 undergoing the lower risk appendectomies and cholecystectomies.

Based on our findings, we recommend that surgeons seriously weigh the risks associated with surgery against the risks of delayed operative management and consider non-operative alternatives (e.g., antibiotics for acute appendicitis), especially for patients with preoperative respiratory findings. In addition, the recently developed COVIDSurg mortality score can serve as a practical and reliable adjuvant to estimate personalized mortality risk for patients with perioperative SARS-CoV-2 infection.[19]

Our study has several limitations that we need to caution the reader about. First, our data was collected during the first wave of the pandemic and none of the patients included in this study had been vaccinated against COVID-19 or were infected with a recent COVID-19 variant (Delta, Omicron). The constantly changing nature of the disease might limit generalizability of our findings to the current patient population. The COVIDSurg group has launched a new collaborative effort (COVIDSurg3) to collect data during the vaccination and Omicron era. We plan to compare the findings of the current study to the data of COVIDSurg3 when data collection is completed. Second, in the absence of data on SARS-CoV-2 patients who underwent non-operative management for similar diagnoses, we cannot confirm with certainty whether the high mortality and pulmonary complications were precipitated by the surgical intervention itself and cannot report the mortality and pulmonary complications of patients who underwent non-operative management instead. Third, the use of CT scan to diagnose some patients with SARS-CoV-2 infection likely led to the inclusion of patients who are already experiencing pulmonary problems, which might skew estimates of pulmonary complication rates for SARS-CoV-2 patients receiving surgery. Fourth, we did not evaluate whether the indication for EGS was related to COVID-19 or not (e.g. COVID-related bowel ischemia), as the relationship was and remains difficult to pinpoint with certainty. Fifth, we only included emergent appendectomies, cholecystectomies, and laparotomies. Other laparoscopic and non-laparoscopic emergent surgeries were excluded, which might limit the generalizability of our findings to the entire EGS population.

CONCLUSION

COVID-19 patients undergoing EGS have significantly higher rates of mortality and pulmonary complications when compared to the pre-pandemic baseline risk. This is especially true for patients

with preoperative respiratory clinical or radiological findings of SARS-CoV-2. Such information is crucial for the bedside clinician and surgeon who is bedside counseling the EGS patient with COVID-19 on the risks and benefits of surgery compared to any viable non-operative alternatives in management. In recognition of the limitations of the current study, the results should not be interpreted as a recommendation against an operation in appropriate emergency surgery patients. Further studies are needed to determine the impact of new therapeutics and vaccination on outcomes of EGS patients infected with recent COVID-19 variants.

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Supplemental Digital Content 1

Table S1. STROBE (Strengthening The Reporting of OBservational Studies in Epidemiology) Checklist

Supplemental Digital Content 2

Table S2. Countries and hospitals that provided data for the study

Table S3. Non-pulmonary complications, by surgical procedure.

STROBE (Strengthening The Reporting of OBservational Studies in Epidemiology) Checklist

A checklist of items that should be included in reports of observational studies. You must report the page number in your manuscript where you consider each of the items listed in this checklist. If you have not included this information, either revise your manuscript accordingly before submitting or note N/A.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

Section and Item	Item No.	Recommendation	Reported on Page No.
Title and Abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	3
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	3
Introduction			
Background/Rationale	2	Explain the scientific background and rationale for the investigation being reported	7
Objectives	3	State specific objectives, including any prespecified hypotheses	7
Methods			
Study Design	4	Present key elements of study design early in the paper	8
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	8
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	8-9
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	9

Section and Item	Item No.	Recommendation	Reported on Page No.
Data Sources/ Measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	8-9
Bias	9	Describe any efforts to address potential sources of bias	9-10
Study Size	10	Explain how the study size was arrived at	N/A
Quantitative Variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9-10
Statistical Methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	9-10
		(*b*) Describe any methods used to examine subgroups and interactions	9-10
		(c) Explain how missing data were addressed	N/A
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	N/A
		(e) Describe any sensitivity analyses	10
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	10
		(b) Give reasons for non-participation at each stage	10
		(c) Consider use of a flow diagram	
Descriptive Data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	10
		(b) Indicate number of participants with missing data for each variable of interest	19-24 (Tables)
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	10-11
Outcome Data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	11
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	

Section and Item	Item No.	Recommendation	Reported on Page No.
Main Results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	10-12
		(b) Report category boundaries when continuous variables were categorized	10-12
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other Analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	12
Discussion			
Key Results	18	Summarise key results with reference to study objectives	12-13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12-14
Generalisability	21	Discuss the generalisability (external validity) of the study results	12-14
Other Information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	5 (Title page)

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Once you have completed this checklist, please save a copy and upload it as part of your submission. DO NOT include this checklist as part of the main manuscript document. It must be uploaded as a separate file.

Table S2. Countries and hospitals that provided data for the study

Country	Number of hospitals participating in COVIDSurg (n=747)	Number of patients contributed to this study (n=1,045)
Albania	1	1 (0.1%)
Argentina	2	1 (0.1%)
Australia	7	3 (0.3%)
Austria	6	1 (0.1%)
Belgium	8	4 (0.4%)
Bulgaria	1	1 (0.1%)
Canada	19	4 (0.4%)
Chile	6	22 (2.1%)
Colombia	6	1 (0.1%)
Dominican Republic	1	1 (0.1%)
Ecuador	1	1 (0.1%)
Egypt	18	12 (1.2%)
Ethiopia	2	1 (0.1%)
France	25	23 (2.2%)
Germany	28	27 (2.6%)
Greece	8	5 (0.5%)
Guatemala	4	9 (0.9%)
Hungary	2	1 (0.1%)
Indonesia	1	3 (0.3%)
Iran	3	1 (0.1%)
Iraq	2	1 (0.1%)
Ireland	10	4 (0.4%)
Israel	2	2 (0.2%)
Italy	77	146 (14%)
Kazakhstan	1	4 (0.4%)
Kuwait	1	1 (0.1%)
Libya	4	1 (0.1%)
Macedonia	1	4 (0.4%)
Malaysia	3	4 (0.4%)
Mexico	11	20 (1.9%)
Netherlands	28	12 (1.2%)
Nigeria	8	1 (0.1%)
Pakistan	14	12 (1.2%)
Panama	6	9 (0.9%)
Peru	17	198 (19%)
Philippines	8	9 (0.9%)
Poland	1	2 (0.2%)
Portugal	17	15 (1.4%)
Qatar	1	12 (1.2%)
Saudi Arabia	25	20 (1.9%)
Serbia	4	2 (0.2%)
Singapore	1	4 (0.4%)
South Africa	5	3 (0.3%)

Spain	71	93 (8.9%)
Sweden	7	17 (1.6%)
Switzerland	8	7 (0.7%)
Turkey	20	91 (8.7%)
United Arab Emirates	4	15 (1.4%)
United Kingdom	169	88 (8.4%)
United States	70	125 (12%)
Yemen	2	1 (0.1%)

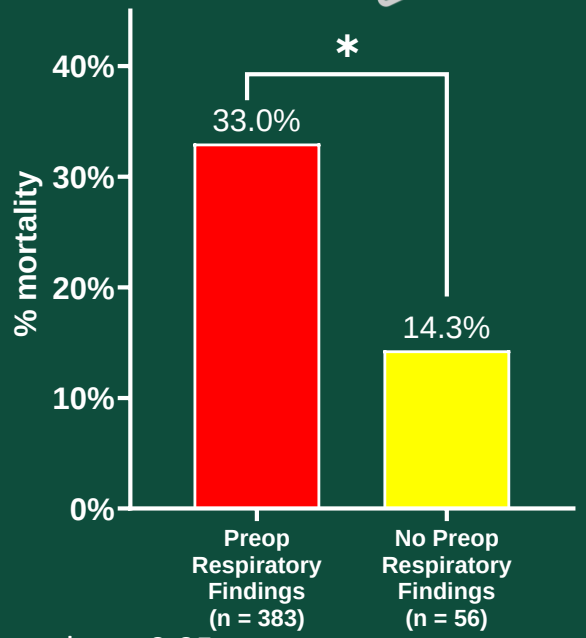
Table S3. Non-pulmonary complications, by surgical procedure.

Outcome	Appendectomy n=461	Cholecystectomy n=145	Laparotomy n=439
DVT	3 (0.7%)	3 (2.1%)	20 (4.6%)
PE	2 (0.4%)	0 (0.0%)	17 (3.9%)
AKI	5 (1.1%)	10 (6.9%)	105 (24.0%)
Bleeding	1 (0.2%)	5 (3.5%)	62 (14.2%)
Cardiac Arrest	2 (0.4%)	4 (2.8%)	34 (7.8%)
Come	0 (0.0%)	0 (0.0%)	24 (5.5%)
Ileus	11 (2.4%)	4 (2.8%)	43 (9.8%)
MI	1 (0.2%)	1 (0.7%)	12 (2.7%)
Sepsis	4 (0.9%)	8 (5.6%)	94 (21.5%)
Septic Shock	3 (0.7%)	9 (6.3%)	106 (24.2%)
Stroke	0 (0.0%)	1 (0.7%)	5 (1.1%)
Superficial/Deep SSI	45 (9.8%)	3 (2.1%)	67 (15.3%)
Organ Space SSI	9 (2.0%)	1 (0.7%)	22 (5.0%)
UTI	3 (0.7%)	2 (1.4%)	20 (4.6%)
Wound Dehiscence	2 (0.4%)	0 (0.0%)	38 (8.7%)
Reoperation	15 (3.3%)	9 (6.2%)	87 (20.0%)
ICU admission	37 (8.1%)	37 (25.5%)	284 (65.0%)

Abbreviation: DVT, Deep Vein Thrombosis; PE, Pulmonary Embolism; AKI, Acute Kidney Injury; MI, Myocardial Infarction; SSI, Surgical Site Infection; UTI, Urinary Tract Infection; ICU, Intensive Care Unit.

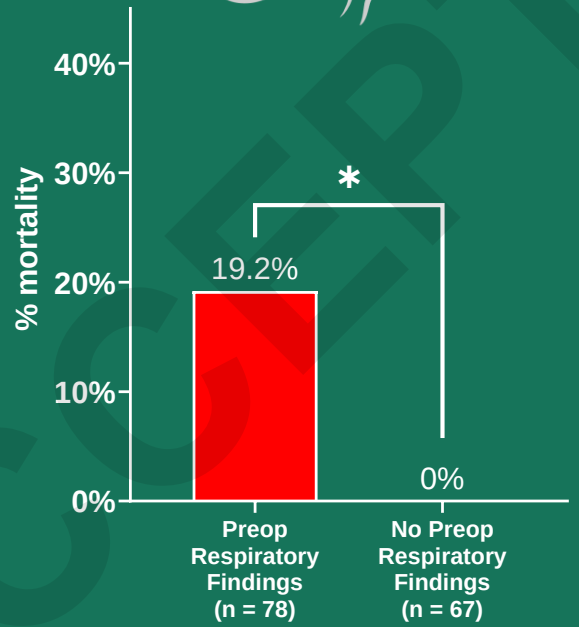
30-day Mortality In Emergency General Surgery Patients With and Without Preoperative Respiratory Findings of COVID-19

Laparotomy

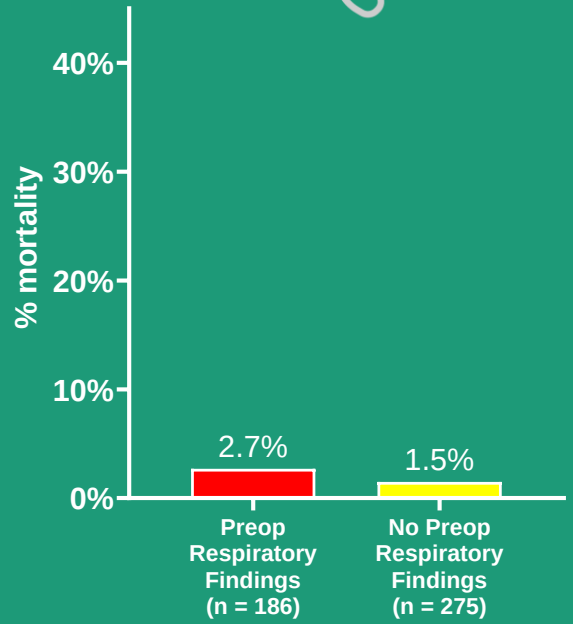


* : p-value < 0.05

Cholecystectomy



Appendectomy



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