

Supplementary Appendix

In-Hospital Cardiac Arrest in Critically Ill Patients with Covid-19

STOP
COVID Study of the Treatment and Outcomes in critically ill
Patients with COVID-19

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Table S1. List of Participating Sites

Northeast
Beth Israel Deaconess Medical Center
Brigham and Women's Faulkner Hospital
Brigham and Women's Hospital
Cooper University Health Care
Hackensack Meridian Health
Hackensack University Medical Center
Hackensack Mountainside Hospital
Johns Hopkins Hospital
Kings County Hospital Center
Lowell General Hospital
Massachusetts General Hospital
MedStar Georgetown University Hospital
Montefiore Medical Center
Mount Sinai
Newton Wellesley Hospital
New York-Presbyterian Queens Hospital
New York-Presbyterian/Weill Cornell Medical Center
New York University Langone Hospital
Rutgers/New Jersey Medical School
Rutgers/Robert Wood Johnson Medical School
Temple University Hospital
Jefferson Health
Tufts Medical Center
United Health Services Hospitals
University of Pennsylvania Health System
University of Pittsburgh Medical Center
Westchester Medical Center
Yale University Medical Center
South
Baylor College of Medicine, Houston
Baylor University Medical Center/Baylor Scott White and Health
Duke University Medical Center
Mayo Clinic, Florida
Memphis VA Medical Center
Methodist University Hospital
Ochsner Medical Center
Tulane Medical Center
University of Alabama-Birmingham Hospital

University of Florida Health-Gainesville
University of Florida Health-Jacksonville
University of Miami Health System
University of North Carolina Hospitals
University of Texas Southwestern Medical Center
University of Virginia Health System
Midwest
Barnes-Jewish Hospital
Cook County Health
Froedtert Hospital
Indiana University Health Methodist Hospital
Mayo Clinic, Rochester
Northwestern Memorial Hospital
Promedica Health System
Rush University Medical Center
University Hospitals Cleveland Medical Center
University of Chicago Medical Center
University of Illinois Hospital and Health Sciences System
University of Kentucky Hospital
University of Michigan Hospital
University of Oklahoma Health Sciences Center
West
Loma Linda University Medical Center
Mayo Clinic, Arizona
Oregon Health and Science University Hospital
Renown Health
Stanford Healthcare
University of California-Davis Medical Center
University of California-Los Angeles Medical Center
University of California-San Diego Medical Center
University of California-San Francisco Medical Center
UCHealth University of Colorado
University Medical Center of Southern Nevada
University of Washington Medical Center

Table S2. Definitions of Baseline Characteristics, Comorbidities, and Treatments

Baseline Characteristics	
Baseline serum creatinine	Lowest value (mg/dl) within 365 to 7 days prior to hospital admission. If not available, serum creatinine on hospital admission
Healthcare worker	Physician, nurse, technician, or other medical professional who provides direct care to patients (does not include ancillary staff such as clerks, pharmacists, or kitchen/cleaning staff)
Home medications	Medications that the patient was taking at home within 1 week prior to admission. Does not include those started at an outside hospital if the patient was transferred.
Anticoagulation	Therapeutic anticoagulants, not including anti-platelet agents like aspirin or clopidogrel
Immunosuppressant drugs	Chemotherapy (in the 30 days prior to admission), corticosteroids >10 mg prednisone/day (or equivalent), calcineurin inhibitors (systemic, not topical), mycophenolate mofetil, azathioprine, rituximab, other
Coexisting Conditions	
Asthma	Per chart review
Atrial fibrillation/flutter	Per chart review
Bone marrow transplant	Per chart review
Cancer	Per chart review; active malignancy (other than non-melanoma skin cancer) treated in the past year. Defined as cancer of the lung, breast, colorectal, prostate, gastric, pancreatic, melanoma, ovarian, brain, or other
Chronic kidney disease	Baseline eGFR <60 ml/min/1.73m ² on at least two consecutive values at least 12 weeks apart prior to hospital admission. If not available, defined as per chart review
Chronic liver disease	Cirrhosis, alcohol-related liver disease, nonalcoholic fatty liver disease, autoimmune hepatitis, hepatitis B or hepatitis C, primary biliary cirrhosis, or other
Chronic obstructive pulmonary disease	Per chart review
Congestive heart failure	Per chart review; heart failure with preserved versus reduced ejection fraction
Coronary artery disease	Per chart review; any history of angina, myocardial infarction, or coronary artery bypass graft surgery
Diabetes mellitus	Per chart review; insulin versus non-insulin dependent
End stage renal disease	Per chart review; on hemodialysis or peritoneal dialysis
History of alcohol abuse	Per chart review
HIV/AIDS	Per chart review
Homelessness	Per chart review
Hypertension	Per chart review
Solid organ transplant	Per chart review (kidney, liver, heart, lung, other)
Smoking	Per chart review; does not include vaping or smoking of non-tobacco products. Non-smoker, former smoker, current smoker
Longitudinal Treatments^a	

Extracorporeal membrane oxygenation	Veno-venous, veno-arterial, or veno-arterial-venous
Mechanical cardiac support	Impella, intra-aortic balloon pump, LVAD, RVAD, other
Mechanical ventilation	Invasive mechanical ventilation
Renal replacement therapy	CRRT 24 hours/day, CRRT ≤12 hours a day, intermittent hemodialysis, peritoneal dialysis, other.
PaO ₂ ^b	Lowest PaO ₂ available during each 24 hour day (midnight to midnight)
FiO ₂ ^b	FiO ₂ corresponding to lowest PaO ₂
PEEP ^b	Highest PEEP available during each 24 hour day (midnight to midnight)
Vasopressors	Maximum number of vasopressors required each day

Abbreviations: COVID-19, coronavirus-19; CRRT, continuous renal replacement therapy; eGFR, estimated glomerular filtration rate; FiO₂, fraction of inspired oxygen; HIV/AIDs, human immunodeficiency syndrome/acquired immunodeficiency virus; LVAD, left ventricular assist device; PaO₂, partial pressure of oxygen; PEEP, positive end-expiratory pressure; RVAD, right ventricular assist device.

^aLongitudinal treatments and outcomes were recorded daily for the first 14 days following admission to the ICU. If multiple values were present, the lowest PaO₂ available, along with the corresponding FiO₂ at the time, was recorded, while the highest PEEP on each day was recorded. If the patient had an outcome, the date of the outcome was recorded.

^bOnly applies to patients on mechanical ventilation with an arterial blood gas available.

Table S3. Modified SOFA Score. The value from ICU day 1 was used. If unavailable on ICU day 1, the value from ICU day 2 was used. If neither was available, a score of 0 was used for that component.¹⁻³

	SOFA Score				
	0	1	2	3	4
SOFA Renal (Cr [mg/dl], UOP [ml/day], and acute RRT)	Cr<1.2 and UOP≥500	Cr 1.2-1.9 and UOP≥500	Cr 2-3.4 and UOP≥500	Cr 3.5-4.9 or UOP 200-499	Cr ≥5 or UOP<200 or acute RRT or ESKD
SOFA Liver (Bilirubin, mg/dl)	<1.2	1.2-1.9	2.0-5.9	6.0-11.9	≥12
SOFA Coagulation (Platelets, K/mm³)	≥150	100-149	50-99	20-49	<20
SOFA Respiratory (PaO₂:FiO₂)	≥400 or not intubated	300-399	200-299	100-199	<100
SOFA Cardiovascular (#vasopressors/inotropes)	0	1	2	3	≥4
SOFA CNS	No AMS		AMS		

Abbreviations: AMS, altered mental status; Cr, creatinine (mg/dl); ESKD, end-stage kidney disease; RRT, renal replacement therapy; UOP, urine output.

Table S4: Missing Value Counts and Frequencies

Variable	Count	Percentage
Institution characteristics		
Institution type	0	0
Number of ICU beds	0	0
Demographics		
Age	0	0
Sex	0	0
Race	1258	25.1
Body mass index	198	3.9
Coexisting conditions		
Smoking status	699	13.9
Diabetes mellitus	0	0
Hypertension	0	0
Coronary artery disease	0	0
Congestive heart failure	0	0
Chronic obstructive pulmonary disease	0	0
Chronic or end stage kidney disease	0	0
Active malignancy	0	0
Laboratory values on day 1 of ICU admission		
White-cell count	314	6.3
Lymphocyte count	1006	20.1
Hemoglobin	312	6.2
Platelet count	337	6.7
Creatinine	269	5.4
Albumin	961	19.1
Aspartate aminotransferase	949	18.9
Alanine aminotransferase	920	18.3
Total bilirubin	938	18.7
Lactate	1915	38.2
Arterial pH	1640	32.7
D-dimer	2221	44.3
C-reactive protein	1845	36.8
Ferritin	2041	40.7
Complications		
Invasive mechanical ventilation	0	0
On extracorporeal membrane oxygenation	0	0
Newly diagnosed reduced left ventricular function	0	0
On vasopressors	0	0
Acute kidney injury requiring RRT	0	0
Outcomes		
ICU length-of-stay	0	0
Vital status	0	0

ICU: intensive care unit; RRT: renal replacement therapy

Table S5: Duration of CPR (minutes) stratified by age, sex, race, and number of ICU beds

	Median (IQR)
Age Category, years	
<45	13 (7-20)
45-64	10 (5-20)
65-79	10 (5-18)
≥80	7 (4-14)
Male	10 (5-19)
Female	10 (5-18)
White (non-Hispanic)	11 (6-18)
Black (non-Hispanic)	11 (5-17)
Number of ICU beds	
≥100	10 (3-21)
50-99	14 (5-24)
<50	10 (6-15)

Table S6: Determinants of hospital mortality post-CPR. N=400. Number of deaths =352.

	Adjusted Odds Ratio (95%CI) for Death	P-value
Model 1:		
Age Category, years		
<45	Reference	
45-64	2.11 (0.86-5.19)	0.10
65-79	1.83 (0.72-4.66)	0.20
≥80	8.66 (1.00-75.22)	0.050
Male sex	2.42 (1.25-4.71)	0.009
Number of ICU beds		
≥100	Reference	
50-99	2.74 (1.23-6.12)	0.014
<50	9.72 (4.40-21.47)	<0.001
mSOFA score, per 2	1.13 (0.88-1.44)	0.33
Model 2: Model 1 + initial cardiac rhythm		
Ventricular fibrillation	Reference	
Pulseless ventricular tachycardia	1.99 (0.27-14.58)	0.50
Pulseless electrical activity	1.33 (0.26-6.85)	0.73
Asystole	1.97 (0.33-11.83)	0.46

CPR: cardiopulmonary resuscitation; ICU: intensive care unit; mSOFA: modified Sequential Organ Failure Assessment score

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