

Study identifies patient- and hospital-level risk factors for death in critically ill COVID-19 patients

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More than 3 million people in the United States have been infected with COVID-19 and more than 130,000 have died. More people have died of

COVID-19 in the U.S. than in any other country, but few studies offer national data on the factors that may contribute to outcomes for critically ill patients. To address this gap, investigators from more than 65 sites across the country, led by a team from Brigham and Women's Hospital, conducted the Study of the Treatment and Outcomes in critically ill Patients with COVID-19 (STOP-COVID), a multicenter cohort examination of the demographics, comorbidities, organ dysfunction, treatment, and outcomes of patients with COVID-19 admitted to intensive care units. The team studied over 2,000 critically ill adults with COVID-19, and found that 35 percent of patients died in the 28 days after ICU admission. They also found that treatment and outcomes varied greatly between hospitals. Results of their work are published in *JAMA Internal Medicine*.

"The U.S. is currently the epicenter of COVID-19, yet few national data are available on the epidemiologic factors, treatments, and outcomes of critically ill patients with COVID-19 in the U.S.," said corresponding author David E. Leaf, MD, MMSc, an associate physician in the Division of Renal Medicine at the Brigham. "We found that critically ill patients with COVID-19 have a greater than 1-in-3 chance of short-term death. We also found that treatment and outcomes varied considerably between hospitals, with a death rate more than three-fold higher in patients admitted to hospitals with fewer ICU beds."

The multicenter cohort study included Brigham and Women's Hospital and 64 other sites from the Northeast, South, Midwest and West regions of the U.S., including parts of the U.S. that were heavily affected by COVID-19. The study included 2,215 adults with laboratory-confirmed COVID-19 who were admitted to ICUs between March 4 and April 4, 2020.

Overall, 784 patients (35 percent) died within 28 days, with wide variation among hospitals. Factors independently associated with death

included older age, male sex, higher body mass index, [coronary artery disease](#), active cancer, and the presence of low oxygen levels, liver dysfunction, and kidney dysfunction at the time of ICU admission.

Even after adjusting for a variety of risk factors, death rates varied widely across hospitals, from 6 percent to 80 percent. The number of pre-COVID ICU beds in the hospital was strongly associated with death rate. Patients admitted to hospitals with less than 50 ICU beds had a more than three-fold higher risk of death than patients admitted to hospitals with 100 or more ICU beds.

In addition, hospitals varied widely in the proportion of patients who received medications and supportive therapy for COVID-19. During the time period studied, hydroxychloroquine, azithromycin, and anticoagulants were commonly prescribed, and interventions such as prone positioning were also being implemented. But the proportion of patients receiving these measures varied considerably—for instance, the use of prone positioning ranged from 4 percent of patients at one hospital to 80 percent at another.

While the team adjusted for a large number of demographic and severity of illness characteristics, its estimates of differences in death rates across hospitals may be impacted by other confounders, such as the socioeconomic status of patients—a risk factor increasingly recognized as important in health outcomes for COVID-19 patients. The team's models also do not account for varying degrees of strain across hospitals.

"This is the largest nationwide study of patients with COVID-19 admitted to ICUs across geographically diverse sites in the U.S.," said lead author Shruti Gupta, MD, MPH, a physician in the Brigham's Renal Division. "These are the patients with the highest mortality. Our study confirms that certain factors, such as older age and higher BMI, are

associated with an increased risk of death. We also identified several novel risk factors for death, such as treatment at a [hospital](#) with fewer ICU beds. That's one of the most intriguing findings from our work, which, along with many other questions, we'll be pursuing in the future."

More information: Shruti Gupta et al, Factors Associated With Death in Critically Ill Patients With Coronavirus Disease 2019 in the US, *JAMA Internal Medicine* (2020). [DOI: 10.1001/jamainternmed.2020.3596](#)

Provided by Brigham and Women's Hospital

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