UW-Madison School of Medicine and Public Health: Hospital socioeconomic status, strain may increase death rate among ICU patients with COVID-19

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Patient physiological status also a factor impacting mortality

MADISON, Wis. – Researchers at the UW School of Medicine and Public Health used hospital data from patients with COVID-19 admitted to intensive care units across the nation to identify factors linked to higher mortality rates within 28 days of admission.

Researchers found that patients' physiological status as measured by vital signs and laboratory tests, the socioeconomic status of a hospital's patient population and hospital strain are the driving factors behind some hospitals having higher 28-day ICU mortality rates.

The analysis aimed to find ways to improve patient outcomes by better understanding the mix of hospital system and patient characteristics that increase risk of death from COVID-19 among critically ill patients, according to Dr. Matthew Churpek, associate professor of medicine, UW School of Medicine and Public Health, and pulmonary and critical care physician, UW Health.

"For an individual patient critically ill with COVID-19, less than half of their mortality risk can be attributed to their physiology," Churpek said. "This highlights the importance of other factors, such as hospital strain, co-morbidities and

socioeconomic status."

The research analysis led by Churpek was recently published in the *American Journal of Respiratory and Critical Care Medicine*.

Churpek and colleagues analyzed a nationally representative dataset of 4,019 patients with lab-confirmed COVID-19 who were admitted to ICUs at 70 hospitals across the United States between March 4 and June 29, 2020.

Of those 4,019 patients, 1,537, or 38%, had died within 28 days of admission. However, the mortality rate for those patients varied considerably from 0% at the lowest-risk hospital to 82% at the highest-risk hospital.

To better understand the reasons for this wide range, the team assessed 51 patient-level and 29 hospital-level variables.

Patient characteristics included severity of illness and intensity of treatments in the first 48 hours of admission to the ICU, and demographics such as age, sex, race, body mass index and history of smoking.

Hospital characteristics included hospital strain, which was inferred by number of ICU beds dedicated to patients with COVID-19 among other capacity indicators, and hospital quality scores in national ratings for measures of mortality, readmission, safety, timeliness, patient experience and effectiveness.

They also developed a patient-level model to determine the degree to which each characteristic contributed to an individual's risk of death.

The statistical approach allowed researchers to identify the major causes of differences in mortality rates, according to Churpek.

"We found that the biggest determinants were severity of patient condition upon admission to the ICU, followed by the overall socioeconomic status of the population served by each hospital and level of hospital strain," he said. "These findings suggest that COVID-19 may be exacerbating existing healthcare disparities in the United States."

The researchers plan to study whether the importance of socioeconomic status relates to an individual's status or to other not-yet-identified characteristics about a hospital, Churpek said.

“Ultimately, our hope is that by identifying the drivers of mortality variation, we can discover new ways to reduce it and improve outcomes for critically ill patients with COVID-19,” he said.

Churpek is available for interviews today, and a recorded interview is available as well.