Identifying risk severity and long-term effects of COVID-19

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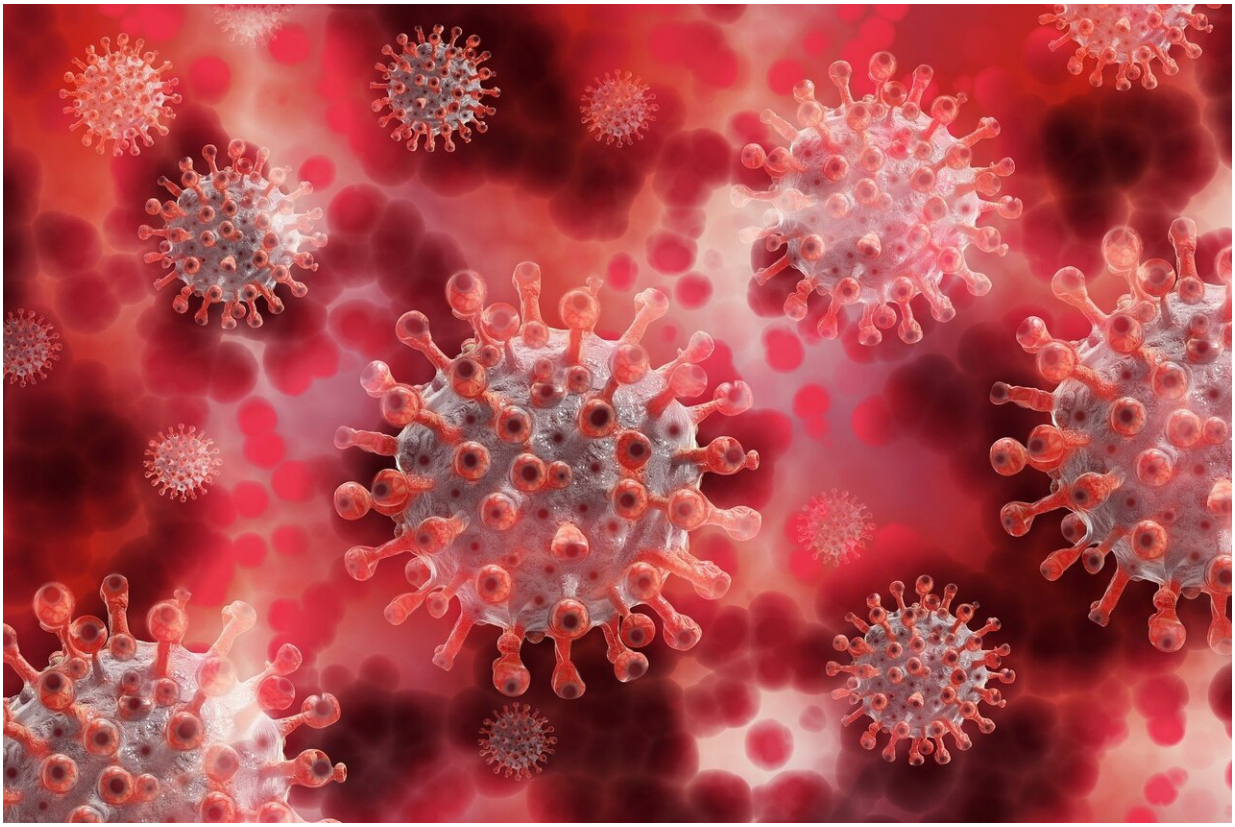

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As COVID-19 hospitalizations reach another pandemic level in a fourth surge more than 18 months after the virus took hold of our lives, two newly published Houston Methodist studies leveraged data from what

we've experienced thus far to reveal more clues about COVID's risk factors and consequences.

In the first study, lead author Edward A. Graviss, Ph.D., M.P.H., F.I.D.S.A., an Associate Professor of Pathology and Genomic Medicine with the Houston Methodist Research Institute, and his team investigated demographic and clinical risk factors for severe disease in hospitalized young adult COVID-19 patients age 18-29 years across Houston Methodist's system of seven hospitals. Their analysis took place from March 1 to December 7, during the first three COVID-19 surges in 2020. They also looked at readmission rates and accompanying severe disease diagnoses within 30 days after these patients were discharged from the hospital.

With patients well-distributed among Houston Methodist's eight hospitals across the greater Houston area, the 1,853 young adult patients were 20% non-Hispanic white, 32% non-Hispanic Black and 43% Hispanic or Latino. Women made up 62% of patients, with 12% being pregnant. While these patients were relatively healthy, 68% were overweight or obese. The most common comorbidities among the patients were asthma, mental health disorders, hypertension and diabetes. While all patients had COVID-positive PCR tests and were potentially infectious at some point during their diagnostic encounter, only 43% reported COVID-19 symptoms at admission.

Hispanic men were more likely to develop severe disease outcomes, and increasing age, asthma history, congestive heart failure, cerebrovascular disease and diabetes were predictive of severe disease diagnoses within 30 days of initial hospitalization. Hispanic ethnicity, non-Hispanic Black race, obesity, asthma and myocardial infarction history, and household exposure were predictive of hospital readmission after 30 days.

Relatively few young adult patients received respiratory interventions,

such as ventilator support, during their initial diagnostic encounter, with 11% receiving supplemental oxygen and 3% requiring intensive care. While 96% of the patients were discharged home from their initial hospitalization, 15% of them returned to the hospital within 30 days. Of the inpatient admissions, four patients (1%) died during their initial hospitalization and four more died after being discharged to another institution.

Overall, within 30 days of their first encounter, 17% of patients were diagnosed with pneumonia and 8% were diagnosed with at least one additional critical diagnoses, such as sepsis, myocardial infarction, cerebrovascular event, cardiac arrest, pulmonary embolism, thrombosis, acute respiratory distress syndrome (ARDS) and the like, to be classified as having severe COVID-19 disease.

The authors say the study demonstrates a significant risk of severe disease and readmission among young adults, especially those in marginalized communities and in individuals with comorbidities. They emphasize a need for more COVID-19 awareness and prevention among young adults and continued investigation of risk factors for severe disease, readmission and long-term consequences of COVID-19.

Collaborators in the Houston Methodist Research Institute working with Dr. Graviss on this study were Micaela Sandoval and Duc T. Nguyen with the Department of Pathology and Genomic Medicine and Farhaan S. Vahidy with the Center for Outcomes Research.

The findings of this peer-reviewed retrospective cohort study are described in a paper titled "Risk factors for severity of COVID-19 in hospital patients age 18–29 years," in *PLoS One*, a multidisciplinary journal published by the *Public Library of Science*, which is a nonprofit open-access publisher and advocacy organization dedicated to accelerating progress in science and medicine.

In the second study, lead author Sonia Villapol, Ph.D., an Assistant Professor of Neurosurgery at the Center for Neuroregeneration at Houston Methodist, and her collaborators detected more than 50 long-term effects of COVID-19 among the 47,910 patients included in the analysis. Topping the list, the most common of these lingering symptoms, which range from mild to debilitating and last weeks to months after initial recovery, are fatigue at 58%, followed by headache (44%), attention disorder (27%), hair loss (25%), shortness of breath (24%), loss of taste (23%) and loss of smell (21%).

Other symptoms were related to lung disease, such as cough, chest discomfort, reduced pulmonary diffusing capacity, sleep apnea and pulmonary fibrosis; cardiovascular issues, such as arrhythmias and myocarditis; and unspecific problems, such as tinnitus and night sweats. The researchers were surprised to also find a prevalence of neurological symptoms, such as dementia, depression, anxiety and obsessive-compulsive disorders.

To assess these long-term effects of COVID-19, the research team identified a total of 18,251 publications, of which 15 met the inclusion criteria for their study. The peer-reviewed studies they analyzed were conducted in the U.S., Europe, UK, Australia, China, Egypt and Mexico and consisted of data published before 2021, following patient cohorts ranging from 102 to 44,799 adults age 17-87 years.

The studies collected information from self-reported patient surveys, medical records and clinical evaluation, with post-COVID follow-up time ranging from 14 to 110 days. Patients hospitalized for COVID-19 made up 40% of the studies with the rest following a mix of mild, moderate and severe COVID-19 patients.

The research team performed a systematic review and meta-analysis of these studies to estimate the prevalence of all the symptoms, signs or

abnormal laboratory parameters extending beyond the acute phase of COVID-19. They measured several biomarkers, including abnormal chest X-ray or CT scan, blood clot risk, presence of inflammation, anemia, and indicators of possible heart failure, bacterial infection and lung damage. They found 80% of recovered adults had at least one long-term symptom lasting weeks to months after acute infection with mild, moderate or severe COVID-19.

In total, the team identified 55 persistent symptoms, signs and abnormal laboratory results, with most of the lingering effects similar to the symptomatology developed during the acute phase of COVID-19. Identifying these same persistent effects across several countries, the researchers say their study confirms the burden of Long COVID is substantial and stress the urgency of recognizing these chronic complications, clearly communicating them to the community and defining therapeutic strategies to avoid long-term consequences from COVID-19. The next phase of their research will focus on determining what makes some individuals more susceptible to Long COVID.

Collaborating with Villapol on this study were Sandra Lopez-Leon with Novartis Pharmaceuticals, Talia Wegman-Ostrosky with Instituto Nacional de Cancerología in Mexico, Carol Perelman with National Autonomous University of Mexico, Rosalinda Sepulveda with Harvard T.H. Chan School of Public Health, Paulina A. Rebolledo with Emory University and Angelica Cuapio with Karolinska Institutet.

First reported as a preprint in medRxiv, the now peer-reviewed study, titled "More than 50 long-term effects of COVID-19: a systematic review and meta-analysis," recently appeared in *Scientific Reports*.

More information: Micaela Sandoval et al, Risk factors for severity of COVID-19 in hospital patients age 18–29 years, *PLOS ONE* (2021). DOI: 10.1371/journal.pone.0255544

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Lopez-Leon, S. et al. More than 50 long-term effects of COVID-19: a systematic review and meta-analysis. *Sci Rep* (2021). DOI: 10.1038/s41598-021-95565-8

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