Risk score predicts prognosis of outpatients with COVID-19

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A new artificial intelligence-based score considers multiple factors to predict the prognosis of individual patients with COVID-19 seen at urgent care clinics or emergency departments. The tool, which was created by investigators at Massachusetts General Hospital (MGH), can be used to rapidly and automatically determine which patients are most likely to develop complications and need to be hospitalized.

The impetus for the study began early during the U.S. epidemic when Massachusetts experienced frequent urgent care visits and hospital admissions. While working as an infectious diseases physician and as part of the MGH Biothreats team, Gregory Robbins, MD, recognized the need for a more sophisticated method to identify outpatients at greatest risk for experiencing negative outcomes.

As described in The Journal of Infectious Diseases, a team of experts in neurology, infectious disease, critical care, radiology, pathology, emergency medicine and machine learning designed the COVID-19 Acuity Score (CoVA) based on input from information on 9,381 adult outpatients seen in MGH's respiratory illness clinics and emergency department between March 7 and May 2, 2020. "The large sample size helped ensure that the machine learning model was able to learn which of the many different pieces of data available allow reliable predictions about the course of COVID-19 infection," said M. Brandon Westover, MD, Ph.D., an investigator in the Department of Neurology and director of Data Science at the MGH McCance Center for Brain Health. Westover is one of three co-senior authors of the study, along with Robbins and Shibani Mukerji, MD, Ph.D., associate director of MGH's Neuro-Infectious Diseases Unit.

CoVA was then tested in another 2,205 patients seen between May 3 and May 14. "Testing the model prospectively helped us to verify that the CoVA score actually works when it sees 'new' patients, in the real world," said first author Haoqi Sun, Ph.D., an investigator in the Department of Neurology and a research faculty member in the MGH Clinical Data Animation Center (CDAC). In this prospective validation group, 26.1 percent, 6.3 percent and 0.5 percent of patients experienced hospitalization, critical illness or death, respectively, within seven days. CoVA demonstrated excellent performance in predicting which patients would fall into these categories.

Among 30 predictors—which included demographics like age and gender, COVID-19 testing status, vital signs, medical history and chest X-ray results (when available)—the top five were age, diastolic blood pressure, blood oxygen saturation, COVID-19 testing status and respiratory rate.

"While several other groups have developed risk scores for complications of COVID-19, ours is unique in being based on such a large patient sample, being prospectively validated, and in being specifically designed for use in the outpatient setting, rather than for patients who are already hospitalized," Mukerji said. "CoVA is designed so that automated scoring could be incorporated into electronic medical record systems. We hope that it

will be useful in case of future COVID-19 surges, when rapid clinical assessments may be critical."

More information: Haoqi Sun et al, CoVA: An Acuity Score for Outpatient Screening that Predicts COVID-19 Prognosis, *The Journal of Infectious Diseases* (2020). DOI: 10.1093/infdis/jiaa663

Provided by Massachusetts General Hospital

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