

Electronic health records can be valuable predictor of those likeliest to die from COVID

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Medical histories of patients collected and stored in electronic health records (EHR) can be rapidly leveraged to predict the probability of death from COVID-19, information that could prove valuable in managing limited therapeutic and preventive resources to combat the devastating virus, researchers from Massachusetts General Hospital (MGH) have found. In a study published in *npj Digital Medicine*, the team described how artificial intelligence (AI) technology enabled it to identify factors such as age, history of pneumonia, gender, race and comorbidities like diabetes and cancer as predictors of poor outcomes in COVID-19 patients.

"By combining [computational methods](#) and clinical expertise, we developed a set of models to forecast the most severe COVID-19 outcomes based on past medical records, and to help understand the differences in risk factors across age groups," says co-lead author Hossein Estiri, Ph.D., an investigator in the Laboratory of Computer Science at MGH and an assistant

professor of Medicine at Harvard Medical School (HMS). "Many prior studies have isolated small subsets of EHR data from after the infection, but ours is the first and largest to use entire historical medical records to try to untangle the role of age as the most important risk factor for COVID adverse outcomes."

The analytics/medical team drew on the COVID-19 "datamart" that had been created by hospital system Mass General Brigham for research, a repository of frequently refreshed longitudinal data on COVID-19 patients from across the system. Using electronic medical records from more than 16,000 such patients, the MGH team applied a computational algorithm—with a human expert in the loop—to identify 46 clinical conditions representing potential [risk factors](#) for death after a COVID-19 infection. "Despite relying on only previously documented demographics and comorbidities, our models demonstrated performance comparable to more complex prognostic models requiring an assortment of symptoms, laboratory values and images gathered at the time of diagnosis or during the course of the illness," notes Zachary Strasser, MD, co-lead author and postdoctoral fellow at MGH.

The MGH study found age to be the most important predictor of mortality in COVID-19 patients. A history of pneumonia was also identified by the study as a significant risk factor, as were histories of diabetes with complications, and cancer (particularly breast and prostate) among COVID-19 patients between the ages of 45 and 65. In patients between 65 and 85, diseases affecting the pulmonary system—including interstitial lung disorders, [chronic obstructive pulmonary disease](#) (COPD), lung cancer, and a history of smoking—were strong predictors of poor outcomes. Comorbidities registering the highest odds ratios for

death irrespective of age were [chronic kidney disease](#), [heart failure](#), [abdominal aortic aneurysm](#), hypertension and aortic valve disease.

As for gender, the study found females to be at lower risk of death from COVID-19. Even after adjusting for age and chronic diseases, the researchers learned that women benefited from an unknown form of underlying protection against the worst outcome of the viral infection. In their overall model, researchers did not find evidence that a certain race or ethnicity altered the odds of mortality after contracting COVID-19. They did find in the oldest cohort of patients, however, that being African American was associated with a higher chance of mortality.

The sheer volume of EHR information and its marriage to predictive analytics becomes particularly important during a pandemic when access to large-scale, clinical trial grade data is not practical, emphasizes Shawn Murphy, MD, Ph.D., senior author and chief research informatics officer at Mass General Brigham. "The ability to quickly utilize data that has already been collected across the country to compute individual-level risk scores," he says, "is crucial for effectively allocating and distributing resources, including prioritizing vaccination among the general population."

Provided by Massachusetts General Hospital

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