

Machine learning tool gives early warning of cardiac issues in COVID-19 patients

January 14 2021, by Doug Donovan



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A team of Johns Hopkins University biomedical engineers and heart specialists have developed an algorithm that warns doctors several hours before hospitalized COVID-19 patients experience cardiac arrest or

blood clots.

The COVID-HEART predictor can forecast cardiac arrest in COVID-19 patients with a median early warning time of 18 hours and predict blood clots three days in advance. It was developed with data from 2,178 patients treated at the five hospitals in the Johns Hopkins Health System between March 1 and Sept. 27.

"It's an early warning system to predict in real time these two outcomes in hospitalized COVID patients," said senior author Natalia Trayanova, a professor of biomedical engineering and a professor of medicine. "The continuously updating predictor can help hospitals allocate the appropriate resources and proper interventions to attain the best outcomes for patients."

The paper is posted online on the pre-print website called *MedRxiv* where scientists throughout the pandemic have been sharing urgent research related to COVID-19. Trayanova's lab began the research in April with one of the first grants awarded from the National Science Foundation's Rapid Response Research effort.

Julie K. Shade, lead author and a doctoral student in the Department of Biomedical Engineering, built the machine-learning algorithm with more than 100 clinical data points, demographic information, and laboratory results obtained from the JH-CROWN registry that Johns Hopkins established to collect COVID-19 data from every patient in the hospital system. She added other variables that she found reported by doctors on Twitter and from other pre-print papers.

"Throughout the summer I would see anecdotal reports on Twitter or in pre-prints of certain cardiovascular variables in COVID patients that doctors had found that might be significant and I would add them into the model," Shade said. "It very much evolved as we learned about

COVID. We didn't know everything that would be important because it's such a new disease."

For example, the team did not anticipate that electrocardiogram data would play a critical role in the prediction of blood clotting. But once it was added, ECG data became one of the most accurate indicators for the condition, Trayanova said

The next step for the researchers is to develop the best method for setting up the technology in hospitals to aid with the care of COVID-19 patients.

"The COVID-HEART predictor tool could help in the rapid triage of COVID-19 patients in the clinical setting especially when resources are limited," said Allison Hays, associate professor of medicine in the Johns Hopkins University School of Medicine and the project's clinical collaborator. "This may have implications for the treatment and closer monitoring of COVID-19 patients to help prevent these poor outcomes."

More information: Julie K Shade et al. COVID-HEART: Development and Validation of a Multi-Variable Model for Real-Time Prediction of Cardiovascular Complications in Hospitalized Patients with COVID-19, *MedRxiv* (2021). [DOI: 10.1101/2021.01.03.21249182](https://doi.org/10.1101/2021.01.03.21249182)

Provided by Johns Hopkins University

Citation: Machine learning tool gives early warning of cardiac issues in COVID-19 patients (2021, January 14) retrieved 23 June 2024 from <https://medicalxpress.com/news/2021-01-machine-tool-early-cardiac-issues.html>

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