

New AI test identifies COVID-19 within one hour in emergency departments

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Researchers are working hard to rapidly trial the CURIAL AI as a clinically useful tool for the NHS. Credit: Rawpixel

Infectious disease and clinical machine learning experts at the University of Oxford have developed an Artificial Intelligence test that can rapidly screen for COVID-19 in patients arriving in emergency departments, and a preprint paper has been published on its effectiveness.

The CURIAL AI [test](#) assesses data routinely collected during the first hour in emergency departments, such as blood tests and vital signs, to

determine the chance of a patient testing positive for Coronavirus.

Currently, testing for COVID-19 is by a molecular analysis of a nose and throat swab, called a Polymerase Chain Reaction (PCR). However, this typically has a turnaround time of 12-48 hours and requires specialist equipment and staff.

The new Oxford study has developed AI that gives a near real-time prediction of a patient's COVID-19 status.

The team is led by Dr. Andrew Soltan, an NIHR Academic Clinical Fellow at the John Radcliffe Hospital, joining with the "AI for Healthcare" lab of Professor David Clifton within Oxford's Institute of Biomedical Engineering, and Professor David Eyre of the Oxford Big Data Institute.

The study has been running since March and began by developing machine learning algorithms trained on data from confirmed cases and pre-pandemic controls to detect subtle differences. It was hoped these algorithms would allow the level of risk of having the illness to be determined.

The preprint article explains: "The early clinical course of SARS-CoV-2 infection can be difficult to distinguish from other undifferentiated medical presentations to hospital, however viral specific real-time polymerase chain reaction (RT-PCR) testing has limited sensitivity and can take up to 48 hours for operational reasons.

"In this study, we develop two early-detection models to identify COVID-19 using routinely collected data typically available within one hour (laboratory tests, blood gas and vital signs) during 115,394 emergency presentations and 72,310 admissions to hospital."

Once trained, the algorithms had to be assessed for their accuracy, and the two early-detection models were put to the test in a real hospital setting. The results have now been published in the preprint.

Useful tool for the NHS

Researchers are working hard to rapidly trial the CURIAL AI as a clinically useful tool for the NHS.

Dr. Soltan said that identifying COVID-19 early in a hospital admission is essential for maintaining infection control and delivering timely care to patients.

"Until we have confirmation that patients are negative we must take additional precautions for patients with coronavirus symptoms, which are very common. The CURIAL AI is optimized to quickly give negative results with high confidence, safely excluding COVID-19 at the front door and maintaining flow through the hospital.

"The blood tests patients receive on admission are usually available in one hour, and have a large number of data points that algorithms can use to distinguish COVID-19 from a wide variety of other illnesses. Because of the advanced electronic records systems at Oxford University Hospitals (OUH), we've been able to train our algorithms using rich clinical data from 115,000 visits to A&E.

"When we tested the CURIAL AI on data for all patients coming to OUH's emergency departments in the last week of April and the first week of May, it correctly predicted patients' COVID status more than 90% of the time."

The AI test was validated by applying it to all patients presenting to A&E and admitted across the four OUH [hospital](#) sites between the 20 April

and 6 May.

Results showed that the Emergency Department Model correctly predicted the COVID-19 status of patients 92.3% of the time, across the 3,326 patients coming to A&E in the two week test period, and the Admissions Model was correct 92.5% of the time for the 1,715 patients admitted.

Dr. Soltan continues: "The next steps are to deploy our AI in to the clinical workflow and assess its role in practice.

"A strength of our AI is that it fits within the existing clinical care pathway and works with existing lab equipment. This means scaling it up may be relatively fast and cheap.

"I hope that our AI may help keep patients and staff safer while waiting for results of the swab test."

David Clifton, Professor of Clinical Machine Learning at the Department of Engineering Science, added: "With many of our clinical colleagues working on the front lines to fight COVID-19, data scientists in Healthcare AI have a supporting role to play by constructing tools to help care for patients. The unique ecosystem at Oxford between hospitals and clinical AI teams gives us a great opportunity to contribute to the international effort against Coronavirus.

"This project initiated by clinical collaborator Dr. Andrew Soltan is a great example of what can be done, and at very great pace, to fast-track the development of technologies to help in the current pandemic—and to increase the resilience of the country's healthcare system for any future events."

It is hoped the development of these techniques will also inform clinical

teams in the early stages of future pandemics, and expedite implementation of appropriate public health measures.

More information: Andrew AS Soltan et al. Artificial intelligence driven assessment of routinely collected healthcare data is an effective screening test for COVID-19 in patients presenting to hospital, (2020). [DOI: 10.1101/2020.07.07.20148361](https://doi.org/10.1101/2020.07.07.20148361)

Provided by University of Oxford

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