CRISPR-Based COVID-19 Smartphone Test in Development

A simplified point-of-care assay that turns a smartphone into a fluorescence microscope could expand coronavirus disease 2019 (COVID-19) testing capability, researchers reported in a study in Cell.

The assay, which uses clustered regularly interspaced short palindromic repeats (CRISPR) gene editing technology, emits a fluorescent signal in the presence of the novel coronavirus’s RNA. A smartphone camera can detect this signal directly, without amplification of the viral genome used in most genetic tests. This means the test can quantify the amount of virus in the sample—the quicker the signal is picked up, the higher the viral load.

In the study, the assay was able to detect RNA extracted from patients’ nasal swabs within 5 minutes. Samples with less virus could be detected within 30 minutes. “Monitoring viral loads quantitatively would allow estimation of infection stage and help predict infectivity, recovery, and return from quarantine in real time,” the authors wrote.

“We plan on applying for [Emergency Use Authorization] in the next few months,” researcher Melanie Ott, MD, PhD, of the Gladstone Institute of Virology at the University of California, San Francisco, wrote in a January email. A rollout in pharmacies and drop-in clinics is planned first, with an at-home test potentially to follow later. The technique targets different parts of the virus’ genome, which should make it less vulnerable to false-negatives as the pathogen continues to mutate.

For now, the test still requires laboratory equipment and RNA extraction. “In the future, our next assay will cut out the need for laboratory in a single-step assay,” Ott wrote. The research team also includes Jennifer Doudna, PhD, who shares a Nobel Prize in chemistry for developing CRISPR-based gene editing.

Predicting COVID-19 Outcomes in Emergency Department Patients

A new artificial intelligence algorithm uses chest x-ray severity scores and clinical variables collected during emergency department (ED) visits to predict whether patients with coronavirus disease 2019 (COVID-19) will be intubated or will die. If further validated in larger studies with additional patient populations, the proof-of-concept model, described in Radiology: Artificial Intelligence, could be used to appropriately triage ED patients before they become seriously ill with COVID-19.

Researchers at the Icahn School of Medicine at Mount Sinai in New York City trained and validated the algorithm using deidentified electronic health record data from patients with COVID-19 who were treated at 3 Mount Sinai Health System EDs in the Brooklyn, Manhattan, and Queens boroughs over 2 weeks last March. The training and validation data comprised outcomes, x-rays with radiologist-assigned severity scores, blood pressure readings, and blood work like creatinine, D-dimer, and troponin levels from 338 patients aged 21 to 50 years.

The algorithm learned how to assign severity scores to x-rays. The researchers then tested the model’s ability to predict outcomes for 161 different patients with COVID-19 seen at the EDs the following week in March. Two-thirds of this group were older than 50 years. Overall, the approach predicted intubations with 86% accuracy and deaths with 82% accuracy, but it performed better for younger patients.

“The algorithm can help clinicians anticipate acute worsening (decompensation) of patients, even those who present without any symptoms, to make sure resources are appropriately allocated,” Fred Kwon, PhD, the study’s lead author, said in a statement. The chest x-ray severity scores alone could be useful. “We are working to incorporate this algorithm-generated severity score into the clinical workflow to inform treatment decisions and flag high-risk patients in the future,” Kwon said.

Phone Apps and WearableTrackers Modestly Improve Activity

Smartphone fitness applications and wearable activity trackers seem to have a small to moderate positive effect on physical activity, a systematic review and meta-analysis of randomized trials found. The improvements, reported in the British Journal of Sports Medicine, corresponded to an additional 1850 steps per day.

The review is the first to focus on healthy adults using contemporary technology like fitness wristbands and smartwatches with automated and continuous self-monitoring and feedback, the authors said. The analysis included 28 studies that involved 7454 participants aged 18 to 65 years with no chronic health conditions, 28% of whom were women. The studies were published between January 2007 and January 2020 and tested interventions that lasted an average of 13 weeks. Most of the interventions used a fitness tracker with or without an app.

Apps and trackers with text message prompts and features allowing for personalization were significantly more effective than those without these elements. Participant retention in studies was also associated with effectiveness.

“Given the wide and increasing reach of smartphones, even modest improvements in physical activity can produce large effects at the population level,” the authors wrote. They suggested that clinicians could prescribe the use of smartphone apps or activity trackers to extend their benefits beyond the “worried well” early adopters.” — Jennifer Abbasi

Note: Source references are available through embedded hyperlinks in the article text online.