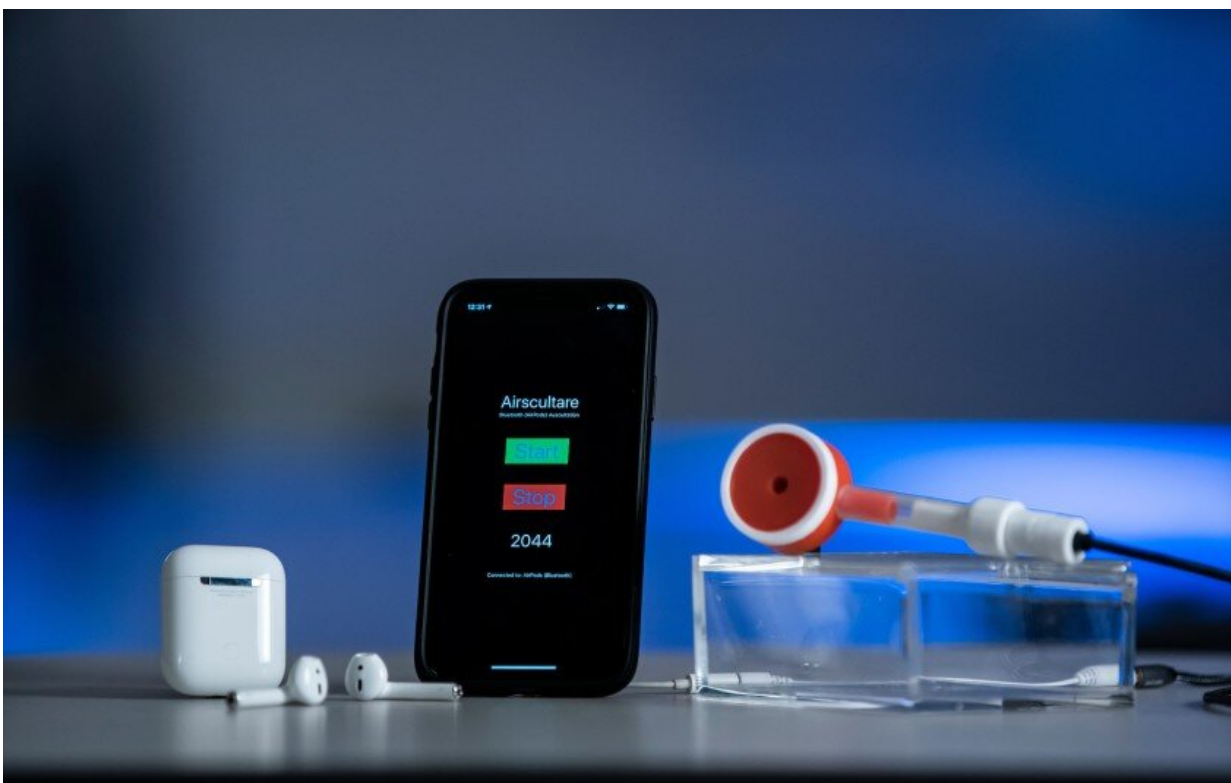


Researchers design bluetooth stethoscope with a 50-foot range to help healthcare practitioners stay safe

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Components of the digital stethoscope developed at BYU. Credit: Nate Edwards

The COVID-19 pandemic has posed a serious issue for doctors and nurses assessing a patient's heart and lungs with a traditional stethoscope.

Many healthcare practitioners have found it difficult to position the [stethoscope](#) correctly around their face masks. These assessments also require practitioners to be very close to the patient, heightening the risk of contracting and spreading the virus.

To protect both patients and practitioners, BYU nursing and technology professors collaborated to design a digital, 3-D-printed stethoscope that makes it possible to listen to the heart and lungs of their patients while standing up to 50 feet away.

The digital stethoscope connects directly to a phone and then transmits the sounds from the patient's lungs to Bluetooth earbuds. The 3-D-printed design and an added microphone makes it possible to connect to a smartphone and let [healthcare workers](#) listen remotely and digitally.

Craig Nuttall, an emergency nurse practitioner and professor in BYU's College of Nursing, has been using his 3-D-printed stethoscope on COVID-19 patients over the past month.

"I give the stethoscope to the patient and they can put it on their chest as I direct them in the appropriate areas that I need to listen to," Nuttall said. "I can stand at a [safe distance](#) wearing little AirPods underneath my face shield and hear everything I need to hear."

The device works just as well as other expensive stethoscopes on the market while being only a fraction of the cost.

"COVID-19 affects the lungs," Nuttall said. "If we aren't able to fully assess the lungs, we really don't know everything that is going on with the patient, and we may delay lifesaving treatment."

Chia-Chi Teng, a professor of information technology and cybersecurity at BYU, realized that the way to make stethoscopes more accessible and

less expensive was through 3-D printing. He helped develop the 3-D printed parts to form a functional, digital stethoscope that costs less than \$20 to make.

Nuttall and Teng also developed an app to help connect the sound from the stethoscope to the earbuds via Bluetooth on both iOS and Android.

"When we developed this digital stethoscope, we weren't designing it with the Coronavirus scenario in mind, but it turns out to be a perfect application," Teng said.

Both professors have been working for more than a year to improve access to healthcare in remote villages and developing countries. The engineering challenge was to create a low cost, accessible and easy to assemble digital stethoscope that could be used in any area around the world.

"With this digital stethoscope we can have a low cost, non-fragile device that can be put in the hands of patients," Teng said. "Then, through a phone, healthcare practitioners can hear the patient's heart or [lung](#) sounds streaming real time through Bluetooth."

Nuttall and Teng have made the plans for this stethoscope [open source](#) to help protect as many healthcare providers and patients as they can.

Instructions on how to build the 3-D printed digital stethoscope can be found at github.com/ccteng/Stethogram. The accompanying Stethogram iOS app is available at testflight.apple.com/join/yx0PVjsa.

Provided by Brigham Young University

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