Raise hand for early Covid-19 detection

Researchers and technology firms around the world are working on tech wearables that can monitor and detect the coronavirus even before symptoms surface

Trevor Tan

Using wearables for Covid-19 contact tracing has been in the news, with 10,000 seniors here given the first batch of the Trace-Together token earlier this month.

However, researchers and technology companies around the world, including those in Singapore, are finding another related application for wearables, or wearable technology devices – to monitor and detect Covid-19, including at an early stage before its symptoms surface.

Finland-based smart-ring maker Oura grabbed headlines last month when the National Basketball Association (NBA) in the United States said it would provide NBA players and staff with Oura's smart rings for the restart of the season, which will begin at the end of the month.

Researchers from the West Virginia University Rockefeller Neuroscience Institute said in April that the Oura ring has been successful in recognising Covid-19 symptoms up to three days in advance with 90 per cent accuracy.

Fitness wearables firms Garmin and Fitbit recently announced efforts to harness the data collected by their smartwatches and fitness trackers to detect Covid-19.

Meanwhile, the efforts in Singapore have so far been focused on in-house instead of off-the-shelf wearables.

Home-grown medical technology start-up Respiree, a spin-off from the Agency for Science, Technology and Research (A*Star), has been working with the National University Hospital (NUH) and National University of Singapore Yong Loo Lin School of Medicine (NUS Medicine) since March to develop predictive models using respiratory rate and breathing variability, to detect clinical deterioration in patients suffering from acute respiratory failure and pneumonia. The aim: to deploy respiratory bio-markers to predict worsening conditions in Covid-19 patients in isolation rooms.

For the hospital trials, the Respiree solution uses two wearables, one attached to the chest and the other clipped over a finger, to measure vital parameters such as respiratory rate, breathing-pattern variability and pulse oximetry or blood oxygen level. The data from patients in isolated rooms are sent wirelessly to a unified dashboard in real time every five minutes.

NUS Medicine associate professor Lee Pyng, who is also a senior consultant in NUH's respiratory and critical care medicine division, says the algorithms that detect clinical deterioration incorporate depth of breathing – which is not a parameter the hospital routinely measures – as well as respiratory rate to improve the sensitivity of detection. She says that in this instance, manual monitoring of respiratory and pulse rates "is not accurate" as healthcare workers take measurements every four hours compared with the wearables' continuous measurement.

She says the ability to identify Covid-19 patients at risk of clinical deterioration ahead of time will aid physicians in the correct siting of care for these patients, such as intensive care or high dependency units for closer monitoring, as well as the administration of therapies in a timely fashion, which can save lives.

Dr Gurpreet Singh, founder of Respiree and senior research fellow at A*Star's Singapore Bioimaging Consortium, adds that in addition, nurses can now monitor patient vitals without needing to enter isolated rooms, thus mitigating their risk of infection and saving on personal protective gear.

Respiree has received approval from the Health Sciences Authority for the use of its devices in Singapore and is in the process of securing approval from the US Food and Drug Administration to commercialise its product globally.

Home-grown smart wearables firm KaHa is also using in-house wearables, in the form of wrist bands, to monitor patients remotely and continuously, without the need for a caregiver to be in close contact.

The solution uses machine-learning algorithms that process large and continuous data sets such as body temperature, heart rate, blood pressure, sleep levels and blood oxygen levels (SpO2), says KaHa's founder and chief executive officer Pawan Gandhi.

KaHa's wrist bands can be used pre- and post-hospitalisation to provide vital health data outside of hospital premises for preventive care. The company's wearables and solutions have been deployed for back-to-work and back-to-school initiatives in Switzerland, the US, India and Singapore, says Mr Gandhi.

"Moving forward, we plan to take this to end users in a few countries for faster and easier access," he says.

IMPACT OF CONSUMER WEARABLES

While bespoke wearables can be important tools to detect Covid-19, it might be off-the-shelf wearables that could make a larger impact on a broad scale.

Ms Aliyah Farouk, medical device analyst at data analytics and consulting firm GlobalData, says data collected from such wearable devices can be used to detect early signs of Covid-19 cases.

"This can drastically improve the pandemic public health response as the wearable devices can notify users of potential Covid-19 exposure, help users follow social distancing requirements, enhance remote patient monitoring, detect general patterns and identify geographical hot spots," she says.

Mr Kenneth Liew, associate research director at research firm IDC Asia Pacific, says the key advantage of using consumer-grade wearables is that it is easier to get mass adoption. "The platforms of these wearables are also generally more established than those that are newly built," he says.

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> **MS ALIYAH FAROUK,** medical device analyst at data analytics and consulting firm GlobalData, on data collected from wearable devices being used to detect early signs of Covid-19 cases.

ILLUSTRATION: ISTOCKPHOTO

Round-the-clock data collection

Fitbit announced in April its collaboration with Scripps Research Translational Institute and Stanford Medicine in using Fitbit data to help detect, track and contain infectious diseases like Covid-19.

Dr Eric Topol, director and founder of Scripps Research Translational Institute, said in a statement that "from our previously published work, we know that data collected from consumer wearables can significantly improve the prediction of influenza-like illness".

The Stanford Healthcare Innovation Lab launched its Covid-19 wearables study in April to establish whether data collected from wearables, including those from Apple, Samsung, Fitbit, Oura and Garmin, can be used to predict the onset of an infectious disease such as Covid-19 before the symptoms start. The study is looking for volunteers in the US.

Last month, Garmin announced that it is partnering non-profit organisation PhysioQ to provide data for Covid-19 research.

On an opt-in basis, Garmin smartwatch users worldwide can choose to share their tracked health statistics, such as heart rate and SpO2, with PhysioQ's app called Neo, which will help researchers identify trends helpful in the larger fight against Covid-19.

Data from PhysioQ has been used by researchers in top US medical institutions, including Harvard University, Berkeley University, Boston University, McGill University and Massachusetts General Hospital Research Institute.

Dr Andrew Ahn, assistant professor of medicine and radiology at Harvard Medical School, says: "Many diseases, not just Covid-19, are asymptomatic, especially in the beginning stages. This would mean potential patients don't know they have the disease or the precursor to the disease. However, wearable metrics can help to find many of these issues."

Dr Ahn adds that the research on Covid-19 is concentrated on hospitalised patients and little is known about cases outside of the hospital. "There may also be unfortunate cases where individuals suffer an untimely death due to Covid-19 without reaching the hospital. As a result, data collected in hospitals is controlled and usually cleaner, but also skewed," he says.

On the other hand, wearables allow round-the-clock data collection, giving researchers a window into one's health and habits, he says.

However, access and cost will be issues in using consumer wearables in fighting Covid-19.

"The geriatric population – the group most affected by Covid-19 – are typically less experienced with technology. Furthermore, the high cost of some wearables devices may deter consumers from buying them," says Ms Farouk.

Another concern is privacy. "As wearables often collect data using cloud storage systems, they can be vulnerable to cyberattack," she warns.

Public relations associate Tabitha Ong, 25, who uses a Garmin smartwatch, believes the advantages outweigh the concerns.

"Honestly, there is a part of me that is worried about what my data will be used for and if it will be safe. But if contributing my data will help in Covid-19 research and the greater good, I don't see why I should not contribute," she says.

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Home-grown medical start-up Respiree's wearables – one attached to the chest (left) and the other clipped over a finger – are on hospital trials to measure patients' vital parameters such as respiratory rate, breathing-pattern variability and pulse oximetry or blood oxygen level. PHOTO: RESPIREE