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Letter to the Editor

Use of wearable technology to enhance response to the Coronavirus (COVID-19) pandemic

Introduction

In December 2019, an outbreak of pneumonia of unknown origin was detected in China and quickly determined to be caused by novel coronavirus – severe acute respiratory syndrome - Coronavirus-2 (SARS-CoV-2). With highly infectious properties, the outbreak was declared a global pandemic by the World Health Organization on March 11, 2020.

Combating the spread of the virus has been a global challenge. On the positive side, access to unprecedented technology and widespread communication networks are helping to enhance global response. From Australia to Israel, more than 30 countries have implemented systems for population surveillance and contact tracing, mostly in the form of smartphone apps.

In recent years, wearable sensors have become popular in many applications. These are electronic devices, worn on the body, containing sensors which log information on physiological parameters and user interaction with the environment. In 2017, in the U.S. alone, 17% of adults used a wearable device.[1]

With advances in technology, there is now an opportunity to benefit from data collected from wearable devices at a population level. The Internet of Things (IoT) is a grid of interconnected devices, machines, objects or people with unique identifiers (UIDs) that transfer data over a network. IoT can facilitate extrapolation of associations, patterns and trends within extremely large data sets to provide near real-time insights to ensure a data-driven, informed response to the pandemic.

Such wearables can offer a centralised solution for simultaneously tracking Coronavirus (COVID-19) data and digital diagnostics at both individual and population levels. In this instance, we propose a customized biometric bracelet with a wireless communication circuit and a subscriber identity module that has three built-in features: (1) an infrared thermometer, (2) a global positioning system (GPS) and (3) a radio-frequency identification (RFID) with an UID number. The bracelet would use the IoT to transfer data over a network to an interactive web-based dashboard that tracks COVID-19 in real-time. Wearing the bracelet would be recommended within a predefined geographic area. Big data analytics could then provide a centralised bird's eye perspective of emerging trends and patterns to enhance response and containment.

Infrared thermometer for early screening on a population level

The need for early screening at a population level has been one of the main challenges of the pandemic. With fever being one of the most common presenting symptoms (43.8% upon hospital admission, 88.7% during hospitalisation),[2] many countries have used devices such as 'temperature guns' to measure fever as a barrier of entry into public places. Still, tracking fever mostly requires people to self-report and actively seek medical care, leaving numerous cases unreported. As fever is easy to gauge objectively, a biometric bracelet could continuously measure fluctuations in temperature using an integrated infrared sensor. Thus, if a person has a fever, they could automatically be contacted by a healthcare professional, screened or tested for SARS-CoV-2, as required.

If an individual then tested positive for SARS-CoV-2, the database could automatically trace back anyone they had come in contact within the past 14 days using a GPS feature (described in the following paragraphs). Potential carriers could then self-isolate, be tested and treated as required.

GPS for contact tracing of infection chains

Contact tracing plays an important role in the control of emerging infectious diseases and has been used successfully to mitigate the spread of numerous past outbreaks including smallpox and severe acute respiratory syndrome (SARS).[3]

In this instance, the biometric bracelet's GPS feature would continuously track movements of individuals within a geographical area and communicate back to the COVID-19 database platform saving input on the population whereabouts at each time point. The database could then use advanced data analytics to extract a list of other people that were within a predefined distance of an infected individual at a certain day and time.

The bracelet could also send an alert using a beeping sound or vibration to people at risk of having been in contact with a confirmed positive case.

RFID for tracking immunity status

To date, only incomplete information is available on the host innate immune status of SARS-CoV-2–infected patients. Based on published research on other coronaviruses, some form of active immunity can be expected.[4] The global race to develop and approve accurate, widespread antibody tests for SARS-CoV-2 is well on its way. Although several practical questions remain due to an incomplete understanding of how the virus triggers immune recognition and neutralisation.[5]

As more people are infected, most are likely to generate an immune response. This may lead to a need for a community-wide immunity status classification, for example: (1) previously infected,

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now immune, non-infectious, (2) currently infected and (3) immunologically naïve, still susceptible to infection. In time, we may see different sets of restrictions/privileges for people with different immune statuses.

Importantly, as more people recover, we need to consider how to best use people with active immunity to reignite our economy, restore critical facilities and provide much needed relief to workers in health care and essential services. But how will we know an individual's immune status in real-time?

RFID within a biometric bracelet could be the solution. The bracelet would have a unique personal ID and be configured to communicate with a second device – either handheld or free-standing. The second device can be located at the entrance to hospitals, public facilities, parks, grocery shops and workplaces. A quick scan of the bracelet could retrieve an individual's health status instantaneously displaying a ‘clear’ or ‘block’ signal to the device. Possible status codes could be colour coded or show classifications such as ‘currently sick’, ‘recovered’, ‘in quarantine’ or ‘unknown’.

Population health vs privacy

Logically, any government-sanctioned surveillance programme raises privacy concerns regarding data security, potential leaks and hacks, access to private companies and more. However, during an extraordinary crisis, many governments are willing to decrease privacy restrictions to save lives.

Many countries already have privacy laws in place to govern the regulation, storing and use of personally identifiable information, healthcare and financial information. As the coronavirus pandemic continues to spread, some privacy commissioners are lifting data restrictions for health officials to keep track of the outbreak. For example, in March, Israel passed an emergency law to use mobile phone data for contact tracing.[6]

Beyond protecting private data, a crucial role of government is to coordinate public health efforts to suppress and mitigate the pandemic. As the world braces for the next phase of the pandemic, why not leverage existing technology to design a centralised solution, a one-stop shop to undertake three major tasks for enhancing a unified response to SARS-CoV-2.

Author statements

Author contributions

All authors listed have made a substantial, direct and intellectual contribution to the work and approved it for publication.

Ethical approval

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Competing interests

None declared.

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