

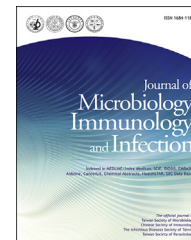


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Continuous temperature monitoring by a wearable device for early detection of febrile events in the SARS-CoV-2 outbreak in Taiwan, 2020



KEYWORDS

COVID-19;
Thermal screening;
Wearable device;
HEARThermo

The recent ongoing outbreak of coronavirus disease 2019 (COVID-19)¹ was declared as a public health emergency of international concern and pandemic by the World Health Organization. The outbreak of COVID-19 at least involved 181 regions/countries and 896,450 confirmed cases as of April 2nd, 2020 and 45,526 deaths to date.² As of April 3rd, there were 339 confirmed cases (included 5 death) in Taiwan. Taiwan focus concurrently on containing spread of

this virus in the communities, including 827 people in isolation and over 64,000 in quarantine.

Thermal screening for all visitors at the entrance of hospital buildings has become a standard protocol in Taiwan to response since the SARS epidemic.³ Among patients with pneumonia caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), fever was a common symptom, 47.4%–100%.^{1,4} Body temperature measurements once daily for healthcare workers and twice daily for people in isolation or quarantine are important measures to reduce the risk of cross infections. However, the use of ear or forehead thermometers has the risk of close contact.

The HEARThermo, a watch-like wearable device, can measure body surface temperature and heart rate every 10 s with good test-retest reliability and adequate criterion validity.⁵ We provided the HEARThermo to continuously monitor body surface temperature and heart rate to trigger the reminders sent by chatbots. The warning messages

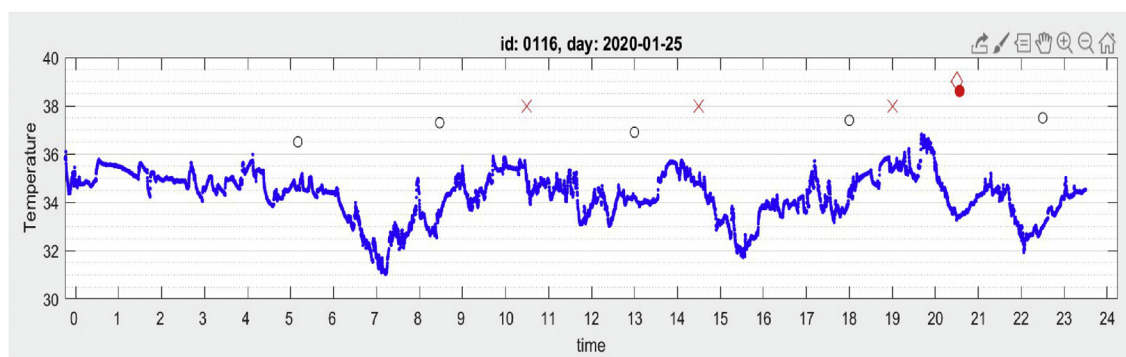


Figure 1. The chatbots sent three pre-warning messages (×), and body temperature was taken by the patient (O) after the receipt of warning message. Surface temperature keep raising at the time of 17:50 and 38.6 °C was noted at 20:34 (◇) by the patient.

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reminded further measurements by ear thermometers. A total of 149 healthcare professionals, 75 suspected/confirmed patients and 63 college students in quarantine wear the HEARThermo. The data efficiency retrieved by the HEARThermo ranged from 33 to 70%, and suspected patients retrieved highest data (70%), followed by healthcare professionals (45%). Only three healthcare professional and nine patients had fever. Body surface temperature of the patient on January 25, 2020 was shown in Fig. 1.

The HEARThermo, as a wearable physiological monitor for remotely monitoring the health status of people under risk of infection, provides real-time data and decision support for healthcare providers and public health agencies. Our data suggest the application of the innovative wearable device in continuous monitoring of body temperature with heart rate variation may be a solution in provision of early detection and point-of-care for suspected cases, in response to the COVID-19 pandemic.

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