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Letter to the Editor

Use of surveillance technology to enhance exposure management for healthcare workers during the COVID-19 pandemic



Sir,

We read with interest the recent article by Wee *et al.* describing the contact tracing processes for a COVID-19 case among their institution's healthcare workers (HCWs), a security guard working in the emergency department's 'fever area', who was picked up by universal screening of all ancillary HCWs [1]. We commend the contact tracing team for their robust epidemiological investigation and contact tracing processes to prevent nosocomial transmission of COVID-19. We wish to add that surveillance technology, such as real-time location systems (RTLS), may be a valuable addition to contact tracing practices [2]. We report our experience on how surveillance technology has facilitated investigations and enhanced exposure management for HCWs suspected of having COVID-19 infection, from our own institution.

Singapore reported its first imported case of COVID-19 on 23rd January 2020, from Wuhan, China [3]. To manage the escalating number of patients presenting with possible COVID-19 infection, an outpatient Screening Centre (SC) was set up at the National Centre for Infectious Diseases (NCID), Singapore. All staff on duty in the NCID SC are required to be in full personal protective equipment (PPE), and all patients are required to wear surgical masks. NCID is also outfitted with RTLS technology [4]. Pre-assigned RTLS tags, using integrated Radio Frequency Identification (RFID) and Wi-Fi technologies to track physical location (by pre-demarcated zones) and proximity to another tag holder (within 2 m), are given to staff and patients. Closed-circuit television (CCTV) cameras have also been installed, mainly for operational and security purposes, but also usable as a visual aide for exposure risk assessment.

In February 2020, a junior physician, deployed to the SC for nine days, was diagnosed with pneumonia and admitted for suspected COVID-19 infection. She reported no epidemiological links to known cases, and was unaware if any patients she had attended to were confirmed to have COVID-19. In addition to interviewing the physician, we extracted data captured through her RTLS tag to objectively determine her contacts over her working duration in the SC. This contact list was cross-checked against the master list of confirmed COVID-19 patients

admitted to our institution. These processes were completed in a few minutes, using tools in Microsoft Excel (2013). We determined that six days earlier, she had been within 2 m of a subsequently confirmed COVID-19 patient, for 9 min. A review of the COVID-19 patient's electronic medical record (EMR) confirmed this encounter.

CCTV footage was reviewed to visualize the encounter, where both parties were wearing PPE and identified using visual clues (shoes and goggles colours, staff's physical build, and assigned table number where the patient was seated). There was only brief physical contact, and no breach in PPE observed, including during the physician's PPE removal process. These suggested that accidental exposure to the patient's droplets/fluids was unlikely. As a precaution, the physician was kept as an inpatient for daily SARS-CoV-2 polymerase chain reaction (PCR) nasopharyngeal swab testing. She discharged well after negative tests for six days.

In March 2020, a porter working at the NCID SC developed febrile respiratory illness and was confirmed to have COVID-19 infection through SARS-CoV-2 PCR swab testing. Activity mapping and contact tracing measures rapidly commenced to determine the possible source of transmission and identify close contacts at risk of COVID-19 transmission. The porter reported no epidemiological links to known cases. Using his RTLS tag data, we determined that he had close contact with two confirmed cases in the preceding two days in the SC, each for under 4 min. However, CCTV footage showed no breach in PPE when in proximity to these cases, and during his PPE removal processes. Overall, nosocomial transmission was thought unlikely, and his infection was attributed to exposure in the community (where there was ongoing transmission). Contact tracing focused on identifying contacts in non-work areas (e.g., the pantry) who would not be in full PPE and have possible unprotected exposure, during the period of potential infectiousness (from two days before symptom onset until the point of isolation). Using RTLS data, we objectively identified 55 staff contacts in total, with seven having prolonged exposure of ≥ 30 min. These seven were given 14 days' leave of absence and closely monitored, while the other 48 were monitored via the institution's staff health surveillance system, including twice-daily temperature monitoring [5]. None of these seven was diagnosed with COVID-19 infection. The porter was admitted to NCID and discharged well without clinical complications.

RTLS enables more effective contact tracing of hospital contacts compared with traditional EMR-based methods [2,4], and can rapidly identify and quantify key interactions among patients and HCWs [6]. Separately, CCTV monitoring can serve as a visual aide for evaluation of HCWs' exposure risk and

compliance with infection control measures [7]. Staff should be assured that such technology is employed for enhancing staff and patient safety.

We recommend that healthcare institutions consider adopting RTLS and CCTV systems to enhance assessment of frontline staff with suspected COVID-19 infection.

Author contributions

H.J.H. designed the study, contributed to data acquisition and interpretation, and drafted the manuscript. W.L. and B.A. contributed to data acquisition and interpretation, and reviewed the manuscript. A.C. designed the study, contributed to data acquisition and interpretation, and critically revised the manuscript. All authors approved the final version of the manuscript.

Conflict of interest statement

All authors declare no conflicts of interest.

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