



Editorial

Estimating Coronavirus Disease 2019 Infection Risk in Health Care Workers

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Coronavirus disease 2019 (COVID-19) due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has been posing a public health threat since early 2020. Pandemic transmission of SARS-CoV-2 has already caused more than 3.1 million infections and 224 000 deaths globally over a period of 4 months. The overwhelming number of individuals who are infected not only leads to widespread community lockdowns, but also paralyzes health care systems and puts health care workers (HCWs) at potential risk. Although cases of HCWs who are infected owing to community or nosocomial acquisition of SARS-CoV-2 have been receiving unparalleled attention in social media and are increasingly reported in many parts of the world, as of yet there have been few scientific reports specifically looking into this aspect. The studies by Kluytmans-van den Bergh et al¹ and Lai et al² report on SARS-CoV-2 infection rates of HCWs in 2 countries. Kluytmans-van den Bergh et al¹ described a group of HCWs with predominantly community acquisition of SARS-CoV-2 in the Netherlands,¹ whereas Lai et al² presented another group of HCWs with predominantly nosocomial acquisition of SARS-CoV-2 in Wuhan, China, where cases of COVID-19 were first reported.

Lai et al² described a cohort of 110 HCWs with symptomatic COVID-19 in a tertiary hospital in Wuhan, China, with more than 7000 beds that was designated to care for patients with COVID-19 in both outpatient and inpatient settings during the early phase of the epidemic. From January 1 to February 9, 2020, one-third of HCWs were deployed to high-risk areas, including fever clinics and wards, to care for 10 830 patients with confirmed or suspected COVID-19, and 17 of 3110 frontline HCWs (0.55%) were infected with SARS-CoV-2. This relatively low infection rate is reassuring, as it suggests that personal protective equipment, if available, can protect frontline HCWs directly caring for patients with COVID-19. However, the infection rate was higher, at 73 of 4433 HCWs (1.65%), among non-frontline HCWs who only cared for patients who did not fulfill the clinical and epidemiological criteria of COVID-19. Another 20 of 2012 HCWs without direct patient contact (0.99%) were also confirmed to be infected, which suggests a community source of infection.

The apparent higher rate of infection among HCWs working in low-risk areas deserves further investigation. Lack of awareness among staff may be one of the reasons. However, infection control training had been arranged for HCWs by either face-to-face sharing or using mobile electronic devices. Appropriate personal protective equipment, such as gloves and gowns, were provided in both high- and low-risk areas, whereas N95 respirators were used in high-risk areas and surgical masks were used in low risk areas. The presence of patients with subclinical or asymptomatic SARS-CoV-2 infection may have played an important role in nosocomial transmission in low-risk areas, especially when aerosol-generating procedures, such as cardiopulmonary resuscitation, manual ventilation, endotracheal intubation, tracheostomy, noninvasive ventilation, and bronchoscopy, are performed. These procedures may have resulted in opportunistic airborne transmission similar to the experience of SARS in 2003,³ despite the fact that droplet and contact routes are considered to be the predominant mode of transmission for SARS-CoV-2. Nevertheless, optimal architectural and engineering design of hospital wards can help to alleviate the risk by rapid dilution of SARS-CoV-2-laden aerosols in clinical areas.

In addition to nosocomial acquisition of SARS-CoV-2, HCWs may also be infected with SARS-CoV-2 in the community. Kluytmans-van den Bergh et al¹ assessed the prevalence and clinical manifestations of COVID-19 among HCWs in 2 hospitals in the Netherlands in the early phase of the pandemic.¹ In their cross-sectional study, 86 of 1353 HCWs who reported fever or respiratory symptoms in the last 10 days (6.36%) had positive reverse transcriptase-polymerase chain reaction

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test results for SARS-CoV-2, resulting in an overall infection rate of 86 of 9705 HCWs (0.89%).

Overall, health care workers in the Netherlands who were found to be infected were employed in 52 different hospital departments. The diversity of working locations among them suggests that hospital outbreak was unlikely; instead, the HCWs most likely acquired SARS-CoV-2 in the community. However, the source of infection was not specified. Further investigation is needed to fully understand the epidemiological link among HCWs who were infected to determine if they had social gatherings outside the workplace or if they had contact with known patients with COVID-19 in the community, for example. This does highlight how important it is for HCWs, like any other person, to remain vigilant of community risk by maintaining social distancing and avoiding social gatherings after work hours.

The clinical symptoms of COVID-19 among HCWs in the Netherlands who were infected were relatively mild. Only 46 of 86 HCWs who were infected (53.49%) reported fever,¹ which was similar to the report from Lai et al,² in which 67 of 110 HCWs who were infected (60.91%) presented with fever. The proportion of patients with fever is associated with the clinical progression of COVID-19.⁴ While the viral load of HCWs who were infected was not mentioned by Lai et al,² the median (range) viral load in oropharyngeal samples of HCWs who were infected expressed as cycle threshold value was 27.0 (14.5-38.5) in the Netherlands,¹ which is approximately equivalent to a moderate level of viral load of SARS-CoV-2. The cycle threshold values were similar in HCWs with or without self-reported fever, in contrast to the preliminary observation by Liu et al that viral load of SARS-CoV-2 might be a useful marker for assessing disease severity and prognosis.⁵ However, it is important to note that in the Netherlands, 54 of 86 HCWs who were infected (62.79%) reported that they had worked in the hospital while being symptomatic. It is not an uncommon phenomenon for HCWs to work while sick, as illustrated in a recent global survey conducted by the Infection and Prevention Control Working Group of International Society of Antimicrobial Chemotherapy focusing on influenza-like symptoms and work-related behavior among HCWs.⁶ If these symptomatic HCWs did not wear surgical masks and had low adherence with hand hygiene at work, SARS-CoV-2 might be transmitted from HCWs to patients. Early identification of both HCWs and patients who have been infected and contact tracing of exposed personnel should be conducted to reduce the risk of hospital outbreak of SARS-CoV-2.

In the fight against COVID-19, HCWs are the most important human resource for hospitals. One HCW who was infected died in the report from Lai et al.² Infection with and death of HCWs not only compromise the workforce in health care settings but also affect the morale of HCWs and can cause public panic. Achieving 0 nosocomial infection among HCWs should be the goal in this pandemic. A contingency plan for preparedness against emerging infectious diseases should be made available at the hospital, government, and national levels. In the case of COVID-19, this plan should comprise a series of actions to minimize the risk of nosocomial transmission, including active surveillance of suspected cases, rapid molecular diagnostics, isolation of confirmed cases, environmental disinfection, and most importantly, enforcement of infection control measures and regular training for HCWs. Special attention should be paid to the meticulous steps of collection and handling of respiratory specimens and wearing personal protective equipment. It is reassuring that the frontline HCWs in China and the Netherlands had low rates of nosocomial acquisition of COVID-19. This suggests that infection control measures are effective and should be escalated in response to the rapidly evolving epidemic to provide maximal protection to our HCWs and patients.⁷

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