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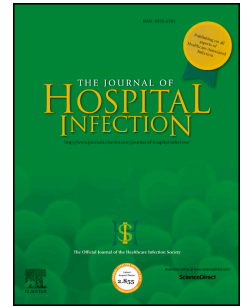
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Hand hygiene and the novel coronavirus pandemic: the role of healthcare workersNasim Lotfinejad¹, Alexandra Peters², Didier Pittet²**Affiliations**¹Department of Research, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran²Infection Control Program, University of Geneva Hospitals and Faculty of Medicine, Geneva, Switzerland

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The novel coronavirus (SARS-CoV-2) responsible for the current pandemic of coronavirus disease (COVID-19) that originated in Wuhan, China in December 2019 has now spread to 113 countries and territories outside of China (1, 2). SARS-CoV-2 is a betacoronavirus that infects humans and the disease presents mostly with fever, cough, and dyspnea (3). Healthcare workers (HCWs) are at the front-line of COVID-19 outbreak, and their constant exposure to infected patients and contaminated surfaces can put them at risk for acquiring and transmitting the infection (4). SARS-CoV-2 appears to be transmitted person-to-person through respiratory droplets and close contact, as previously seen in SARS-CoV and MERS-CoV, the two other zoonotic coronaviruses. In healthcare settings, this highlights the necessity of practicing respiratory hygiene and hand hygiene, and using appropriate personal protective equipment (5, 6). Additional airborne precautions such as N95 masking should be used by HCWs during aerosol-generating procedures when caring for COVID-19 patients (6). The World Health Organization (WHO) has strongly recommended HCWs to ask patients to cover their nose and mouth with a tissue or elbow when coughing or sneezing, to provide masks for patients who are suspected for COVID-19, and perform appropriate hand hygiene (6).

Hand hygiene with alcohol-based handrub (ABHR) is widely used around the world as one of the most effective, simple and low-cost procedures against COVID-19 cross-transmission (6). By denaturing proteins, alcohol inactivates enveloped viruses, including coronaviruses, and thus ABHR formulations with at least 60% ethanol have been proven effective for hand hygiene (7). ABHRs such as those recommended by the WHO, containing ethanol (80% v/v) or isopropanol (75% v/v) as active components, have a marked virucidal effect against SARS-CoV and MERS-CoV (8, 9). Accordingly, during

outbreaks and periods with increased demand, in case of the absence or shortage of commercially-produced ABHRs, the WHO formulation can be produced locally (10). HCWs should adhere to the WHO's My 5 Moments for Hand Hygiene: before touching a patient, before clean or aseptic procedures, after body fluid exposure or risk, after touching a patient and after touching patient surroundings (9). The WHO guidelines promote a six-step technique by applying a palmful of ABHR, covering all surfaces of the hands and rubbing until dry (9). However, low hand hygiene compliance levels are still a disquieting challenge worldwide despite the numerous interventions and campaigns performed in promoting this action (11). According to existing reports, hand hygiene, an essential component of infection prevention and control (IPC), is often neglected by HCWs both in developed and developing countries, with compliance rates sometimes dipping below 20% (12). Overcrowding of healthcare facilities, and the absence of distinct patient zones and lack of access to reliable and adequate ABHR, are among the many challenges preventing effective hand hygiene procedure in resource-limited healthcare settings (13).

As the WHO has recently reported, 9 million more nurses and midwives are needed around the world in order to achieve universal health coverage by 2030 (14). Nurses are the group of HCWs who are often the primary point of care in their communities especially during infectious disease outbreaks. Their frequent exposure to pathogens, long working hours, stressful work environment and fatigue predispose them to acquire or transmit infections such as COVID-19 (15, 16). Their adherence to IPC guidelines is vital in combatting the current COVID-19 pandemic (15). Most healthcare-acquired infections could be avoided by well-trained nurses with appropriate hand hygiene compliance and use of protective equipment (17). In order to ensure safety and quality of care, having adequate number of nursing staff and access to equipment is crucial (18). The growing rate of nosocomial transmission of COVID-19 magnifies the global demand to implement IPC more effectively in all healthcare settings (2, 6).

Midwives are another major group of HCWs who contribute significantly to the provision of quality health services in the community (14). Although the impact of COVID-19 is not yet clear on pregnant women, they might be at greater risk of acquiring the infection since pregnant women are more susceptible to respiratory viruses (19). As COVID-19 infection has been reported from close contact of neonates with confirmed cases, it is important to consider pregnant women and their newborn infants as at-risk populations while preventing and managing COVID-19 infection (19). Accordingly, nurses and midwives should be trained to appropriately comply with IPC guidelines including hand hygiene when providing care for this group (20).

Given the seriousness of disease outbreaks in general and COVID-19 specifically, it is crucial to promote the WHO guidelines and implement the "SAVE LIVES: Clean Your Hands" campaign around the world. The WHO has designated 2020 the Year of the Nurse and the Midwife. The hard work and responsibility of this often underappreciated group of HCWs should be addressed and appreciated, especially during outbreaks and global health challenges. Please join us in honoring their significant role in providing and improving health services. "Nurses and Midwives: CLEAN CARE is in YOUR HANDS"!

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