Guidelines for COVID-19 patients

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The aim of this review is to summarize current evidence of infection control in healthcare settings and patients with COVID-19 to increase awareness among healthcare workers and prevent nosocomial infections during actual pandemics. Guidelines should target all modes of transmission while recommending control precautions. During epidemics, healthcare facilities must promptly implement a multidisciplinary defense system to combat the outbreak. More evidence-based infection control strategies are needed to uniform the guidelines.

Keywords: COVID-19 ; guidelines ; infection control

1. Introduction

A pneumonia outbreak of unknown origin, which was detected in Wuhan, Hubei province, China by the end of 2019, quickly became a global concern [1][2]. The responsible agent was found to be a virus from the *Coronaviridae* family [3]. The new virus was initially labelled 2019-nCOV and subsequently renamed SARS-CoV-2 due to its resemblance to the virus from the previous SARS-CoV pandemic. SARS-CoV-2 causes coronavirus disease 2019 (COVID-19) [4]. The virus started spreading globally, resulting in 171.6 million cases and 3.6 million attributed fatalities as of 3 June 2021 [4][5][6][7].

Infectivity is thought to begin before symptoms and decrease significantly around seven days after the onset of symptoms [8]. The infectious period is reported to depend upon the seriousness and stage of the patient's infection [9].

COVID-19 poses significant social and health risks because even asymptomatic individuals can transmit the disease. Infected individuals who spread the disease through droplets during close contact situations are the main source of infection [8]. In healthcare settings, contact of the mucosae with infectious respiratory droplets or fomites was the most common pathway to human transmission [9]. In previous studies, however, sputum, nasal or nasopharyngeal secretions, endotracheal aspirate, broncho-alveolar lavage, urine, faecal matter, tears, conjunctival secretions, blood, and lung tissues were also found to transmit the virus [9][10][11][12][13].

Healthcare workers (HCWs) account for a significant rate of infections in these outbreaks because of multiple prolonged exposure [14]. In addition, stress, heavy workload, and sudden changes in the routine during the COVID-19 outbreak has made it difficult for many HCWs to apply preventive measures [15].

The high rate of infection among HCWs deserves further investigation. In a survey done among HCWs, the increased exposure to COVID-19 patients did not promote self-reported infection prevention and control (IPC) behaviours. HCWs who contacted confirmed and suspected COVID-19 patients even reported worse in some IPC. It may be due to a shortage in supplies, human deficiency, and high workload. This explains that the subsequent lack of protective equipment, human resources, and prompt assistance is critical in combating COVID-19 [16].

Lack of awareness, discomfort in PPE, poor knowledge of IPC or its negligence among staff influence pathogen spread. In addition, the presence of asymptomatic patients and reliance on IPC measures that do not account for all the dynamics of the pathogens may play a role in nosocomial transmission [17][18][19][20].

A policy rule is not the only factor in the IPC behaviours of HCWs. The outbreak, contact with confirmed and suspected patients, key clinical departments (such as intensive care unit and emergency department) are vital risk factors in the pandemic and affect nosocomial infections worldwide [19][21]. Other influencing factors associated with HCWs' IPC behaviours include years of experience and preparedness [17].

New and unique infectious disease outbreaks are a danger to healthcare providers and other leading providers because of limited awareness of the emerging threats and reliance on IPC measures that do not account for all the dynamics of the new pathogens [13][14]. Theoretically, IPC prevents or stops the spread of infections in healthcare settings, making it pivotal

to reducing the spread of the pandemic. In the case of COVID-19, IPC guidelines were adopted and developed based on experience gained during the MERS-CoV and SARS-CoV outbreaks, despite both viruses being from the same family of SARS-CoV-2; however, they share very low similarities [14][15][16].

The WHO has defined eight pillars for an IPC structure, namely: IPC programmes, IPC guidelines, education and training, and surveillance [22]. Others include multimodal strategies, monitoring and feedback, workload, staffing, bed capacity, built environment, materials, and equipment for IPC at healthcare facilities [17].

Poor point of care risk assessment is a factor contributing to the spread of COVID-19 among HCWs. Ensuring triage, early recognition, and isolation of patients with suspected COVID-19 is the first IPC strategy to prevent or limit transmission in healthcare settings [23].

The following critical healthcare IPC measures are required to prevent or limit COVID-19 spread in health facilities, including having the following in place: an IPC programme or at least a dedicated and trained IPC focal point, engineering and environmental controls, administrative controls, standard and contact precautions, screening, robust surveillance, and vaccination of health workers [18].

2. Guidelines

To decrease exposures to COVID-19, all of the guidelines recommend early diagnosis and rapid isolation of COVID-19 patients [24]. The necessary precautions should be taken that comprise the whole process, which start with an infectious disease plan, administrative and engineering controls and triage [25]. Further, procedures such as elective surgeries and routine follow-ups should be postponed. Rooms should be equipped with hand disinfectants and proper ventilation [26]. Staff should be trained for appropriate donning and doffing of PPE [27]. Summary of IPC recommendations for COVID-19 is reported in Table 1.

Table 1. Summary of IPC recommendations for COVID-19.

Recommendation	Description
Infectious Disease Plan [17][18]	• Assigning a responsible infection control team. • Education and training of health-care workers. • Adjusting working shifts. • Supplying PPE.
Administrative Controls [17][28]	• Postponing elective surgeries and noncritical visits. • Triage protocols on admission. • Monitoring temperature on entrance.
Triage [21]	• Triaged based on clinical history and infection susceptibility. • Cohorting COVID-19 cases in an isolated ward. • Daily assessment to identify incubating infections.
Engineering controls [18][22]	• Maintaining viral clearance periods. • Theatre bundling and transition areas. • Physical barriers.

Recommendation	Description
Personal Protective Equipment [29][30][31]	• Training, selection, and proper disposal of all PPE. • Sequenced PPE donning and doffing. • Fluid-resistant gowns, gloves, face shields, eye protection, hair cover, and N95 masques.
Environmental cleaning [15]	• Cleaning environmental surfaces and equipment with effective disinfectants.

2.1. Discrepancy and Limitations among International Guidelines

All international and national guidelines (CDC, WHO, ECDC, DHA, BDPCC, and PHE) agreed on the basic practices but with different specifications. For example, the Australian guidelines recommends training on IPC to ICU staff only. The CDC recommends providing surgical masks to patients depending on the area and risk assessment while surgical masks to staff only if N95 respirators are not available. The use of spatial separation between patients are recommended by the CDC, WHO, and DHA at 1-m distance, 2-m and according to state-level policies, respectively. Placing known or suspected patient in AIIR/negative pressure room is recommended by the ECDC while advised by the DHA, BDPCC, and PHE only when available. Cleaning and disinfection electronic equipment is recommended by ECDC and DHA only. The use of clean cloth towels is recommended by only the ECDC when paper towels are unavailable. Moreover, the global shortage of N95 and facemasks had forced the CDC and BDPCC to loosen their recommendations for face protection of healthcare personnel and recommend cloth masks when both are unavailable [27].

Discrepancy is also present regarding the disposition of patients after recovery and isolation precautions. The WHO guideline recommends continuing the precautions until a patient is asymptomatic. However, one study identified prolonged shedding of COVID-19 after recovery [27]. In addition, low- and middle-income countries often apply international IPC guidelines according to their local context. Therefore, the guidelines should consider the global context when recommending IPC measures [22].

A study has assessed the feasibility of COVID-19 infection control practices. The guidelines were not always feasible because of overcrowding in the emergency room leading to less commitment of the providers, insufficient training, lack of policy, and shortage of infection control materials [24].

2.2. Changes in Guidelines

Conflicting and changing recommendations have fueled the arms race among the facilities. Hospitals are spurring to adopt more strict infection control practices that often exceed the standards published by the CDC and WHO. Whenever a hospital adopts a new practice that is thought to be more protective, another feels pressure to follow. Examples include testing asymptomatic patients more frequently; using face shields and N95 respirators regardless of positivity and symptoms; additions to AGP list; and strict PPE, including shoe, hair, and leg covers [32].

In February, the WHO recommended contact and droplet precautions while reserving N95 respirators or PAPRs for AGPs. The CDC initially recommended N95 respirators but changed to medical masks in times of N95 shortages. This shift impresses that CDC guidance is driven by supply availability rather than science [32].

In fact, the CDC recently updated their guidelines to recommend that areas with high prevalence of COVID-19 should consider using N95 respirators in all asymptomatic patients undergoing AGP, regardless of test results [32].

The updated UK Health Security Agency (UKHSA) guidance consists of three categories focused on changes to the requirements for physical distancing, pre-elective procedure testing, and enhanced cleaning. In terms of physical distancing, UKHSA has recommended a reduction of physical distancing from 2 m to 1 m with appropriate mitigations where patient access can be controlled. UKHSA has also proposed removing the need for a negative PCR and 3 days self-isolation before selected elective procedures as currently advised by the National Institute for Health and Care Excellence (NICE). UKHSA has also encouraged re-adopting standard rather than enhanced cleaning procedures in low-risk areas [28].

2.3. Unanswered Questions

The evidence for using a type of filtering masque (FFP2, FFP3, N95) over a surgical masque is not robust, with a lack of clear evidence of the efficacy of high filtration masks. Variables such as fitting, testing, and personal use probably contribute to this uncertainty. The classification of AGP and risk of transmission from each procedure also are not clear yet. In addition, evaluation of the possibility of decontaminating and reusing N95 masks has been undertaken, with early results suggesting promise for both steam and UV sterilization. However, these results cannot be widely applied because of loss of filtering capacity [29][30]. The use of FFP2 masks by the public is also controversial. Some countries, such as Spain, has banned their use by the public to preserve them for healthcare workers [33].

The guidelines do not describe the use of protective hoods or headgear, though they are widely used in some countries [34]. Furthermore, there is slight evidence that double gloving in AGP may provide enhanced protection and reduce fomite contamination [35]. Facilities reported low rates of HCW infection after performing further precautions, such as careful doffing of PPE, showering, and oral and nasal disinfection [36]. In some cases, staff were isolated from families and kept under surveillance [31]. It is unknown if these extreme precautions are necessary or practical to prevent HCW infection.

A Cochrane review about PPE and protection of healthcare staff in contact with contaminated body fluids does not show a robust evidence with an almost complete absence of clinical studies examining relevant clinical outcomes. All interventions studied were supported by no more than one study and rated as low evidence [37][38]. For example, the review reports that gowns provide more protection than aprons; doffing supported by verbal instructions reduces errors; and air-purifying respirators may reduce contamination compared with conventional PPE [39].

The presence of virus in stool indicates the transmission through fecal–oral or fecal–droplet routes [29][40]. In recent studies, COVID-19 was detected in toilet bowls, air, and sinks [41]. One study detected the organism in air samples of hospital toilets, remaining viable for at least 30 min after flushing. This evidence suggests the possibility of fecal–droplet transmission [42]. Specific recommendations are needed regarding the prevention of fecal transmission in hospitals.

Studies have showed that rapid diagnosis is challenging because the manifestations of COVID-19 are nonspecific and may be confused with other microbial infections [43]. Routine testing is suggested by at least in one international practice statement [44], however it depends on the local resources of the hospital and the phase of the pandemic.

Regarding virulence factors, the recommendation of social distancing in the guidelines varies between 1 and 2 m; however, a recent study has shown that COVID-19 can travel more than 4 m [45]. Moreover, environmental influences, such as humidity, air flow, conditioners or fans, may affect the spread of droplets. An outbreak of COVID-19 related to conditioners was described in China [46]. These results suggest that the recommendations for spatial separation need to be reviewed again.

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