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**SPECIAL COMMUNICATION**

# How Should the Rehabilitation Community Prepare for 2019-nCoV?



Gerald Choon-Huat Koh, PhD,<sup>a</sup> Helen Hoenig, MD<sup>b</sup>

From the <sup>a</sup>Saw Swee Hock School of Public Health, National University of Singapore, Singapore; and <sup>b</sup>Physical Medicine and Rehabilitation Service, Durham VA Medical Center, Durham, NC.

## Abstract

With the novel coronavirus 2019 (2019-nCoV) pandemic spreading quickly in the United States and the world, it is urgent that the rehabilitation community quickly understands the epidemiology of the virus and what we can and must do to face this microbial adversary at the early stages of this likely long global pandemic. The 2019-nCoV is a novel virus so most of the world's population does not have prior immunity to it. It is more infectious and fatal than seasonal influenza, and definitive treatment and a vaccine are months away. Our arsenal against it is currently mainly social distancing and infection control measures.

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In late December 2019, novel coronavirus 2019 (2019-nCoV) emerged from Wuhan, Hubei Province, China,<sup>1</sup> and by early January 2020, Singapore became the country with the second highest number of cases.<sup>2</sup> On January 30, 2020, Centers for Disease Control and Prevention confirmed the first person-to-person transmission of 2019-nCoV in the United States.<sup>3</sup> Although 2019-nCoV is phylogenetically similar to severe acute respiratory syndrome coronavirus in 2003 and Middle East respiratory syndrome coronavirus in 2012, its disease characteristics such as reproduction ratio ( $R_0$ ), case fatality rate (CFR), and symptomatology more resemble the seasonal influenza virus (table 1). Nevertheless, 2019-nCoV appears to be as contagious as, if not more contagious than, seasonal influenza and have at least 2 times higher CFR than seasonal influenza.

## Epidemiology of 2019-nCoV

The World Health Organization (WHO)—China Joint Mission COVID-19 (the WHO name for 2019-nCoV) where 25 local and international experts investigated the outbreak in China, found that

the main mode of transmission was contact and droplet (not aerosol).<sup>7</sup> It also found that most of the 2000+ infected hospital workers were either infected at home or from patient contact in the early phase of the outbreak in Wuhan when hospital safeguards were not raised yet. Asymptomatic transmission was rare. A total of 80% of laboratory confirmed patients had mild to moderate disease, 13.8% had severe disease (dyspnea, tachypnea, oxygen desaturation, or chest radiograph infiltrates >50% of the lung field within 24-48h), and 6.1% were critically ill (respiratory failure, septic shock, and/or multiple organ dysfunction or failure). A total of 20% of 2019-nCoV patients needed supplemental oxygen, of which a quarter needed artificial respiration. Mortality increases with age, with the highest mortality among people older than 80 years (case fatality rate [CFR] 21.9%). Compared to patients who had no comorbid conditions who had a CFR of 1.4%, the CFR for patients with cardiovascular disease was 13.2%, 9.2% for diabetes, 8.4% for hypertension, 8.0% for chronic respiratory disease, and 7.6% for cancer. Disease in children appears to be relatively rare and mild.

## Public health measures to contain 2019-nCoV

The escalating outbreak in Hubei was reversed through China's use of aggressive public health measures such as proactive surveillance to detect cases immediately, rapid diagnosis and immediate case isolation, rigorous tracking and quarantine of close contacts, and an exceptionally high degree of population

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**Table 1** Comparison of disease characteristics of SARS, MERS, and seasonal influenza with 2019-nCoV<sup>4-6</sup>

Characteristics	SARS	MERS	Seasonal Influenza	2019-nCoV*
Reproduction ratio <sup>†</sup> ( $R_0$ )	2-5	0.3-0.8	1.3-1.8	1.4-3.8
CFR (%) <sup>‡</sup>	35	9	0.1	Outside Wuhan: 0.2 (within Wuhan: 3.8)
Infectious before fever onset if symptomatic?	No	Yes	Yes	Yes
Total no. of cases	200+	8000+	5-20 million a year	927,986 and rising (of which 211,143 in United States) <sup>§</sup>

\* All values for COVID-19 are based on current data, are dynamic, and hence, may vary by the end of COVID-19 pandemic. (Values for SARS, MERS, and seasonal influenza are more stable because they are based on past outbreak data.)

<sup>†</sup> Reproduction ratio\* ( $R_0$ ) is the number of cases directly generated by 1 case in a population where all individuals are susceptible to infection and is a measure of infectivity.

<sup>‡</sup> CFR is the ratio of deaths from a disease to the total number of people diagnosed with this disease over a time period. It is conventionally expressed as a percentage and is a measure of disease severity.

<sup>§</sup> Correct as of April 2, 2020.

understanding and acceptance of these measures. Is the global community ready, in mind-set and resources, to implement such measures? For countries with imported cases and/or early outbreaks of 2019-nCoV like the United States, WHO recommends the immediate following actions detailed in [table 2](#).

## Diagnosis of 2019-nCoV

There are 3 main ways to detect 2019-nCoV in nasooropharyngeal, bronchoalveolar, blood and fecal samples, each with its distinct diagnostic value: (1) *active virus shedding*: reverse transcriptase–polymerase chain reaction of 2019-nCoV single-stranded RNA. Turnaround for testing can be as short as 3-6 hours but reverse transcriptase–polymerase chain reaction requires specialized machines, test kits, and expertise so they are not easily available and accessible; thus, transportation time needs to be factored in.<sup>8</sup> (2) With the presence of symptoms and signs of pneumonia in high 2019-nCoV-load hospital settings and where sampling is too high risk (eg, shortage of personal protective equipment [PPE]): chest computed tomography with its characteristic features of ground glass opacities and consolidation may be useful.<sup>9</sup> (3) Past infection: serological testing now available but false-positive and false-negative rates are still uncertain.<sup>10</sup>

## Patient management of 2019-nCoV

The mainstay of treatment of 2019-nCoV is symptomatic until the infected self-recovers. For the subgroup of patients who develop severe disease, besides intensive care, studies are underway to explore the use of antivirals, anti-inflammatories, and monoclonal antibodies, especially in those who develop cytokine storm.<sup>11</sup> Vaccines are also being developed, but experts estimate that it will take 6 months before scientists know whether any of the vaccines in development will help against 2019-nCoV and at least a year before one will be ready for human use.

### List of abbreviations:

2019-nCoV/COVID-19	novel coronavirus 2019
CFR	case fatality rate
HCW	health care worker
PPE	personal protective equipment
WHO	World Health Organization

## Rehabilitation during 2019-nCoV outbreak

### General advice

For both staff and patients, the following precautions should be adopted: personal hygiene; the Centers for Disease Control and Prevention's handwashing advice<sup>12</sup>; staying home if you have flu symptoms; if unwell, seeking medical help and wearing a mask when venturing outside. Misinformation and misconceptions can trigger panic and irrational behavior, so everyone should stay up-to-date on the rapidly evolving 2019-nCoV situation from reliable information sources like the Centers for Disease Control and Prevention (<https://www.cdc.gov/media/rss-govd.html>) and WHO (<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen>) that can send updates automatically. Everyone can expect more social distancing measures including business continuity plans such as split teams, restricted movement and work-from-home arrangements, periodic school closures and remote learning, travel restrictions, greater use of video conferencing, e-commerce platforms, telemedicine, and fewer large social events and gatherings.

### Patient challenges

#### Deconditioning

For our patients undergoing rehabilitation who need to be quarantined (eg, from contact with a positive case) or when they themselves become ill with 2019-nCoV, deconditioning and providing rehabilitation while protecting health care staff are major concerns. Practical advice would include continuation of home exercises last prescribed, and continued attendance at rehabilitation centers if well but with stepped-up infection control measures such as patient screening for fever and flu symptoms at the entrance. Systematic reviews on telerehabilitation interventions poststroke have demonstrated either better or equal salutary effects on motor, higher cortical, and mood disorders compared with conventional face-to-face therapy.<sup>13</sup> However, studies on the effectiveness of telerehabilitation for nonstroke conditions are still lacking. Nevertheless, during situations like outbreaks, telerehabilitation has the additional advantage of continuing rehabilitation supervision remotely without the risk of virus exposure.

#### Infection risk

Diabetes is an immunocompromising disease that increases the risk of severe 2019-nCoV infection and mortality. Diabetes is also

**Table 2** WHO's major recommendations for countries with imported cases and/or outbreaks of 2019-nCoV

1. Activate the highest level of national Response Management protocols to ensure the all-of-government and all-of-society approach needed to contain COVID-19 with nonpharmaceutical public health measures.
2. Prioritize active, exhaustive case finding and immediate testing and isolation, painstaking contact tracing, and rigorous quarantine of close contacts.
3. Fully educate the general public on the seriousness of COVID-19 and their role in preventing its spread.
4. Expand surveillance to detect COVID-19 transmission chains, by testing all patients with atypical pneumonias, conducting screening in some patients with upper respiratory illnesses and/or recent COVID-19 exposure, and adding testing for the COVID-19 virus to existing surveillance systems (eg, systems for influenza-like illness and severe acute respiratory infections).
5. Conduct multisector scenario planning and simulations for the deployment of even more stringent measures to interrupt transmission chains as needed (eg, the suspension of large-scale gatherings and the closure of schools and workplaces).

a risk factor for common conditions that require rehabilitation like cardiovascular disease and stroke which themselves increase the mortality risk. Other common conditions needing rehabilitation like chronic respiratory disease and cancer are also associated with higher risk of mortality from 2019-nCoV. Hence, our rehabilitation patients are at higher risk of severe and fatal 2019-nCoV infections. For those who are capable of performing rehabilitation at home with guidance from telerehabilitation, this should be their first option. For the rest who need center-based or inpatient rehabilitation, we recommend fever and flu symptom monitoring to separate the well from the unwell, and strict infection control measures including handwashing between patients to reduce virus transmission. Patients who are symptomatic should be separated from the well, quarantined and tested for 2019-nCoV, and isolated and treated if positive. Hospital management should designate and prepare isolation rooms with adequate PPE and trained staff.

## Staff challenges

### Infection control

When local transmission is established, health care workers (HCWs) on the frontline should wear PPE (eg, masks, gloves, gowns, etc). The level of PPE protection should be titrated against the risk of infection according to hospital protocols. Hospital management should procure sufficient PPE supplies for staff for several months, taking into account surge need which depends on the evolving epidemic curve for one's state or country. Staff should be retrained on PPE donning and removal procedures and mask refitting if masks available have never been fit tested by staff.

Another concern pertains to the staff-patient-environment interface, particularly regarding rehabilitation equipment. Environmental persistence of coronaviruses varies with ambient temperature and humidity, surface type, and viral inoculum load. The coronavirus can persist on inanimate surfaces at typical room temperatures and humidity for up to 9 days but inactivated efficiently by surface disinfection procedures with 62%-71% ethanol, 0.5% hydrogen peroxide, or 0.1% sodium hypochlorite within 1 minute.<sup>14</sup> Although evidence on infection control specific to rehabilitation settings is sparse, limited data have shown persistence of bacterial contaminants in rehabilitation equipment such as electrode sponges, water for hot pack units, topical lotions, and therapy ball pits.<sup>15-19</sup> Hence, we should also pay attention to infection control for such surfaces, in consultation with local infection control experts and with consideration of available disinfectants.

### Occupational risks

Wearing PPE may be uncomfortable for HCWs, especially with N95 masks which requires greater effort to breathe when worn. It may not be wise to deploy HCWs with chronic respiratory problems to hospital areas that require high level of PPE protection which includes N95 masks. Frequent handwashing and glove allergy often trigger itchy and wet hand eczema and will affect staffs' ability to work. Emollients and steroid creams should mitigate irritant and allergic eczema. Rehabilitation staff like speech and swallowing therapists and chest physiotherapists are at increased risk because they are in close contact and exposed directly to respiratory droplets from patients. Thus, they should wear high levels of PPE.

### Business continuity plans

Business continuity plans are organizational strategies that allow the workforce to continue functioning if a significant subset of the workforce needs to be quarantined or worse, falls ill. This usually involves arrangements like split teams, restricted movement, and work-from-home arrangements. With the exception of clerical staff and telerehabilitation, it is impractical for rehabilitation HCWs to work from home because our discipline is very hands-on. Hence, strategies like split teams and restricted movement are more relevant in rehabilitation. Split teams is complete physical division of a workforce into (usually 2) subteams with each containing the necessary skill sets to continue most of its functions if 1 subteam becomes unable to work. Restricted movement is another strategy whereby the principle is every member in a subteam does not come in physical contact with any staff from other subteam(s) to minimize risk of cross-infection. Hospital management should also review triage processes at entry points and workflows that separate high-risk from low-risk areas and subteams. Other often forgotten issues are HCWs who are parents of young children. If schools or day care centers close and both parents are working, HCWs may be forced to stay home to look after them. HCWs may also be afraid to return home after work in fear of passing loved ones the virus if infected and infectious during the asymptomatic phase. Hospital management should also explore alternative childcare and temporary rooming arrangements for staff.

### Communication with staff

Just as it is important for everyone to stay up-to-date about 2019-nCoV, it is especially important for hospital management to update staff regularly and in a timely manner about 2019-nCoV policies and the situation, which typically evolve day-to-day. Staff and their managers should ensure that communication channels

are open and information is flowing bidirectionally. Staff should also carefully read management circulars and seek clarification if needed.

2019-nCoV is a novel virus, so most of the world's population does not have prior immunity to it. It is more infectious and fatal than seasonal influenza, and definitive treatment and a vaccine are months away. Our arsenal against it is currently mainly social distancing and infection control measures. We hope this article that is targeted at the rehabilitation community outlines the epidemiology of the virus and what we as rehabilitation professionals can and must do to face this microbial adversary at the early stages of this likely long global pandemic.

## Keywords

2019-nCoV; COVID-19; Distancing; Epidemiology; Infection control; Rehabilitation

## Corresponding author

Gerald Choon-Huat Koh, PhD, Saw Swee Hock School of Public Health, National University of Singapore, 12 Science Drive 2, #10-01, Singapore. *E-mail address:* [gerald\\_koh@nuhs.edu.sg](mailto:gerald_koh@nuhs.edu.sg).

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