How Should the Rehabilitation Community Prepare for 2019-nCoV?

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Running Head: How Should the Rehabilitation Community Prepare for 2019-nCoV?

How Should the Rehabilitation Community Prepare for 2019-nCoV?

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SPECIAL COMMUNCATION

How Should the Rehabilitation Community Prepare for 2019-NCOV?

Abbreviations Used:

- 2019-nCoV/COVID-19: Novel coronavirus (2019)
- SARS-CoV: Severe Acute Respiratory Syndrome
- MERS-CoV: Middle East Respiratory Syndrome
- CFR: Case fatality rate
- WHO: World Health Organization
- RT-PCR: Reverse transcriptase–polymerase chain reaction
- RNA: Ribonucleic acid
- PPE: Personal protective equipment
- HCW: Healthcare worker

Abstract

With the 2019-nCoV pandemic spreading quickly in USA 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 the majority of 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 are currently mainly social distancing and infection control measures.

Main Text

In late December 2019, a novel coronavirus 2019-nCoV emerged from Wuhan, Hubei Province, China,[1] and by early January 2020, Singapore became the country with second highest number of cases.[2] On 30 January 2020, Centers for Disease Control and Prevention (CDC) confirmed the first person-to-person transmission of 2019-nCoV in the United States.[3] Although 2019-nCoV is phylogenetically similar to Severe Acute Respiratory Syndrome (SARS-CoV) in 2003 and Middle East Respiratory Syndrome (MERS-CoV) 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, if not more, contagious and have 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).[4] It also found that most of the 2,000+ infected hospital workers was 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. 80% of laboratory confirmed patients had mild to moderate disease, 13.8% had severe disease (dyspnea, tachypnea, oxygen desaturation

or chest-X-ray infiltrates >50% of the lung field within 24-48 hours) and 6.1% were critically ill (respiratory failure, septic shock, and/or multiple organ dysfunction/failure). 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 over 80 years of age (CFR 21.9%). Compared to patients 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 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 US, WHO recommends the immediate following actions detailed in **Table 2**.

Diagnosis of 2019-nCoV

There are three main ways to detect 2019-nCoV in naso-oro-pharyngeal, broncho-alveolar, blood and fecal samples, each with its distinct diagnostic value:

- *Active* virus shedding: Reverse transcriptase–polymerase chain reaction (RT-PCR) of 2019-nCoV single-stranded RNA. Turnaround for testing can be as short as 3-6 hours but RT-PCR requires specialised machines, test kits and expertise so they are not easily available and accessible; thus, transportation time needs to be factored in.[5]
- With presence of symptoms and signs of pneumonia in high 2019-nCoV-load hospital settings and where sampling is too high risk [(e.g. shortage of personal protective equipment (PPE)]: Chest computed tomography with its characteristic features of ground glass opacities and consolidation may be useful.[6]
- *Past* infection: Serological testing now available but false-positive and false-negative rates are still uncertain.[7]

Patient Management of 2019-nCoV

The mainstay of treatment of 2019-nCoV is symptomatic until the infected self-recovers. For the sub-group of patients who develop severe disease, besides intensive care, studies are underway to explore the use of anti-virals, anti-inflammatories and monoclonal antibodies, especially in those who develop cytokine storm.[8] 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.

Rehabilitation During 2019-nCoV Outbreak

General Advice

For both staff and patients, the following precautions should be adopted: personal hygiene; CDC's handwashing advice[9]; staying home if you have flu symptoms; if unwell, seek medical help and wear a mask when venturing outside. Misinformation and misconceptions can trigger panic and irrational behaviour so everyone should stay up-to-date on the rapidly evolving 2019-nCoV situation from reliable information sources like CDC (https://www.cdc.gov/media/rss-govd.html) & WHO (https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen) who can send persons updates automatically. Everyone can expect more social distancing measures including business continuity plans such a 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, tele-medicine, and fewer large social events and gatherings.

Patient Challenges

Deconditioning

For our patients undergoing rehabilitation who need to be quarantined (e.g. from contact with a positive case) or when they themselves become ill with 2019-nCoV, deconditioning and how to provide rehabilitation while protecting healthcare staff are major concerns. Practical advice would include continuation of home exercises last prescribed, and continued attendance at rehabilitation centres if well but with stepped-up infection control measures such as patient screening for fever and flu symptoms at the entrance. Systematic reviews on tele-rehabilitation interventions after stroke have demonstrated either better or equal salutary effects on motor, higher cortical, and mood disorders compared with conventional face-to-face therapy.[10] However, studies on the effectiveness of tele-rehabilitation for non-stroke conditions are still lacking. Nevertheless, during situations like outbreaks, tele-rehabilitation has the additional advantage of continuing rehabilitation supervision remotely without 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 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 tele-rehabilitation, this should be their first option. For the rest who need centre-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, healthcare workers (HCWs) on the frontline should wear personal protective equipment (PPE – e.g. masks, gloves and 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 re-trained on PPE donning and removal procedures and mask re-fitting if masks available have never been fit-tested by staff.

Another concern pertains to the staff-patient-*environment* interface, particularly with regards to 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.[11] While evidence on infection control specific to rehabilitation settings is sparse, limited data has shown persistence of bacterial contaminants in rehabilitation equipment such as electrode sponges, water for hot pack units, topical lotions and therapy ball pits.[12,13,14,15,16] 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 of 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 include 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 protection.

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 tele-rehabilitation, it is impractical for rehabilitation HCWs to work from home as 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 two) sub-teams with each containing the necessary skill sets to continue most of its functions if one sub-team becomes unable to work. Restricted movement is another strategy whereby the principle is every staff in a sub-team does not come in physical contact with any staff from other sub-team(s) to minimise 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 sub-teams. Other often forgotten issues are HCWs who are parents of young children. If schools or day care centres 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 to 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 situation which typically evolve day-to-day. Staff and their managers should ensure that communication channels are open and information is flowing bi-directionally. Staff should also carefully read management circulars and seek clarification if needed.

2019-nCoV is a novel virus so the majority of 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 are currently mainly social distancing and infection control measures. We hope this paper 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.

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Table 1. Comparison of disease characteristics of SARS, MERS and season influenza with 2019-nCoV[i,ii,iii]

	SARS	MERS	Seasonal Influenza	2019-nCoV[§]
Reproduction Ratio* (R_0)	2-5	0.3-0.8	1.3-1.8	1.4-3.8
Case Fatality Rate (CFR) (%)[†]	35	9	0.1	Outside Wuhan: 0.2 (Within Wuhan: 3.8)
Infectious Before Fever Onset if Symptomatic?	No	Yes	Yes	Yes
Total Number of Cases	200+	8,000+	5-20 million a year	100,000 and rising (of which 80,000 in China)

* Reproduction Ratio* (R_0) is the number of cases directly generated by one case in a population where all individuals are susceptible to infection and is a measure of infectivity.

[†] Case Fatality Rate (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.

[§] 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.)

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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 non-pharmaceutical 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 (e.g. systems for influenza-like-illness and severe acute respiratory infections).
5. Conduct multi-sector scenario planning and simulations for the deployment of even more stringent measures to interrupt transmission chains as needed (e.g. the suspension of large-scale gatherings and the closure of schools and workplaces).