



## MEDICAL REHABILITATION IN PANDEMICS: TOWARDS A NEW PERSPECTIVE

A global pandemic has been declared due to the serious public health risk posed by Coronavirus (COVID-19). The WHO declared COVID-19, a new disease, different from other viruses such as Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS) and influenza, as a 'pandemic' on 12<sup>th</sup> March 2020 (1). The number of infected cases with COVID-19 and the human toll is escalating worldwide. Economic losses have skyrocketed and expected to increase in coming months and will exceed capacity of both developing and developed countries. There were more than 777,000 cases, over 37,000 deaths; and 164,446 people recovered worldwide (as of 31 March 2020) (2). The spectrum of disease severity is wide and still evolving. It can range from an asymptomatic infection, mild upper respiratory tract illness to severe viral pneumonia with respiratory failure and death. It is estimated that 80% of cases are asymptomatic or mild; 15% of cases are severe (infection requiring oxygen); and 5% are critical requiring ventilation and life support (3, 4). The mortality rate for COVID-19 is estimated to be 3 to 5% and is higher than for influenza (0.1%) (5). Almost half of all patients admitted to hospital (42%) will require oxygen therapy, with approximate 5% requiring admission to intensive care unit (ICU) (3). The key risk factors for developing severe COVID-19 disease and requiring hospitalisation (and/or ICU support) include: older individuals, male, those with at least one co-existing comorbidity, higher severity of illness scores, elevated d-dimer levels and/or lymphocytopenia (3, 4, 6).

Depending on the severity of COVID-19 impact, patients may suffer a range of functional and psychological impairments during both acute and sub-acute stages, specifically respiratory insufficiency, dyskinesia, neuromuscular and cognitive impairments, and stress etc. Emerging reports from most effected countries like China, South Korea, Italy, Spain, suggest that in addition to more commonly recognized respiratory symptoms, other clinical presentation/complications also relevant to rehabilitation include: posterior reversible encephalopathy syndrome, critical illness myopathy/neuropathy following acute respiratory distress syndrome and extracorporeal membrane oxygenation; neuromuscular illness along with plantar flexion contractures and wounds, mental health problems (3, 7–10). Recent data suggests that COVID-19 virus also effects the central nervous system (CNS). COVID-19 related neurological symptoms can be categorized into 3 groups: neurological expressions of the symptoms of the underlying disease (headache, dizziness, disturbances of state of consciousness, ataxia, epileptic manifestations and stroke); symptoms of neuro-peripheral

origin (hypo-ageusia, hyposmia, neuralgia); and symptoms of skeletal muscle damage, often associated with liver and kidney damage (9). One recent study in Wuhan, China, reported neurologic manifestations in over one-third of patients (36.4%), with more severe cases likely to have neurologic symptoms such as acute cerebrovascular diseases, impaired consciousness and skeletal muscle injury (8). Similar pattern of neurological syndromes are reported from University of Brescia, Italy (9). The hospital opened an 18-bed neuro-COVID-19 unit (to separate COVID-19 patients from other patients) to treat COVID-19 patients for stroke, delirium, epileptic seizures, and non-specific neurologic syndromes like encephalitis (9). Likewise, other hospitals in Northern Italy are also experiencing dramatic increase in COVID-19-related number of vascular events, ischemic strokes, and thrombosis, likely due to the virus affecting coagulating mechanisms. It is still unclear whether these neurologic syndromes are a direct cause of the virus entering the CNS, or an indirect response to the viral storm in their bodies (9). Further, a wide range of cognitive and psychological disorders have been reported in this patient population. These include: mood alterations (depression), anxiety disorder and suicidal ideas, organic hallucinosis (visual and auditory hallucinations), behavioral disturbances, delusions of persecution, temporal-spatial disorientation, hypomanic disorder, etc. (9, 10). These alarming figures signify the upcoming challenges for the healthcare sectors, specifically rehabilitation both in the short and over the longer term. In the short-term rehabilitation service wards may be occupied by acute COVID-19 patients, due to increased acute care demand. Patients who will survive the COVID-19 will likely need post-acute care to recover from the deficits.

The COVID-19 pandemic has overwhelmed the acute health sector in many countries, especially emergency departments, ICUs, laboratory, radiology services etc. As the situation worsens, it will impact rehabilitation. Although limited data is available to suggest the proportion of COVID-19 patients requiring post-acute care globally. However, historical data from the USA of patients requiring hospitalization following sepsis (a condition with similar inpatient mortality to COVID-19) suggests that approximately 20% required facility-based care and 20% needed care at home (11). With the predicted surge of COVID-19 there will be increasing pressure from acute care to transfer the patients to inpatient rehabilitation facilities (and home rehabilitation, nursing home facilities and other long-term care providers) to free up acute beds. Patients may not be able to be transferred from hospital to these facilities directly given risk of transmitting di-

sease. Currently there are no guidelines as to how long a patient remains contagious following clinical recovery (12). Although rehabilitation in the patient's own home is an option, this will be limited by inability to manage high acuity patients with COVID-19. Therefore, care models where institutions provide 'hospital at home' services are more feasible (13). Delivery of ambulatory care services will need to use 'Telemedicine' rather than face-to-face care model, where possible. This will have significant impact on patients and families/carers, and healthcare system at large.

Following the guidance and recommendation from the WHO (5, 14), many Governments worldwide have implemented extensive measures, such as immediate case detection and surveillance, rapid diagnosis and immediate case isolation, rigorous tracking and quarantine of close contacts, and public health prevention measures to reduce the spread of disease. In absence of an effective therapeutic agent or a vaccine, widescale 'social distancing' (1.5 m) to limit spread of infection, including local and national lockdowns, banning of mass gatherings and/or public events, personal hygiene (hand washing, regular showers), 'self-isolation', are the primary interventions to flatten the escalating epidemiological curve. These effective measures have shown some promising results in countries like China, Korea, Singapore, Australia and others (15, 16). Recent reports from China suggest that after strict case isolation and quarantine, movement restrictions resulted in a downward trend in the number of confirmed new cases (16).

In recent disasters, significant improvements have been achieved in international and regional collaboration, and capacity management, governance, preparedness, and risk-identification. The initiatives by United Nation's coordinated appeal 'Global humanitarian response plan COVID-19' (15) and WHO's key 'Strategic Preparedness and response plan for COVID-19' (14) are much-needed steps for controlling and managing the pandemic worldwide. Further various clinical practice guidelines and protocols are currently being published, with set standards for all healthcare professionals including, rehabilitation personnel to use these minimum standards when responding to current pandemic (4, 15, 17–19).

COVID-19 appears to differ with respect to severity and contamination patterns, with much to learn about the disease and its impact in different contexts. Therefore actions will continue to be driven by rapidly accumulating scientific and public health knowledge (14). Currently, stopping transmission of the virus and reducing mortality is an urgent health priority hence most attention has been on acute management of these patients. Post-acute management and rehabilitation of

the current COVID-19 patients and those in recovery is less prioritised. In the coming months, epidemiological modelling predicts that healthcare facilities, specifically sub-acute care, will be overwhelmed by demand as many COVID-19 survivors will require rehabilitative care. Regrettably, subacute care and rehabilitation facilities in many countries currently lack the capacity and capability to safely treat patients with COVID-19, as they transition from hospital to home or to other care settings (20, 21). Regardless, trained skilled staff will be key limiting factor, magnified by this pandemic. Other challenges include availability of personal protective equipment (PPE) and staff COVID-19 testing to ensure they are not transmitting the disease. This is especially challenging in many developing countries where access to rehabilitation, trained staff and PPE is already limited (22).

The WHO defines medical rehabilitation as '*a set of interventions designed to optimize functioning and reduce disability in individuals with health conditions (disease (acute or chronic), disorder, injury or trauma) in interaction with their environment*' (23). The evidence suggests that during disasters, early involvement of rehabilitation reduces disability, improves clinical outcomes and participation (12, 24). Similar to other disasters, effective rehabilitation in pandemics include: management of the condition (impairments/disabilities), prevent complications, optimize functional capabilities (including cognitive, neuropsychological function), and social re-integration of patients in view of contextual factors that impact functional performance (22, 25). This is especially important as people who survive COVID-19 will require rehabilitation following ICU and/or acute hospital stay, for respiratory and/or neurological impairments, deconditioning and multisystem complications.

Rehabilitation can play an important role in the current pandemic setting. Rehabilitation physicians (and/or allied health/nursing) should be included in the interdisciplinary acute-hospital COVID-19 treating teams. Rehabilitation physicians are not only trained in diagnosis and treatment of general health conditions but are also experts in disability and 'functioning'. They can coordinate member roles, in the context of patient's clinical and rehabilitation needs and perform a role in integrating rehabilitation efforts with other health strategies and providers (24). Currently, there is a window of opportunity for authorities and policy makers to integrate the rehabilitation professionals in the midst of the coronavirus pandemic (21, 26). Their potential roles of rehabilitation professionals is to recommend a best practices approach (based on evidence to date), reinforce public health measures- social distancing, self-isolation, hygiene measures; advise/educate patients (and families) about optimizing physical and nutritional health;

raise public awareness; assist with communication with primary care physicians, actions and activities to return the patients to a safe environment and successful reintegration into the community.

During this pandemic, the rehabilitation community faces unprecedented challenges due to increased demand for rehabilitative care to COVID-19 patients during their recovery phase. Special consideration will be needed to address safety and care of elderly patients and those with pre-existing comorbidities and disabilities in rehabilitation facilities (6). Rehabilitation professionals will provide disability management and assessment in the context of evolving disease pattern, changing clinical needs, treatment and management of the condition and complications, and longitudinal follow-up. The potential challenges include:

- Integrating rehabilitation personnel in acute-care COVID-19 clinical teams, provide patient assessment whilst in acute setting for range of disabilities in the recovery phase.
- Provide safe physical environments within rehabilitation wards that comply with social distancing and hygiene, allocated ward spaces for COVID-19 and non-COVID patients and their treating clinical and non-clinical teams, etc.
- Mitigate risk (as able) for a potential COVID-19 exposure to patients and staff- comply with COVID-19 Guidelines, limit visitor numbers, screening of staff and visitors for temperature and hand hygiene, etc.
- Allocation health care resources in rehabilitation facilities (trained workforce, PPE, equipment, infrastructure).
- Manage psychological distress in staff and patients by identifying at risk people and appropriate timely intervention.

The rehabilitation needs and demand for COVID-19 survivors can vary in various settings and over time, however, rehabilitation is essential in all phases of pandemic management. There is a need for an integrated system to enhance capacities of healthcare institutions in the prevention and management process of this pandemic. Some potential recommendations for rehabilitation approach of the COVID-19 patients is detailed in Table I below (4, 7, 19, 21).

In conclusion, the novel COVID-19 is having a devastating effect worldwide, and the situation is still evolving. The control of spread of disease and management of these patients is a daunting challenge in modern times. Prevention, response management plans and standards will continue to be driven by rapidly accumulating scientific and public health knowledge. As in any disaster, the role of medical rehabilitation in pandemics is an integral component of comprehensive management. Early rehabilitation of the COVID-19 patients can enhance pulmonary, respiratory function, reduce complications, improve function, cognitive impairments and quality of life (8–10, 12, 27).

There is need for a coordinated, collaborative approach for managing COVID-19 with relevant national and international organisations and stakeholders for acute response, rehabilitation and recovery. The WHO, and International Society of Physical and Rehabilitation Medicine (ISPRM) are key players to facilitate coordination amongst 77 National Societies of Physical Medicine and Rehabilitation globally to assist with action needed in this pandemic. However, effective rehabilitation-inclusive pandemic response and management will depend on the capacity and willingness of countries to learn from shared experiences and build a systematic advance planning and preparedness to ensure that effective services are available to those who need it.

**Table I.** Potential recommendations for rehabilitation approach of the COVID-19 patients

Organisational issues	Operational issues
<ul style="list-style-type: none"> <li>• Rehabilitation personnel should be part of the COVID-19 response team</li> <li>• Integrated approach (public and private health sectors and primary care providers)</li> <li>• Infrastructure - Specialized sub-acute rehabilitation facilities (located within an acute facility or remote) will be required to treat new COVID-19 patients, along with those recovering from COVID-19, as they may be potentially contagious</li> <li>• Establish electronic platform for effective collaboration and communication with other healthcare service providers</li> <li>• Coordination with emergency and other relevant stakeholders</li> <li>• Stringent risk assessment from every aspect</li> <li>• Whole organisation-based approach</li> <li>• Workforce education, training, planning</li> <li>• Staff support including financial, psychological, etc.</li> <li>• Liaison with other healthcare facilities, Government health services and other stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of specific COVID-19 units separate from non-COVID-19 units within rehabilitation units</li> <li>• Stringent safety and cleaning procedures: PPEs for staffs, environmental cleaning and disinfection procedures</li> <li>• Strict monitoring of patients, physicians/healthcare professional, employees, visitors for signs of infections</li> <li>• Enforcing strict safety measures such as social distancing, hygiene, restriction in visitors, etc.</li> <li>• Organisation of spaces (social distancing) in compliance to the recommendations issued by the authorities and specific equipment</li> <li>• Adherence to droplet and airborne precautions during patient care as per requirement (use of PPE)</li> <li>• Caring for those with non-COVID related disabilities requiring rehabilitation</li> <li>• Resource requirements (staffing/equipment etc)</li> <li>• Establishment of patient triage, discharge, referral, and tracking systems to include non-face to face follow-up consults via phone, skype or video</li> <li>• Exploring alternative models of care (such as service delivery via telemedicine, community screening clinics and rehabilitation in the home setting)</li> <li>• Cancellation or withhold all non-required therapies, admissions</li> <li>• Education and training of staff and patients/carers (especially PPE, infection control)</li> <li>• Staff wellbeing including management of stress, post-traumatic disorders (PTSD) etc.</li> </ul>



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## REFERENCES

- World Health Organisation. WHO Director-General's opening remarks at the media briefing on COVID-19 Geneva: WHO; 11 March 2020 [cited 2020 Mar 29]; Available from: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>.
- Australian and New Zealand Intensive Care Society (ANZICS). COVID-19 by numbers. Camberwell, Victoria, Australia: ANZICS; 2020 [cited 2020 Mar 31]; Available from: <https://www.anzics.com.au/coronavirus-numbers/>.
- Guan WJ, Zhong NS. Clinical Characteristics of Covid-19 in China. *N Engl J Med* 2020; 382: pii: 10.1056/NEJMc2005203#sa5. [Epub ahead of print].
- Thomas P, Baldwin C, Bissett B, Boden I, Gosselink R, Granger CL, et al. Physiotherapy management for COVID-19 in the acute hospital setting: Recommendations to guide clinical practice. Version 1.0. Endorsed by Association of Chartered Society of Physiotherapist in Respiratory Care UK (ACPRC), 2020 Mar 23.
- World health Organisation. World Health Organisation, Coronavirus disease 2019 (COVID-19): Situation Report 46. Geneva: WHO, 2020.
- Guan WJ, Liang WH, Zhao Y, Liang HR, Chen ZS, Li YM, et al. Comorbidity and its impact on 1590 patients with Covid-19 in China: A Nationwide Analysis. *Eur Respir J* 2020 Mar 26. [Epub ahead of print].
- McNeary L, Maltzer S, Verduzco-Gutierrez M. Navigating Coronavirus Disease 2019 (Covid-19) in physiatry: a CAN report for inpatient rehabilitation facilities. *PM R* 2020 Mar 20. [Epub ahead of print].
- Mao L, Wang M, Chen S, He Q, Chang J, Hong C, et al. Neurological Manifestations of Hospitalized Patients with COVID-19 in Wuhan, China: a retrospective case series study. *medRxiv* 2020. Available from: <https://www.medrxiv.org/content/10.1101/2020.02.22.20026500v1>.
- Talan J. COVID-19: Neurologists in Italy to colleagues in US: Look for poorly-defined neurologic conditions in patients with the coronavirus. *Neurology Today*, American Academy of Neurology 2020 Mar 27. Available from: [https://journals.lww.com/neurotodayonline/blog/breakingnews/pages/post.aspx?PostID=920&fbclid=IwAR2omdLXmhl7DEa0vLB8WVIMJp5CaI4w\\_gVQaJ6uPeKUNnAfpGxy7fn3V0](https://journals.lww.com/neurotodayonline/blog/breakingnews/pages/post.aspx?PostID=920&fbclid=IwAR2omdLXmhl7DEa0vLB8WVIMJp5CaI4w_gVQaJ6uPeKUNnAfpGxy7fn3V0).
- Xiang YT, Zhao YJ, Liu ZH, Li XH, Zhao N, Cheung T, et al. The COVID-19 outbreak and psychiatric hospitals in China: managing challenges through mental health service reform. *Int J Bio Sci* 2020; 16: 1741–1744.
- Buchman TG, Simpson SQ, Sciarretta KL, Finne KP, Sowers N, Collier M, et al. Sepsis among Medicare beneficiaries, 2: the trajectories of sepsis, 2012–2018. *Crit Care Med* 2020; 48: 289–301.
- Grabowski DC, Joynt Maddox KE. Postacute Care Preparedness for COVID-19: Thinking Ahead. *JAMA* 2020 Mar 25 [Epub ahead of print].
- Levine DM, Ouchi K, Blanchfield B, Saenz A, Burke K, Paz M, et al. Hospital-level care at home for acutely ill adults: a randomized controlled trial. *Ann Intern Med* 2019 Dec 17 [Epub ahead of print].
- World Health Organisation. Critical preparedness, readiness and response actions for COVID-19 (Interim guidance). Geneva: WHO, 22 March 2020.
- United Nations. Global humanitarian response plan COVID-19: United Nations coordinated appeal April – December 2020. Geneva: Coordination of Humanitarian Affairs (OCHA), 2020.
- World health Organisation. Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19) 16–24 February 2020 [cited 2020 Mar 30]. Available from: <file:///C:/Users/Bhasker/Downloads/who-china-joint-mission-on-covid-19---final-report-1100hr-28feb2020-11mar-update.pdf>.
- Liang T (Editor-in-Chief). Handbook of COVID-19 Prevention and Treatment. The First Affiliated Hospital, Zhejiang University School of Medicine, China, 2020.
- Chinese Association of Rehabilitation Medicine, Respiratory rehabilitation committee of Chinese Association of Rehabilitation Medicine, Cardiopulmonary rehabilitation Group of Chinese Society of Physical Medicine Rehabilitation. Recommendations for respiratory rehabilitation of COVID-19 in adult. *Chin J Tuberc Respir Dis* 2020; 43: E029, DOI: 010.3760/cma.j.cn112147-20200228-20200206
- National Health Commission (NHC) of the PRC and National Administration of Traditional Chinese Medicine of the PRC. Guidance for Corona Virus Disease 2019: prevention, control, diagnosis and management. People's Republic of China: 2020.
- Chang MC, Park D. How should rehabilitative departments of hospitals prepare for coronavirus disease 2019? *Am J Phys Med Rehabil* 2020 Mar 24. [Eub ahead of print].
- Koh GC-H, Hoenig H. How should the rehabilitation community prepare for 2019-nCoV? *Arch Phys Med Rehabil* 2020 Mar 16 [Epub ahead of print].
- Khan F, Amatya B, Lee SY, Vasudevan V. Rehabilitation in Disaster Relief. *Phys Med Rehabil Clin N Am* 2019; 30: 723–747.
- World Health Organization. Rehabilitation in health systems. Licence: CC BY-NC-SA 3.0 IGO. Geneva: 2017, 2017.
- Khan F, Amatya B, Gosney J, Rathore FA, Burkle FM, Jr. Medical Rehabilitation in Natural Disasters: A Review. *Arch Phys Med Rehabil* 2015; 96: 1709–1727.
- Rathore FA, Gosney JE, Reinhardt JD, Haig AJ, Li J, DeLisa JA. Medical rehabilitation after natural disasters: why, when, and how? *Arch Phys Med Rehabil* 2012; 93: 1875–1881.
- Landry MD, Jalovcic D, Jesus TS. The novel coronavirus (COVID-19): making a connection between infectious disease outbreaks and rehabilitation. *Physiotherapy Canada* 2020; Advance online article:e20200019. doi:20200010.20203138/ptc-20202020-20200019.
- Boldrini P, Bernetti A, Fiore P. Impact of COVID-19 outbreak on rehabilitation services and Physical and Rehabilitation Medicine (PRM) physicians' activities in Italy. An official document of the Italian PRM Society (SIMFER). *Eur J Phys Rehabil Med* 2020 Mar 16 [Epub ahead of print].

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