

Rehabilitation Response in Pandemics

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Abstract

The WHO declared a pandemic due to the serious health risk posed by Coronavirus disease (COVID-19). The number of infected cases is on the rise globally with escalating human, economic and societal costs. COVID-19 survivors may suffer a range of clinical, functional and psychological impairments, resulting in disabilities. Many are amenable to rehabilitation intervention. The current focus of COVID-19 management is on public health measures and acute management. As patients transfer to sub-acute care or discharged to the community, rehabilitation services need to have a number of organizational and operational models in place to provide safe effective care for patients and health professionals.

There is need for global action by professional organizations in developing a structured rehabilitation approach for international response to disasters, including pandemics. This report proposes development of a ‘Rehabilitation Response Plan’ to enable the International Society of Physical and Rehabilitation Medicine, to provide crucial leadership and governance role in liaison and coordination with the WHO (and other stakeholders), to provide rehabilitation input during current and future pandemics. The key considerations include following categories: Governance, Coordination, Communication, Evaluation, and Care-continuum. These will strengthen rehabilitation, assist in the effective delivery of services, provide advocacy, and an international coordinated perspective.

Key Words: Rehabilitation, Pandemic, Corona virus disease, Response Plan

Novel coronavirus disease (COVID-19), a pandemic declared by the World Health Organisation on 12th March 2020, presents a global challenge.¹ First reported in December 2019 in Wuhan, Hubei province, China, to date (as of 6th May 2020) it has spread to 212 countries and territories, with over 3.7 million confirmed cases and 258,000 deaths and still escalating.²⁻⁴ The reported estimated mortality ranges between 3 to 5%, with death toll exceeding over 70,000 in United States of America (USA) over 25,000 in Italy, Spain, France and United Kingdom (UK).^{2,4} Economic losses are expected to reduce the global economy to under 2.5%, with predicted cost exceeding US\$1 trillion.⁵ The disease spectrum of COVID-19 is wide: majority (80%) have asymptomatic infection and mild upper respiratory tract illness (sore throat, cough or shortness of breath), 13.8% of cases have severe disease (dyspnoea, respiratory frequency ≥ 30 /minute, and/or lung infiltrates within 24-48 hours) and 6.1% are critical (respiratory failure, septic shock, and/or multiple organ dysfunction/failure).⁶⁻⁸ Those requiring hospitalization present with: fever, cough, dyspnoea, sputum, myalgia or fatigue; approx. 42% develop serious respiratory insufficiency (oxygen therapy) and with 5% requiring intensive care unit (ICU).^{6,9} Majority (approx. 67%) of ICU admitted patients have multi-organ failure, and approximately a third have acute kidney or liver dysfunction and/or cardiac problems.¹⁰

The COVID-19 virus is highly contagious (spread via droplet transmission) and the situation is still evolving. The exact incubation period is unknown, however based on the previous coronavirus infections, it is estimated at 4-10 days (possibly extend to 14 days).^{11,12} COVID-19 patients are considered infectious whilst they have symptoms, initial data from Wuhan, China suggesting median duration of viral shedding of 20 days (Inter quartile range:

17.0–24.0), with longest observed duration of 37 days.^{13,14} Period of development of immunity and reinfection is poorly understood.¹⁵

Effective vaccine or specific anti-viral drugs and/or other medications are being investigated. As recommended by the WHO,^{2,16} many Governments worldwide have implemented measures to reduce the spread of disease, and implemented immediate case detection, surveillance, rapid diagnosis, immediate case isolation, rigorous tracking and quarantine of close contacts, and public health prevention measures (mainly *social distancing*, personal hygiene, ‘self-isolation’, lock-downs, border controls, etc.). These measures are effective with promising results in countries like China, South Korea, Singapore, Australia and others.^{8,17,18}

Pandemics and Rehabilitation Needs

Currently, the focus of COVID-19 management is on acute management, stopping virus transmission and reducing morbidity and mortality. The global data reports from most affected countries (like USA, China, Spain, and Italy) suggest that despite many deaths from COVID-19 (total global death over 126,000) a significant number of people as of 6th May 2020 over 1.2 million people have recovered.^{3,4} However, limited data is available to suggest what proportion of COVID-19 patients required or will require post-acute care. One recent report from the National Health Services (NHS), UK provide anecdotal data suggesting only 4% of the COVID-19 patients will require inpatient rehabilitation and 40% will require support from health and social care.^{19,20}

The post-acute management and rehabilitation of the current COVID-19 survivors will be the focus in the coming months, given the range of functional, psychological and clinical impairments reported in many patients.^{21,22} The common manifestation of COVID-19 is characterized by mild respiratory diseases or moderate-to-severe pneumonia, causing Acute Respiratory Distress Syndrome (ARDS) and multi-organ failure.²³ However, emerging reports from most effected countries suggest, other clinical presentation/complications including neurological symptoms (such as headache, dizziness, hypogeusia, and neuralgia); and complications (encephalopathy, acute cerebrovascular diseases, ataxia, epileptic manifestations, impaired consciousness; critical illness myopathy/neuropathy; skeletal muscular injury; and cognitive and psychological problems.^{6,24-27} Previously, post-ICU survivors report cognitive impairments (30-80%), new physical impairments (25-80%), and post-traumatic stress disorder in 8-57% of patients.²⁸ Further, patients with ARDs and extended hospital stay report: sleep deprivation, delirium, pain, muscle wasting, neuropathy, loss of mobility and function, and fatigue.^{20,28,29} These issues require comprehensive longer-term interdisciplinary management, including rehabilitation.

There is evidence for rehabilitation programs during disasters for reduction in disability, improve clinical outcomes, and participation amongst disaster survivors.³⁰ Although, evidence for the effect of rehabilitation in COVID-19 population group is limited, the recent WHO guidelines for COVID-19 patients recommend active mobilization of the critically ill patients when safe to do so.³¹ Early rehabilitation intervention in the critical care environments (following comprehensive assessment by an interdisciplinary team) is safe.³² Previous report of survivors of ARDS following severe influenza (H1N1) showed exercise capacity and quality of

life improved significantly following an 8-week pulmonary rehabilitation program.^{22,33} Similar beneficial effect of interdisciplinary approach (including physiotherapy) was reported in Ebola patients for improved physical and mental function, reduction in hospital stay and successful community reintegration.³⁴⁻³⁶

New scientific information is emerging and clinical care is driven by rapidly accumulating knowledge.^{16,21} Currently, there are limited rehabilitation-specific guidelines published for COVID-19 patients.^{7,37,38} Various innovative approaches for rehabilitation within the context of pandemic are recommended and evaluated (such as, virtual rehabilitation, telerehabilitation, smartphone apps)^{22,39} The summary of key recommendations from these Guidelines are listed in Table 1.

Please insert table 1 here

A Coordinated Rehabilitation Approach in Pandemics

The predicted surge in discharge/transfer of the patients to subacute services and/or community signifies the upcoming challenges for rehabilitation facilities both in the short and longer-term. Undoubtedly, rehabilitation professionals will play a crucial role, which will be more complex, like in any disaster situation.⁴⁰ There is the additional burden for maintaining strict safety of staff and patients, as well as specific rehabilitation focussed management required in the current context. Additional staff training and education, PPEs, strict hygiene and infection control, space allocation, etc. need addressing.⁴¹ Further, provision of care and advocacy for persons with pre-existing disabilities and special medical needs is essential.⁴² Other *organisational* and

operational challenges in rehabilitation settings have been reported in details in previous reports.^{21,37}

The WHO recognizes the importance of rehabilitation-inclusive disaster management plans for continued sustainable and comprehensive care in both acute stage and the longer-term.⁴³ There is a consensus amongst healthcare authorities for global action by professional organizations to work towards developing a structured rehabilitation approach for a coordinated international response to disasters, including pandemics.^{40,42,44,45} In the current pandemic, as the epidemiological peak shifts towards the low- and middle-income countries, the risks posed by this virus are higher for millions of people living in poverty in crowded environments, refugee camps, etc.^{46,47} The challenges associated with virus containment are more significant, as measures such as social distancing are difficult to implement, with increased risk of community transmission.⁴⁶ Many developing countries do not have well developed rehabilitation services or rehabilitation-inclusive disaster- response management systems.⁴⁷ The current travel restrictions, border control and lockdowns in place can limit humanitarian assistance and delivery of essential medical supplies to vulnerable populations (personal communication National Societies of India, Pakistan, Nepal etc.). Initiatives by the WHO and United Nations (UN) in publishing guidelines/strategies, are useful in setting standards for healthcare authorities to respond to current pandemic.^{16,17,48}

The WHO provides a focal point for coordination of pandemic management, ensuring synergies in coordinated care among member states and systems; and deployment of Emergency Medical Teams (EMTs) if required. It recommends implementation of the ‘six building blocks’

to develop and strengthen systematic, sustainable health care system, namely: service delivery; health workforce; information; medical products, vaccines and technologies; financing; leadership and governance (stewardship).⁴⁹ It recognises rehabilitation as part of universal health system and coverage for incorporation into the national healthcare systems.^{43,49} In line with the WHO's 'Rehabilitation 2030: A Call for Action' and the UN agenda of Sustainable Development Goals (SDGs), the International Society of Physical and Medical Rehabilitation (ISPRM) recognises that building and strengthening rehabilitation capacity requires a skilled rehabilitation workforce, for improved service provision and governance.⁵⁰ The ISPRM provides leadership (and governance) role within the field of rehabilitation medicine as an independent NGO for the WHO and UN systems at large. Specifically, the ISPRM Disaster Committee (DRC) and ISPRM-WHO Liaison Committees have an important role in education, organisation and coordination of rehabilitation needs and response by its member National Societies (NS) within the ISPRM.

Presently, the ISPRM (and DRC) are in a unique position to lead and facilitate liaison/coordination of its 77 NSs (with >35,000 members) for delivery of evidence-based rehabilitation input in the midst of COVID-19 pandemic. The key objectives are to strengthen and deliver rehabilitation services during pandemics from an international coordinated perspective, which may include (but not limited to):^{8,16,48}

- Encourage member societies to implement and support measures to minimise transmission to contain infection

- Upskill/educate rehabilitation staff, prepare rehabilitation services for COVID-19 related care as per recommendations
- Provide updates on best evidence care to minimise mortality and morbidity for COVID-19 related care
- Provide alternative sustainable methods of service delivery for consideration (such as Telemed, social media platforms, etc.) and longer-term care processes for community integration
- Engage, empower workforce and public- including safety during and post COVID-19
- Encourage rehabilitation staff mental-health support networks, as they care for COVID-19 patients
- Advocacy and inclusion of persons with disabilities for empowerment and participation during the pandemic
- Information, translation platforms and knowledge dissemination for members

Ideally, the ISPRM (Central) and DRC should establish the ‘*Regional Task Force*’ and/or ‘*Working Groups*’ in the ISPRM regions (namely: Americas, Asia-Oceania and Europe, Eastern Mediterranean, Africa). Although ISPRM cannot implement the suggested measures or rehabilitation care models locally, it can provide virtual guidance and share up-to-date information to guide the rehabilitation professionals through the Regional Task Force, who can direct the NSs in their region. The ISPRM has already established dedicated COVID-19 resource centre and a Special Interest Group, where members can join and share their experiences (<https://www.isprm.org/>). Further, the DRC is actively circulating up-to-date information to all members via e-mails and social media portals. The Regional Task Force

should collaborate with the individual NSs in the region to ascertain rehabilitation needs for COVID-19 and provide evidence-based resources and assist as able.

This report proposes a rehabilitation response plan to enable ISPRM working through its NS and regional task force, to provide the crucial leadership and governance role in liaison/coordination with the WHO, other relevant stakeholders, during current and future pandemics. This plan extends the ISPRM Disaster Rehabilitation Response Plan (DRRP),⁴⁵ and recommends a rehabilitation-inclusive pandemic management approach. The potential roles for key considerations for ISPRM in pandemics can be broadly explained in five different categories (listed below). A detailed systemic pathway of coordination of the ISPRM, and the DRC is provided in **Figure 1**. This approach considers ongoing overarching principles and health/humanitarian response plans put forward by the WHO, UN and other agencies. It also takes into account the current operational constraints due to movement restrictions and supply chain disruption worldwide.

Insert Figure 1 here

a. Governance

The ISPRM supports the WHO (and other organisations) in the global initiative in pandemic management, using a pragmatic approach so all parties share responsibility and participate. Many developing countries with limited rehabilitation capacity and basic service delivery will face challenge to prevent spread of disease and post-acute care, and also provide health services to the general population. The ISPRM and NS can develop rehabilitation-inclusive action plan

and best-practices approach for prevention/mitigation, preparedness, response, recovery and longer-term care. The ISPRM Regional Task Force should provide advice and information on action, training activities, assessment and planning for longer-term outcomes following severe COVID-19 infection. Particular attention should be given to published policies and practices (from WHO and key organisations),⁴⁸ so services can allocate equitable and transparent allocation of scarce medical resources for best possible evidence-based patient care. Special consideration should be given to safety and wellbeing of frontline health workers and staff, as they carry the greatest risk of exposure.¹¹

b. Coordination

Strong leadership and collaboration/coordination should include all NS and regional Physical and Rehabilitation Medicine societies, INGOs/NGOs, disability advocacy and consumer organizations, media etc. The ISPRM, with global-level organisations, (WHO, UN etc.), should support NS coordinating structures and incorporate rehabilitation-inclusive pandemic plan into emergency management plans for facilities in affected regions. Development of a central coordinating mechanism standard may not be possible given the heterogeneous healthcare systems and varying pandemic severity around the world, however, a platform could allow sharing of different approaches from various organisations, for appropriate approaches. The ISPRM Regional Task Force should liaise with local NS at field level for support and information.

c. Communication

The ISPRM (and DRC) should communicate regularly to guide NS in managing rehabilitation resources and management structures at a higher level in pandemics. In collaboration with Government (and local healthcare authorities), it can raise awareness to reinforce public health

measures (social distancing, hygiene measures, optimizing physical and nutritional health etc.).^{11,16,48} It can provide guidance based on scientific principles for types of rehabilitation services needed and their organization. This also applies to relevant stakeholders, including law enforcement and judiciary, media, public and others. The ISPRM (and DRC) should have effective communication platforms for consistent and timely messages to engage members and the community effectively. Development of on-line training modules (and e-platform) will be step in the right direction (e.g. on PPEs, infection control, social distancing and space allocation, telerehabilitation, etc.). New technology platforms (e.g., internet, smartphones, podcasts) are efficient in mass communication in emergencies.

d. Evaluation

Due to complexity of COVID-19 pandemic, speed of transmission and difficulty in projecting health models at country level, including rehabilitation facilities should have a plan in place for surveillance and evaluation system, so services can adopt and adjust as required.¹¹ The provision of education and training programs for safety of rehabilitation personnel, patients (and families), and basic prevention control measures are a priority in the current pandemic. A contingency plan that identifies safety of patients and staff, staffing prioritized based on critical needs and health status, functional limitations, and essential facility operations.¹⁶ These plans should be transparent and effectively communicated to all staff and evaluated regularly for long-term sustainability.² All facilities should be encouraged to collect data and disseminate their experience and findings/knowledge regarding the impact, course and outcomes of COVID-19 and rehabilitation approach.⁴⁸ Such scientific evidence will facilitate better understanding of disease and inform future decision-making regarding rehabilitation for survivors.

e. Care continuum

The provision for improved access to information and essential health services for patients discharged to the community is essential and those most vulnerable referred for ongoing healthcare, follow-up and social services.^{2,11} Those medically ready and safe to return to community should be discharged earliest possible.¹¹ At discharge, an individual assessment of rehabilitation should be documented, for immediate needs (e.g., safe mobility, symptom control (dyspnoea, fatigue, pain), need for supplemental oxygen, adequate nutrition, psychological/social supports, occupational (assistive devices, return to work).⁵¹ The treatment of emotional and psychological impact of COVID-19 should be addressed.^{11,48} Provision of the community-based rehabilitation and longer-term support (vocational/avocational, caregiver support, disability management) provided as required. Regular follow-up and evaluation initiated consistent with local practice, within local cultural boundaries. Pandemic planning should also address psychosocial support needs (specifically stress, PTSD) for the healthcare staff.¹¹

The COVID-19 pandemic is an unprecedented public health emergency affecting all countries with major implications for achievement of the UN 2030 Agenda (and SDGs). It has overwhelmed medical capacity of many developed western countries with advanced medical infrastructure (Asia, Europe and America). However, dire consequences are expected, as it spreads to under-resourced developing countries (and populations) with fragile healthcare systems and limited medical capacity (including rehabilitation services). In many cases, for example in cramped refugee camps and shelters, slums, war-torn areas where medical resources are minimal and many public health measures are difficult to implement.⁴⁶

The role of ISPRM (and medical rehabilitation) in pandemics are key to facilitate collaborative rehabilitation-inclusive management approach of the COVID-19 patients working through its NSs, and with the WHO and UN. Early rehabilitation can enhance functional and cognitive capacity, and improve overall quality of life. There is a clear mandate for all actors (and stakeholders) in pandemic management for a “*shared*” responsibility to act quickly, efficiently and effectively. The proposed rehabilitation response plan for the ISPRM suggests a comprehensive model for coordination and implementation with relevant stakeholders in current and future pandemics. .

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REFERENCES

1. World Health Organisation. WHO Director-General's opening remarks at the media briefing on COVID-19 11 March 2020. Available at: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020> Accessed: 29 March 2020.
2. World health Organisation. *World Health Organisation, Coronavirus disease 2019 (COVID-19): Situation Report 106*. Geneva: WHO, 5 May 2020.
3. Johns Hopkins University. COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU). 2020. Available at: <https://coronavirus.jhu.edu/map.html> Accessed: 14 April 2020.
4. Worldometer. Coronavirus Worldwide Graphs. 2020. Available at: <https://www.worldometers.info/coronavirus/worldwide-graphs/> Accessed: 6 May 2020.
5. United Nation Conference on Trade and Development (UNCTD). The coronavirus shock: a story of another global crisis foretold and waht policy makers should be doing about it. UNCTD; 9 March 2020.
6. Guan WJ, Zhong NS. Clinical Characteristics of Covid-19 in China. *N Engl J Med* 2020; 382. DOI: 10.1056/NEJMc2005203.
7. Thomas P, Baldwin C, Bissett B, 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), 23 March 2020.

8. World Health Organisation. Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19) 16-24 February 2020. Available at: <https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf>. Accessed 30 March 2020.
9. Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet* 2020; 395(10223): 497-506. DOI: 10.1016/S0140-6736(20)30183-5.
10. Yang X, Yu Y, Xu J, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. *Lancet Respir Med* 2020; [Epub ahead of print]. DOI: 10.1016/S2213-2600(20)30079-5.
11. Melbourne Health (MH). *Guidance for staff about COVID-19 (Version 9)*. Melbourne: Royal Melbourne Hospital, MH, 27 March 2020.
12. Victoria State Government Health and Human services. Coronavirus disease 2019 (COVID-19) Case and contact management guidelines for health services and general practitioners (Version 17) 5 April 2020. Available at: <https://www.dhhs.vic.gov.au/health-services-and-general-practitioners-coronavirus-disease-covid-19>. Accessed 9 April 2020.
13. Health Protection Scotland. *Rapid review of the literature: Assessing the infection prevention and control measures for the prevention and management of COVID-19 in healthcare settings*. Scotland: Health Protection Scotland, 3 March 2020.
14. Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet* 2020; 395(10229): 1054-62. DOI: 10.1016/S0140-6736(20)30566-3.

15. Chang D, Mo G, Yuan X, et al. Time Kinetics of Viral Clearance and Resolution of Symptoms in Novel Coronavirus Infection. *Am J Respir Crit Care Med* 2020; [Epub ahead of print]. DOI: 10.1164/rccm.202003-0524LE.
16. World Health Organisation. *Critical preparedness, readiness and response actions for COVID-19 (Interim guidance)*. Geneva: WHO, 22 March 2020.
17. United Nations. *Global humanitarian response plan COVID-19: United Nations coordinated appeal April – December 2020*. Geneva: Coordination of Humanitarian Affairs (OCHA), 2020.
18. Department of Health. Coronavirus (COVID-19) current situation and case numbers. 6 May 2020. Available at: <https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/coronavirus-covid-19-current-situation-and-case-numbers>. Accessed 6 May 2020.
19. England N. *COVID-19 Hospital Discharge Service Requirements*. In: *Government O, ed: Crown Copyright*. UK: NHS, 2020.
20. Murray A, Gerada C, Morris J. We need a Nightingale model for rehab after covid-19 April 2020. Available at: <https://www.hsj.co.uk/commissioning/we-need-a-nightingale-model-for-rehab-after-covid-19-/7027335.article>. Accessed 18 April 2020.
21. Khan F, Amatya B. Medical rehabilitation in pandemics: Towards a new perspective. *J Rehabil Med* 2020; 20: jrm00043. DOI: 10.2340/16501977-2676.
22. Simpson R, Robinson L. Rehabilitation following critical illness in people with COVID-19 infection. *Am J Phys Med Rehabil* 2020; [Epub ahead of print]. DOI: 10.1097/PHM.0000000000001443.

23. Brugliera L, Spina A, Castellazzi P, et al. Rehabilitation of COVID-19 patients. *J Rehabil Med* 2020; 52(4): jrm00046. DOI: 10.2340/16501977-2678.
24. McNeary L, Maltser S, Verduzco-Gutierrez M. Navigating Coronavirus Disease 2019 (Covid-19) in psychiatry: a CAN report for inpatient rehabilitation facilities. *PM R* 2020; [Epub ahead of print]. DOI: 10.1002/pmrj.12369.
25. Mao L, Wang M, Chen S, et al. Neurological Manifestations of Hospitalized Patients with COVID-19 in Wuhan, China: a retrospective case series study. medRxiv 2020; [Epub ahead of print]. DOI: 10.1101/2020.02.22.20026500.
26. Talan J. COVID-19: Neurologists in Italy to colleagues in US: Look for poorly-defined neurologic conditions in patients with the coronavirus March 27, 2020 Available at: https://journals.lww.com/neurotodayonline/blog/breakingnews/pages/post.aspx?PostID=920&fbclid=IwAR2omdLXmhl7DEa0vLB8WVIMJp5CaI4w_gVQaJ6uPeKUNnAfpaGxy7fn3V0. Accessed 14 April 2020.
27. Xiang YT, Zhao YJ, Liu ZH, et al. The COVID-19 outbreak and psychiatric hospitals in China: managing challenges through mental health service reform. *Int J Bio Sci* 2020; 16(10): 1741-44.
28. Colbenson GA, Johnson A, Wilson ME. Post-intensive care syndrome: impact, prevention, and management. *Breathe (Sheff)* 2019; 15(2): 98-101. DOI: 10.1183/20734735.0013-2019.
29. Davidson JE, Harvey MA, Bemis-Dougherty A, et al. Implementation of the Pain, Agitation, and Delirium Clinical Practice Guidelines and promoting patient mobility to prevent post-intensive care syndrome. *Crit Care Med* 2013; 41(9 Suppl 1): S136-45. DOI: 10.1097/CCM.0b013e3182a24105.

30. Amatya B, Galea M, Li J, et al. Medical rehabilitation in disaster relief: Towards a new perspective. *J Rehabil Med* 2017; 49(8): 620-8. DOI: 10.2340/16501977-2250.
31. World health Organisation. Clinical management of severe acute respiratory infection (SARI) when COVID-19 disease is suspected. Interim guidance 13 March 2020 Available at: <file:///C:/Users/Bhasker/Downloads/WHO-2019-nCoV-clinical-2020.4-eng.pdf>. Accessed 5 April 2020.
32. Yu P, Wei Q, He C. Early rehabilitation for critically ill patients with COVID-2019: More benefits than risks. *Am J Phys Med Rehabil* 2020; [Epub ahead of print]. DOI: 10.1097/PHM.0000000000001445.
33. Hsieh MJ, Lee WC, Cho HY, et al. Recovery of pulmonary functions, exercise capacity, and quality of life after pulmonary rehabilitation in survivors of ARDS due to severe influenza A (H1N1) pneumonitis. *Influenza Other Respir Viruses* 2018; 12(5): 643-8. DOI: 10.1111/irv.12566.
34. 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: 10.3138/ptc-2020-0019.
35. Martin D, Howard J, Agarwal B, et al. Ebola virus disease: the UK critical care perspective. *Br J Anaesth* 2016; 116(5): 590-6. DOI: 10.1093/bja/aew098.
36. Moll R, Reece S, Cosford P, et al. The Ebola epidemic and public health response. *Br Med Bull* 2016; 117(1): 15-23. DOI: 10.1093/bmb/ldw007.
37. Phillips M, Turner-Stokes L, Wade D, et al. *Rehabilitation in the wake of Covid-19 - A phoenix from the ashes (Issue 1)*. London: British Society of Rehabilitation Medicine (BSRM) 27 April 2020.

38. 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: 10.3760/cma.j.cn112147-20200228-00206 10.3760/cma.j.cn112147-20200228-00206.
39. Mukaino M, Tatemoto T, Kumazawa N, et al. Staying active in isolation: Telerehabilitation for individuals with the SARS-CoV-2 infection. *Am J Phys Med Rehabil* 2020; [Epub ahead of print]. DOI: 10.1097/PHM.0000000000001441.
40. Khan F, Amatya B, Lee SY, et al. Rehabilitation in Disaster Relief. *Phys Med Rehabil Clin N Am* 2019; 30(4): 723-47. DOI: 10.1016/j.pmr.2019.06.001.
41. Cook TM. Personal protective equipment during the COVID-19 pandemic - a narrative review. *Anaesthesia* 2020. DOI: 10.1111/anae.15071.
42. Shapiro LT, Shultz JM. Letter to the Editor on "Disaster Rehabilitation Response Plan: Now or Never". *Am J Phys Med Rehabil* 2020. DOI: 10.1097/PHM.0000000000001433.
43. World Health Organization. *Rehabilitation: key for health in the 21st century (WHO/NMH/NVI/17.3)*. Geneva: WHO, 2017.
44. World Health Organization. *The need to scale up rehabilitation: background paper (WHO/NMH/NVI/17.1)*. Geneva: WHO, 2017.
45. Amatya B, Lee SY, Galea MP, et al. Disaster Rehabilitation Response Plan: Now or Never. *Am J Phys Med Rehabil* 2019; 99: 170-7. DOI: 10.1097/PHM.0000000000001308.
46. Vince G. The world's largest refugee camp prepares for covid-19. *BMJ* 2020; 368: m1205. DOI: 10.1136/bmj.m1205.

47. Amatya B, Khan F. COVID-19 in developing countries: a rehabilitation perspective. *J Int Soc Phys Med Rehabil* 2020; [Accepted for publication 05 May 2020].
48. World Health Organisation. *COVID -19 strategy update*. Geneva: WHO, 13 April 2020.
49. World Health Organisation. *Everybody business : strengthening health systems to improve health outcomes : WHO's framework for action*. Geneva: WHO, 2007.
50. World Health Organization. *Rehabilitation in health systems. Licence: CC BY-NC-SA 3.0 IGO*. Geneva: 2017, 2017.
51. Ad-hoc International Task Force. Report of an ad-hoc International Task Force to develop an expert-based opinion on early and short-term rehabilitative interventions (after the acute hospital setting) in COVID-19 survivors April 3, 2020. Available at: <https://www.thoracic.org/members/assemblies/assemblies/pr/journal-club/report-of-an-ad-hoc-international-task-force-to-develop-an-expert-based-opinion.php> Accessed 7 April 2020.

FIGURES CAPTION AND LEGENDS

FIGURE 1. Systemic collaboration and coordination pathway of the ISPRM and DRC to facilitate rehabilitation relief response in pandemics

AAP: Association of Academic Psychiatrists, AAPMR: American Academy of Physical Medicine and Rehabilitation, AMLAR: Latin American Society of Physical and Rehabilitation Medicine, AOSPRM: Asia Oceania Society of Physical and Rehabilitation Medicine, AOFNR: Asia Oceania Federation of NeuroRehabilitation, CBR: Community based rehabilitation COVID-19: Corona virus disease 2019, DRC: Disaster, Rehabilitation Committee, EFNR: European Federation of NeuroRehabilitation Societies, EMT: Emergency Medical Team, ESPMR: European Society of Physical and Rehabilitation Medicine, INGO: International non-governmental organisation, ISCoS: International Spinal Cord Society, ISPRM: International Society of Physical And Rehabilitation Medicine, NGO: Non-governmental organisation, PAHO: Pan American Health Organization, WCPT: World Confederation of Physical Therapy, WFOT: World Federation of Occupational Therapists, WFNR: World Federation Of NeuroRehabilitation, UN: United Nation; UNDRR: United Nations Office for Disaster Risk Reduction WHO: World Health Organisation, WHO-ISPRM LC: WHO ISPRM Liaison Committee

Figure 1

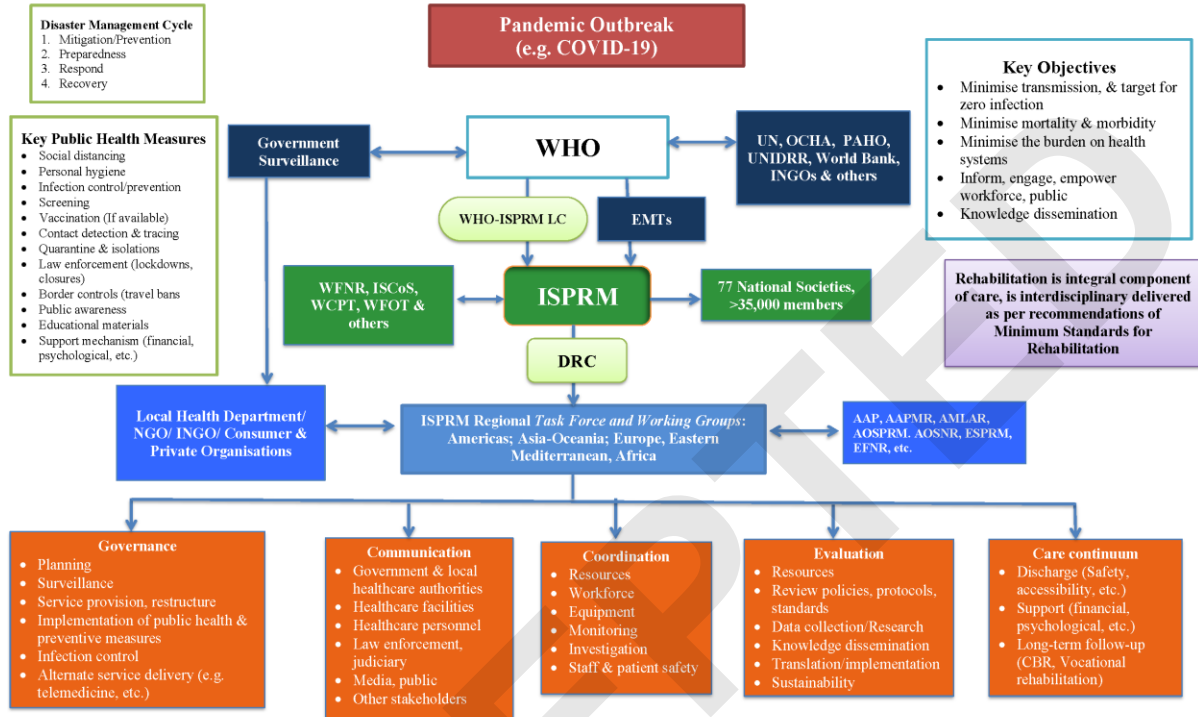


Table 1. Rehabilitation pathways for COVID-19 patients^{7,37,38}

Rehabilitation Pathways	Recommendations
<i>Recovery</i>	<ul style="list-style-type: none"> • Rehabilitation personnel should be part of the acute COVID-19 response team • Rehabilitation programs to be delivered by a coordinated interdisciplinary team of rehabilitation professionals (led by a rehabilitation medicine consultant) • Rehabilitation should start as early as possible with input from other medical specialties • A rapid access acute rehabilitation program to provide early intervention with an opportunity for further triage into post-acute pathways in the health network • Recovered patients should have access to community rehabilitation services in a timely manner • Patients with complex needs (or slower trajectory towards recovery) should receive specialist rehabilitation, for longer periods
<i>Infection control</i>	<ul style="list-style-type: none"> • Provision of separate rehabilitation services for both COVID-19 patients (positive and negative) be made available • Staff involved in face-to-face care have access to PPE • Stringent safety and cleaning procedures as recommended • Public health safety measures on the service (social distancing, hygiene, restriction in visitors, etc.)
<i>Assessment & prescription</i>	<ul style="list-style-type: none"> • Individual rehabilitation needs and goals of care be recorded, clinical assessment and recommendations noted prior to transfer to other facilities or discharge into community • Rehabilitation medicine physicians to assist in diagnosis, management and prognostication of patients with complex needs, and direction for appropriate clinical pathways • Rehabilitation programs to include: exercise, activities of daily living practice, emotional/mental support, education, information, and equipment/assistive devices • Careful consideration made prior to rehabilitation program prescription (stable clinical presentation with stable respiratory and haemodynamic function, and those with pre-existing disabilities, etc.) • Best decision-making opportunities provided to all patients for appropriate, neuro-palliative and end-of-life care • Provided adequate education/information and training for patients (carers/family)

<i>CBR & community reintegration</i>	<ul style="list-style-type: none">• Patients should have access to supported discharge and community reintegration programs• On-going specialist rehabilitation or generalist ambulatory rehabilitation services in the community for those in need• Integrated care planning for those with longer-term care needs• Supportive care from community-based organisations for patients with long-term disability requiring on-going support as appropriate• Care continuum and surveillance from specialist rehabilitation teams for patients with life-long complex disability
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CBR: Community-based rehabilitation, COVID-19: Coronavirus disease 2019, PPE: Personal protective equipment

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