

## Evidence check

4 May 2020

Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

### Rehabilitation needs of post-acute COVID-19 patients

#### Rapid review questions

1. What are the rehabilitation needs of post-acute COVID-19 cohort?
2. What is the appropriate timing of rehabilitation interventions?

#### In brief

- COVID-19 can affect respiratory, cognitive and motor functioning.
- A small quasi-randomised trial of elderly patients with COVID-19 showed respiratory rehabilitation can improve respiratory function, quality of life and anxiety.
- Recommendations from international researchers for physiotherapy in acute hospital settings cover post COVID-19 mobilisation, exercise and rehabilitation interventions. They recommend early rehabilitation after the acute phase of acute respiratory distress syndrome, which is of particular value to those admitted to ICU to limit the severity of ICU-acquired weakness and promote rapid functional recovery.
- Italian guidelines recommend rehabilitation both in the acute phase, when patient has reached a minimum clinical stability, and in the post-acute phase.
- Even with rehabilitation, Recovery time is variable - depending upon the degree of normocapnic respiratory failure, and the associated physical and emotional dysfunction.
- A living guideline for allied health professionals recommends a case prioritisation process that explicitly considers for each patient, the potential impact of not receiving immediate rehabilitation on critical outcomes (i.e., risk of hospitalisation, extended hospital stay).
- The British Society of Rehabilitation Medicine recommends rehabilitation pathways provided by coordinated networks, starting service provision in intensive care units, followed by an acute rehabilitation programme with the opportunity for further triage into post-acute pathways in the network.
- Tele-rehabilitation tools are available to observe and communicate directly with patients and/or staff already in isolation areas (e.g., use of data-secure cameras, such as iPads and baby monitors). Models for cardiac rehabilitation in COVID-19 have also been described.

#### Limitations

The sparse evidence that is available is generally low level and opinion-based.

## Background

Symptomology and treatment of COVID-19 can lead to cognitive, motor functioning and respiratory deterioration. Little is known about the long-term physical consequences of COVID-19. Patients who require intensive care or mechanical ventilation are at risk of post-intensive care syndrome. (1)

Tele-rehabilitation is well described in the literature in contexts broader than COVID-19, with evidence of its effectiveness or non-inferiority to usual care for conditions including, but not limited to, stroke (2-7) spinal cord injury, (8) Parkinson's disease, (9) following fracture recovery or hip/knee replacement, (10, 11) cardiac, (12) multiple sclerosis, (13) and surgical populations. (14)

Tele-rehabilitation models have also been described for COVID-19. (15, 16) Organising health services has also been described, with a small study from the United States describing how a hospital improved transitioning of patients from an acute care hospital to an inpatient rehabilitation facility to increase hospital bed capacity. (17) Organisations such as the Lung Foundation of Australia, and Societies such as the American Thoracic Society have rehabilitation resources available on their websites.

Case reports of COVID-19 and stroke patients have shown discharge to rehabilitation centres, showing the rehabilitation needs of these patients. (18)

## Methods (Appendix 1)

Databases and grey literature sources were searched on 27 April 2020 and 4 May 2020.

## Results (Tables 1, 2 and 3)

The application of telemedicine for rehabilitation has been described in published literature. (19-22)

**Table 1: What are the rehabilitation needs and timing of post-acute COVID-19 cohort?**

Title and author	Findings/Recommendations
<b>Peer reviewed journals</b>	
<p>Systematic rapid living review on rehabilitation needs due to COVID-19: Update to 31 March 2020</p> <p>Ceravolo et al., 2020 (23)</p>	<ul style="list-style-type: none"> <li>• Nine studies were included</li> <li>• For people hospitalised, ensure multidisciplinary care, monitoring conditions after a postural change, reducing unnecessary manoeuvres and checking for side effects</li> <li>• Passive mobilisation should be performed as early as possible to avoid immobilisation sequelae</li> <li>• Tele-rehabilitation is welcome</li> </ul>
<p>Respiratory rehabilitation in elderly patients with COVID-19: A randomized controlled study</p> <p>Liu et al., 2020 (24)</p>	<ul style="list-style-type: none"> <li>• Observational, prospective, quasi-experimental study</li> <li>• 72 total participants, 36 underwent respiratory rehabilitation and 36 without any rehabilitation intervention</li> <li>• After 6 weeks of respiratory rehabilitation in the intervention group, there disclosed significant differences in FEV1(L), FVC(L), FEV1/FVC%, DLCO% and 6 minute walk test. The SF-36 scores, in 8 dimensions, were statistically significant within the intervention group and between the two groups. SAS and SDS scores in the intervention group decreased after the intervention, but only anxiety had significant statistical significance within and between the two groups.</li> <li>• Six-week respiratory rehabilitation can improve respiratory function, QoL and anxiety of elderly patients with COVID-19, but it has little significant improvement on depression in the elderly.</li> </ul>
<p>Clinical Effect of Pulmonary Rehabilitation on Patients with Severe or Critically Severe COVID-19 Pneumonia</p> <p>Li et al, 2020 (25)</p>	<ul style="list-style-type: none"> <li>• Retrospective study, 43 patients with severe or critically severe COVID-19 pneumonia</li> <li>• Conserved intervention versus advanced intervention, according to the initiation time of the pulmonary rehabilitation intervention</li> <li>• The intervention included education, respiratory rehabilitation, physical training, psychological counselling and nutrition management</li> <li>• Oxygenation index increase to moderate level during ICU treatment, and the advanced intervention group showed a faster trend. Lymphocytopenia occurred in 35 patients. 25 patients had elevated blood d-dimer level during ICU stay. Only one DVT case was found in conserved intervention group, no significant differences found.</li> <li>• Pulmonary rehabilitation intervention can bring benefits in the treatment of patients with severe or critically severe COVID-19 pneumonia</li> </ul>
<p>Rehabilitation of COVID-19 patients (letter)</p> <p>Brugliera et al., 2020 (26)</p>	<ul style="list-style-type: none"> <li>• An integrated neuro-motor and respiratory rehabilitation program is required to be tailored, based on advanced age, obesity, multiple chronic diseases and organ failure</li> <li>• In the acute phase, relevant physiotherapy aspects include frequent changes of posture, passive mobilisation, positional therapy and recovery of motor function</li> </ul>

Title and author	Findings/Recommendations
	<ul style="list-style-type: none"> <li>• Neuromotor rehabilitation is a key concept of recovery from immobilisation syndrome - essential to create the basis for starting a complete rehabilitation program as soon as the infectious phase is over</li> <li>• Where patients experience post-intubation iatrogenic dysphagia, speech therapy and physiotherapy may be required to rehabilitate swallowing function</li> <li>• Aerobic exercise: for cases with respiratory/motor problems and physical deconditioning, strength training and balance training</li> <li>• Neuropsychological support may be required if anxiety, post-traumatic stress disorder and depression is present during recovery from COVID-19</li> <li>• In the acute phase, mainly characterised by respiratory disorders, early respiratory rehabilitation is highly recommended</li> </ul>
<p>Effect and enlightenment of rehabilitation medicine in COVID-19 management (review)</p> <p>Li 2020 (27)</p>	<ul style="list-style-type: none"> <li>• Dysfunction associated with COVID-19 may include respiratory function, cardiac function, functions of other organs, motor function, self-care in daily living activities and psychological disorders</li> <li>• Rehabilitation in the acute stage is lacking scientific evidence, current consensus for mild patients is that patients can perform respiratory and mild aerobic training</li> <li>• For severe and critical patients, adopt breath training at prone and/or semi recumbent bed position, moderate head elevation, limb mobilisation, bed and bedside sitting and standing and bedside walking.</li> <li>• In the recovery period, focus on exercise, diet, physiotherapy, living guidance and appropriate Chinese medicine techniques</li> </ul>
<p>The role of physical and rehabilitation medicine in the COVID-19 pandemic: the clinician's view (letter)</p> <p>Carda et al, 2020 (28)</p>	<ul style="list-style-type: none"> <li>• Main repercussions are respiratory, central nervous system (CNS) and cognitive, deconditioning, critical illness-related myopathy and neuropathy, dysphagia, joint stiffness and pain, and psychiatric problems</li> <li>• Rehabilitation of patients with lung fibrosis, secondary to acute respiratory distress syndrome (ARDS) is challenging. We have little evidence about the efficacy of specific rehabilitation techniques but suggest the treatment that is usually recommended in primary lung fibrosis</li> <li>• A bedside screening of executive functions and memory is highly recommended because nearly 50% of ARDS survivors showed cognitive sequelae at 2 years after the injury</li> <li>• Screening for dysphagia is mandatory in critical COVID-19 after extubation and should probably also be performed in older patients with severe disease</li> <li>• The use of tele-consulting for psychological evaluation should be supported and as well as for communication between patients and their families</li> </ul>
<p>Physiotherapy management for COVID-19 in the acute hospital</p>	<ul style="list-style-type: none"> <li>• Patients with COVID-19 who are admitted to ICU may be at high risk of developing ICU acquired weakness. It is therefore essential to anticipate early rehabilitation after the acute phase of acute respiratory distress syndrome in order to limit the severity of ICU-acquired weakness and promote rapid functional recovery</li> </ul>

Title and author	Findings/Recommendations
setting: clinical practice recommendations Thomas et al, 2020 (29)	<ul style="list-style-type: none"> <li>• Physiotherapy will have a role in providing exercise, mobilisation and rehabilitation interventions to patients associated with COVID-19 in order to enable a functional return to home</li> <li>• This will involve identifying additional physical resources that may be required for physiotherapy interventions and how the risk of cross-infection can be minimised (e.g. respiratory equipment; mobilisation, exercise and rehabilitation equipment, equipment storage)</li> </ul>
Early pulmonary rehabilitation for SARS-CoV-2 pneumonia: Experience from an intensive care unit outside of the Hubei province in China (letter of a case report)  Zhu et al, 2020 (30)	<ul style="list-style-type: none"> <li>• After weaning off ECMO, patients had an individualised ICU rehabilitation program</li> <li>• Postural change and prone position to improve gas exchange</li> <li>• Respiratory training to restore respiratory muscle strength and lung volume</li> <li>• Early mobilisation and physical exercises to improve respiratory and diaphragmatic muscle strength and promoting recovery of respiratory function</li> <li>• Psychological intervention and sleep promotion for anxiety and depression</li> </ul>
Recommendations for respiratory rehabilitation of coronavirus disease 2019 in adult (article in Chinese)  Chinese association of rehabilitation medicine (31)	<ul style="list-style-type: none"> <li>• Pulmonary rehabilitation would relieve the symptoms of dyspnoea, anxiety and depression, and eventually improve physical function and the quality of life for inpatients with COVID-19</li> <li>• For severe or critical inpatients, the early performance of pulmonary rehabilitation is not suggested</li> <li>• For isolating patients, the pulmonary rehabilitation guidance should be conducted through educational video, instruction manual or remote consultation</li> <li>• Assessment and monitoring should be performed throughout the entire pulmonary rehabilitation process</li> </ul>
Rehabilitation following critical illness in people with COVID-19 infection (review)  Simpson et al, 2020 (32)	<ul style="list-style-type: none"> <li>• Care is best delivered by a multidisciplinary team (MDT)</li> <li>• Existing evidence for effectiveness suggests that MDT rehabilitation should start early in the course of hospital treatment, involve patients and family in goal planning as much as possible/practical, and consider holistic bio-psycho-social needs</li> <li>• Active mobilisation in the ICU may be in phases (e.g., phase 1, balance practice, phase 2, mobilisation with weight bearing exercises e.g. sit to stand)</li> <li>• Early active mobilisation is associated with improved muscle strength. The patient may still be considered infective, requiring ongoing isolation, and disease reactivation has been observed in COVID-19 patients discharged from hospital</li> </ul>

Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

Title and author	Findings/Recommendations
	<ul style="list-style-type: none"> <li>• Many of the patients who survive COVID-19 associated critical illness will require admission to an inpatient rehabilitation facility in order to optimise functional status prior to discharge and community reintegration. Patients should have no signs or symptoms when transferred</li> <li>• In the context of the COVID-19 pandemic, virtual care outpatient episodes may be preferable to face-to-face interactions for multiple reasons</li> </ul>
<p>Recommendations for respiratory rehabilitation in adults with COVID-19</p> <p>Zhao et al, 2020 (33)</p>	<ul style="list-style-type: none"> <li>• Recommendations based on COVID-19, SARS and MERS publications</li> <li>• Our recommendations are:                             <ul style="list-style-type: none"> <li>- For inpatients with COVID-19, respiratory rehabilitation would relieve the symptoms of dyspnea, anxiety, and depression, and eventually improve physical functions and quality of life</li> <li>- For severe or critical inpatients, early respiratory rehabilitation is not recommended</li> </ul> </li> </ul>
<p>Medical rehabilitation in pandemics: Towards a new perspective</p> <p>Commentary</p> <p>Khan, 2020 (34)</p>	<ul style="list-style-type: none"> <li>• Organisational 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: specialised sub-acute rehabilitation facilities (located within an acute or remote facility) 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> </ul> </li> <li>• Operational issues                             <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: PPE for staff, environmental cleaning and disinfection procedures</li> <li>- Strict monitoring of patients, physicians/healthcare professional, employees, visitors for signs of infections</li> <li>- Adherence to droplet and airborne precautions during patient care, as per requirements (e.g., use of PPE)</li> </ul> </li> </ul>
<p>Rehabilitation and respiratory management in the acute and early post-acute phase. 'Instant</p>	<ul style="list-style-type: none"> <li>• The paper summarises a webinar on an experience from northern Italy</li> <li>• Some specific problems post-ICU stay for COVID-19, include muscle weakness and fatigue, joint stiffness, dysphagia, neuropsychological problems, impaired functioning concerning mobility and daily life and work activities</li> </ul>

Title and author	Findings/Recommendations
<p>paper from the field' on rehabilitation answers to the Covid-19 emergency</p> <p>Kiekens et al, 2020 (35)</p>	
<p>Redefining pathways into acute rehabilitation during the COVID-19 crisis</p> <p>Gitkind et al, 2020 (17)</p>	<ul style="list-style-type: none"> <li>• Describes how a hospital transitioned patients from an acute care hospital to an inpatient rehabilitation facility to increase hospital bed capacity</li> <li>• The needs of COVID-19 patients were not going to be traditional candidates</li> <li>• Patients who were COVID-19 positive were transferred when they were medically stable</li> <li>• Decisions were made on a case-by-case basis</li> <li>• Physician to physician communication was beneficial</li> </ul>
<p>Rehabilitation management of patients with COVID-19. Lessons learned from the first experiences in China</p> <p>Li 2020 (36)</p>	<ul style="list-style-type: none"> <li>• Rehabilitation concerns in Spain:                             <ul style="list-style-type: none"> <li>- COVID-19 related post-intensive care syndrome will likely add functional challenges to patients that rehabilitation professionals will need to address</li> </ul> </li> </ul>
<p>Beyond acute care: why collaborative self-management should be an essential part of rehabilitation pathways for COVID-19 patients</p> <p>Wainwright et al, 2020 (37)</p>	<ul style="list-style-type: none"> <li>• Rehabilitation services acknowledge that new models of post-acute care for COVID-19 will be required</li> <li>• These models must include collaborative self-management to optimise patient outcomes and meet clinical demand</li> <li>• Education is required as patients will need the right information and skills to manage their recovery</li> <li>• It is predicted that psychologic input will be important</li> </ul>
<p>How should the rehabilitation community prepare for 2019-nCoV?</p> <p>Choon-Huat Koh et al, 2020 (38)</p>	<ul style="list-style-type: none"> <li>• Deconditioning                             <ul style="list-style-type: none"> <li>- Deconditioning and providing rehabilitation while protecting healthcare staff are major concerns. Practical advice would include continuation of home exercises last prescribed, and continued attendance at rehabilitation centres with stepped-up infection control measures, if the patient is well</li> </ul> </li> <li>• Infection risk and control                             <ul style="list-style-type: none"> <li>- Home rehabilitation should be first option for those who can</li> </ul> </li> </ul>

Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

Title and author	Findings/Recommendations
	<ul style="list-style-type: none"> <li>- Infection control measures such as handwashing</li> <li>- Hospital management should designate and prepare isolation rooms with adequate PPE and trained staff.</li> <li>• Business continuity plans</li> <li>• Communication with staff</li> </ul>
<b>Grey literature</b>	
<p>What evidence is available re physiotherapy rehabilitation of a COVID-19 patient?</p> <p>National Health Library and Knowledge Service, of the Health Service Executive, Ireland (39)</p>	<ul style="list-style-type: none"> <li>• Specific recommendations for physiotherapy mobilisation, exercise and rehabilitation interventions include:                             <ul style="list-style-type: none"> <li>- Relevant PPE precautions need to be undertaken.</li> <li>- When screening referrals discussion with nursing staff, patient via phone and their family is recommended.</li> <li>- The number of staff who come into contact with the patient needs to be limited.</li> <li>- Direct physiotherapy contact should only be considered where there are considerable functional limitations such as frailty.</li> <li>- Early mobilisation is encouraged and patients in isolation should be encouraged to maintain function in their room.</li> <li>- Use of equipment needs careful consideration and input from local infection control team to ensure it can be decontaminated after use.</li> <li>- Multidisciplinary rehabilitation teams should be more fully incorporated along the disease trajectory from acute and inpatient care, through to the ambulatory settings and onward into the community</li> </ul> </li> </ul>
<p>International task force to develop an expert-based opinion on early and short-term rehabilitative interventions (after the acute hospital setting) in COVID-19</p> <p>Spruit et al, 2020 (40)</p>	<ul style="list-style-type: none"> <li>• Expert based preliminary recommendations:                             <ul style="list-style-type: none"> <li>- Consider routine follow-up of COVID-19 survivors when non-contagious</li> <li>- During the first 6-8 weeks in a patient's home environment, (presumably) infectious patients are recommended to do only low-intensity physical activity and exercises</li> <li>- Patients who are sent from hospital to a (inpatient) rehabilitation centre can start a multidisciplinary patient-centric program, using known pulmonary rehabilitation concepts</li> <li>- The regular exercise training principles that are normally used in patients with chronic lung diseases (COPD, asthma, IPF, etc.) can be considered for non-infectious COVID-19 survivors</li> </ul> </li> </ul>
<p>COVID-19 Hospital Discharge Service Requirements</p>	<ul style="list-style-type: none"> <li>• The document sets out the hospital discharge service requirements for all NHS trusts. The 'Discharge to Assess' model is based on 4% of patients requiring rehabilitation:                             <ul style="list-style-type: none"> <li>- Monitor and increase rehabilitation capacity</li> </ul> </li> </ul>

Title and author	Findings/Recommendations
NHS, 2020 (41)	<ul style="list-style-type: none"> <li>- Deliver enhanced occupational therapy and physiotherapy 7 days a week to reduce the length of time a patient needs to remain in a hospital rehabilitation bed</li> <li>- Maintain the flow of patients from community beds, including reablement and rehabilitation packages in home settings, to allow the next set of patients to be discharged from acute care</li> <li>- Track and assess patients after a period of recovery</li> </ul>
<p>Rehabilitation in the wake of Covid-19 - A phoenix from the ashes</p> <p>British Society of Rehabilitation Medicine, 2020 (42)</p>	<ul style="list-style-type: none"> <li>• Recovery pathways:                             <ul style="list-style-type: none"> <li>- Rehabilitation should start as early as possible, ideally while the patient is still in intensive care</li> <li>- On step-down from intensive care, a rapid access acute rehabilitation programme can provide very early intervention and the opportunity for further triage into post-acute pathways in the network</li> <li>- The majority of patients are on a fairly fast recovery track. Their needs may be met by local rehabilitation services, but these require significant expansion to enable patients to access them in a timely manner</li> <li>- A small number of patients will have more complex rehabilitation needs or a slower trajectory towards recovery. They may require specialist rehabilitation service, often for longer periods</li> </ul> </li> <li>• Infection control:                             <ul style="list-style-type: none"> <li>- Some post-COVID-19 patients will still be shedding the virus as they enter rehabilitation, especially in the early stages, so both COVID-19 positive and negative services are required</li> <li>- Rehabilitation typically involves close face-to-face care, so staff should have access to all the necessary personal protective equipment (PPE) to manage this safely</li> </ul> </li> <li>• Service provision:                             <ul style="list-style-type: none"> <li>- Close networking links between rehabilitation services, with adequate capacity at all levels.</li> <li>- Close integration of hospital and community services with collaborative commissioning arrangements. Primary care teams should be supported by outreach activity from secondary services including primary care supported by cardiopulmonary rehabilitation, sports and exercise medicine, neurorehabilitation and neurological disability services</li> <li>- Multi-disciplinary rehabilitation teams comprising all the relevant disciplines, including rehabilitation medicine, psychiatric and neuropsychiatric support, rehabilitation nursing, physiotherapy, O/T, clinical psychology/neuropsychology, SLT, dietetics and social work</li> <li>- Facilities that include specialist equipment, electronic assistive technology and orthotics</li> </ul> </li> </ul>
Rehabilitation for patients with COVID-19 guidance	<ul style="list-style-type: none"> <li>• Determine risk:</li> </ul>

Rapid evidence checks are based on a simplified review method and may not be entirely exhaustive, but aim to provide a balanced assessment of what is already known about a specific problem or issue. This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

Title and author	Findings/Recommendations
<p>for occupational therapists, physical therapists, speech-language pathologists, and assistants</p> <p>McMaster University et al, 2020 (43)</p>	<ul style="list-style-type: none"> <li>- Prioritisation should consider the risk of a patient not receiving immediate rehabilitation on critical outcomes (i.e., risk of hospitalisation, extended hospital stay).</li> <li>- If proceeding with a rehabilitation assessment or treatment session, point-of-care risk assessments should be conducted prior to each patient interaction</li> <li>• Do as much as possible without patient contact:                         <ul style="list-style-type: none"> <li>- Do not routinely enter an isolation area just to screen a patient with COVID-19</li> <li>- Gather information without direct patient contact for your subjective review: premorbid status, pre-treatment screening, and/or discharge planning.</li> <li>- Consider tele-rehabilitation tools to observe and communicate directly with patients and/or staff already in isolation areas (e.g., use of data-secure cameras, such as iPads and baby monitors). In some instances, these tools can assess dysphagia, communication, mobility and cognition</li> </ul> </li> <li>• Determine type of personal protective equipment needed for patient contact. Aerosol generating procedures require airborne precautions. Other procedures may require droplet and contact protection only</li> </ul>
<p>Joint statement on the role of respiratory rehabilitation in the COVID-19 crisis: the Italian position paper</p> <p>Vitacca et al, 2020 (44)</p>	<ul style="list-style-type: none"> <li>• Healthcare operators need to be sufficiently skilled</li> <li>• Operators and patients must follow all precautionary and preventive measures and wear all the protective gear</li> <li>• Respiratory rehabilitation is structured non-pharmacological therapy with a process delivered in three phases</li> <li>• All interventions must be performed to avoid the risk of droplets</li> <li>• Must be tailored to individuals needs</li> <li>• Assessment and monitoring should occur throughout the entire rehabilitation process</li> <li>• Rehabilitation operators can also attend to reduce anxiety and depression in patients</li> <li>• Specific recommendations for the acute phase and critical phase are also provided</li> <li>• In the acute phase, the rehabilitative intervention in this phase had to be started when patient has reached a minimum clinical stability</li> <li>• In the post-acute phase, recovery time is variable depending upon the degree of normocapnic respiratory failure, and the associated physical and emotional dysfunction</li> </ul>

## References

1. Smith JM, Lee AC, Zeleznik H, Coffey Scott JP, Fatima A, Needham DM, et al. Home and Community-Based Physical Therapist Management of Adults With Post-Intensive Care Syndrome. *Phys Ther.* 2020.
2. Laver KE, Adey-Wakeling Z, Crotty M, Lannin NA, George S, Sherrington C. Telerehabilitation services for stroke. *Cochrane Database Syst Rev.* 2020;1(1):Cd010255.
3. Appleby E, Gill ST, Hayes LK, Walker TL, Walsh M, Kumar S. Effectiveness of telerehabilitation in the management of adults with stroke: A systematic review. *PLoS One.* 2019;14(11):e0225150.
4. Maier M, Rubio Ballester B, Duff A, Duarte Oller E, Verschure P. Effect of Specific Over Nonspecific VR-Based Rehabilitation on Poststroke Motor Recovery: A Systematic Meta-analysis. *Neurorehabil Neural Repair.* 2019;33(2):112-29.
5. Rintala A, Päivärinne V, Hakala S, Paltamaa J, Heinonen A, Karvanen J, et al. Effectiveness of Technology-Based Distance Physical Rehabilitation Interventions for Improving Physical Functioning in Stroke: A Systematic Review and Meta-analysis of Randomized Controlled Trials. *Arch Phys Med Rehabil.* 2019;100(7):1339-58.
6. Tchero H, Tabue Teguo M, Lannuzel A, Rusch E. Telerehabilitation for Stroke Survivors: Systematic Review and Meta-Analysis. *J Med Internet Res.* 2018;20(10):e10867.
7. Sarfo FS, Ulasavets U, Opare-Sem OK, Ovbiagele B. Tele-Rehabilitation after Stroke: An Updated Systematic Review of the Literature. *J Stroke Cerebrovasc Dis.* 2018;27(9):2306-18.
8. de Araújo AVL, Neiva JFO, Monteiro CBM, Magalhães FH. Efficacy of Virtual Reality Rehabilitation after Spinal Cord Injury: A Systematic Review. *Biomed Res Int.* 2019;2019:7106951.
9. Lei C, Sunzi K, Dai F, Liu X, Wang Y, Zhang B, et al. Effects of virtual reality rehabilitation training on gait and balance in patients with Parkinson's disease: A systematic review. *PLoS One.* 2019;14(11):e0224819.
10. Wang X, Hunter DJ, Vesentini G, Pozzobon D, Ferreira ML. Technology-assisted rehabilitation following total knee or hip replacement for people with osteoarthritis: a systematic review and meta-analysis. *BMC Musculoskelet Disord.* 2019;20(1):506.
11. Yadav L, Haldar A, Jasper U, Taylor A, Visvanathan R, Chehade M, et al. Utilising Digital Health Technology to Support Patient-Healthcare Provider Communication in Fragility Fracture Recovery: Systematic Review and Meta-Analysis. *Int J Environ Res Public Health.* 2019;16(20).
12. Oldridge N, Pakosh M, Grace SL. A systematic review of recent cardiac rehabilitation meta-analyses in patients with coronary heart disease or heart failure. *Future Cardiol.* 2019;15(3):227-49.
13. Di Tella S, Pagliari C, Blasi V, Mendozzi L, Rovaris M, Baglio F. Integrated telerehabilitation approach in multiple sclerosis: A systematic review and meta-analysis. *J Telemed Telecare.* 2019;1357633x19850381.
14. van Egmond MA, van der Schaaf M, Vredeveld T, Vollenbroek-Hutten MMR, van Berge Henegouwen MI, Klinkenbijn JHG, et al. Effectiveness of physiotherapy with telerehabilitation in surgical patients: a systematic review and meta-analysis. *Physiotherapy.* 2018;104(3):277-98.
15. Babu AS, Arena R, Ozemek C, Lavie CJ. COVID-19: A Time for Alternate Models in Cardiac Rehabilitation to Take Center Stage. *Can J Cardiol.* 2020.
16. Dalal H, Taylor RS, Greaves C, Doherty PJ, McDonagh ST, van Beurden SB, et al. Correspondence to the EJPC in response to position paper by Ambrosetti M et al. 2020: Cardiovascular rehabilitation and COVID-19: The need to maintain access to evidence-based services from the safety of home. *Eur J Prev Cardiol.* 2020:2047487320923053.
17. Gitkind AI, Levin S, Dohle C, Herbold J, Thomas M, Oh-Park M, et al. Redefining Pathways into Acute Rehabilitation During the COVID-19 Crisis. *Pm r.* 2020.
18. Oxley TJ, Mocco J, Majidi S, Kellner CP, Shoirah H, Singh IP, et al. Large-Vessel Stroke as a Presenting Feature of Covid-19 in the Young. *N Engl J Med.* 2020.
19. Negrini S, Kiekens C, Bernetti A, Capecci M, Ceravolo MG, Lavezzi S, et al. Telemedicine from research to practice during the pandemic. "Instant paper from the field" on rehabilitation answers to the Covid-19 emergency. *Eur J Phys Rehabil Med.* 2020.

20. Thomas E, Gallagher R, Grace ASL. Future-proofing cardiac rehabilitation: Transitioning services to telehealth during COVID-19. *Eur J Prev Cardiol*. 2020:2047487320922926.
21. Yeo TJ, Wang YL, Low TT. Have a heart during the COVID-19 crisis: Making the case for cardiac rehabilitation in the face of an ongoing pandemic. *Eur J Prev Cardiol*. 2020:2047487320915665.
22. Verduzco-Gutierrez M, Bean AC, Tenforde AS, Tapia RN, Silver JK. How to Conduct an Outpatient Telemedicine Rehabilitation or Prehabilitation Visit. *Pm r*. 2020.
23. Ceravolo MG, De Sire A, Andrenelli E, Negrini F, Negrini S. Systematic rapid "living" review on rehabilitation needs due to covid-19: update to march 31st 2020. *Eur J Phys Rehabil Med*. 2020.
24. Liu K, Zhang W, Yang Y, Zhang J, Li Y, Chen Y. Respiratory rehabilitation in elderly patients with COVID-19: A randomized controlled study. *Complement Ther Clin Pract*. 2020;39:101166-.
25. Li J HX. Clinical Effect of Pulmonary Rehabilitation on Patients with Severe or Critically Severe COVID-19 Pneumonia. Preprints with THE LANCET Available at SSRN: <https://ssrncom/abstract=3566145> or <http://dxdoiorg/102139/ssrn3566145>. 2020.
26. Brugliera L, Spina A, Castellazzi P, Cimino P, Tettamanti A, Houdayer E, et al. Rehabilitation of COVID-19 patients. *J Rehabil Med*. 2020;52(4):jrm00046.
27. Li J. Effect and enlightenment of rehabilitation medicine in COVID-19 management. *Eur J Phys Rehabil Med*. 2020.
28. Carda S, Invernizzi M, Bavikatte G, Bensmaïl D, Bianchi F, Deltombe T, et al. The role of physical and rehabilitation medicine in the COVID-19 pandemic: the clinician's view. *Ann Phys Rehabil Med*. 2020.
29. Thomas P, Baldwin C, Bissett B, Boden I, Gosselink R, Granger CL, et al. Physiotherapy management for COVID-19 in the acute hospital setting: clinical practice recommendations. *J Physiother*. 2020.
30. Zhu C, Wu Y, Liu H, Ban Y, Ma X, Zhang Z. Early pulmonary rehabilitation for SARS-CoV-2 pneumonia: Experience from an intensive care unit outside of the Hubei province in China. *Heart Lung*. 2020.
31. [Recommendations for respiratory rehabilitation of coronavirus disease 2019 in adult]. *Zhonghua Jie He He Hu Xi Za Zhi*. 2020;43(4):308-14.
32. Simpson R, Robinson L. Rehabilitation following critical illness in people with COVID-19 infection. *Am J Phys Med Rehabil*. 2020.
33. Zhao HM, Xie YX, Wang C. Recommendations for respiratory rehabilitation in adults with COVID-19. *Chin Med J (Engl)*. 2020.
34. Khan F, Amatya B. Medical Rehabilitation in Pandemics: Towards a New Perspective. *J Rehabil Med*. 2020;52(4):jrm00043.
35. Kiekens C, Boldrini P, Andreoli A, Avesani R, Gamna F, Grandi M, et al. Rehabilitation and respiratory management in the acute and early post-acute phase. "Instant paper from the field" on rehabilitation answers to the Covid-19 emergency. *Eur J Phys Rehabil Med*. 2020.
36. Li J. Rehabilitation management of patients with COVID-19. Lessons learned from the first experiences in China. *Eur J Phys Rehabil Med*. 2020.
37. Wainwright TW, Low M. Beyond acute care: Why collaborative self-management should be an essential part of rehabilitation pathways for COVID-19 patients. *J Rehabil Med*. 2020.
38. Choon-Huat Koh G, Hoening H. How Should the Rehabilitation Community Prepare for 2019-nCoV? *Arch Phys Med Rehabil*. 2020.
39. National Health Library and Knowledge Service, of the Health Service Executive, Ireland. What evidence is available re physiotherapy rehabilitation of a COVID-19 patient? . Accessed on 27 April 2020 Available from: <https://www.lenus.ie/bitstream/handle/10147/627425/Evidence-Summary-COVID-19-Physiotherapy-Rehabilitation-00000002pdf?sequence=2&isAllowed=y>. 2020.
40. Spruit M HA, Singh S, Troosters T. 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. Version April 3. Accessed on 27 April 2020 Available from: <https://www.sunnaasno.seksjon/RKR/Documents/AD-HOC%20INTERNATIONAL%20TASK%20FORCE%20TO%20DEVELOP%20AN%20EXPERT->

[BASED%20OPINION%20ON%20EARLY%20AND%20SHORT-TERM%20REHABILITATIVE%20INTERVENTIONS%20%28AFpdf](#). 2020.

41. NHS. COVID-19 Hospital Discharge Service Requirements. Accessed on 1 April 2020 Available from:

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/880288/COVID-19\\_hospital\\_discharge\\_service\\_requirements.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/880288/COVID-19_hospital_discharge_service_requirements.pdf). 2020.

42. British Society of Rehabilitation Medicine. Rehabilitation in the wake of Covid-19 - A phoenix from the ashes. accessed on 1 April 2020 Available from: <https://www.bsrm.org.uk/downloads/covid-19bsrmissue1-published-27-4-2020.pdf>. 2020.

43. McMaster University. Rehabilitation for Patients with COVID-19 Guidance for Occupational Therapists, Physical Therapists, Speech-Language Pathologists, and Assistants. Accessed on 1 April 2020 Available from: <https://srs-mcmaster.ca/wp-content/uploads/2020/04/Rehabilitation-for-Patients-with-COVID-19-Apr-08-2020.pdf>. 2020.

44. Vitacca M CM, Clini E, Paneroni M, Lazzeri M, Lanza A, et al. Joint statement on the role of respiratory rehabilitation in the COVID-19 crisis: the Italian position paper. on behalf of the Italian Thoracic Society (ITS - AIPO), Association for the Rehabilitation of Respiratory Failure (ARIR) and the Italian Respiratory Society (SIP/IRS). 2020.

## Appendix 1

Rehabilitation search strategy and strings:

- PubMed: (((2019-nCoV[title/abstract] or nCoV\*[title/abstract] or covid-19[title/abstract] or covid19[title/abstract] OR "covid 19"[title/abstract] OR "coronavirus"[MeSH Terms] OR "coronavirus"[title/abstract] OR sars-cov-2[title/abstract] OR "severe acute respiratory syndrome coronavirus 2"[Supplementary Concept]))) AND (((((((Physiotherap\*[Title/Abstract]) OR ("physical therap\*"[Title/Abstract])) OR ("speech therap\*"[Title/Abstract])) OR ("neurological therap\*"[Title/Abstract])) OR ("speech pathologist\*"[Title/Abstract])) OR (rehab\*[Title/Abstract])) OR (rehabilitation[MeSH Terms]))
- Google: "rehabilitation" AND (covid19 OR covid 19 OR 2019-nCoV OR nCoV OR covid-19 OR coronavirus OR SARS) AND restrict to year 2020.
- Proquest: "rehabilitation" AND (covid19 OR covid 19 OR 2019-nCoV OR nCoV OR covid-19 OR coronavirus OR SARS) AND restrict to year 2020.

Non-English language were excluded.

**Evidence checks are archived a year after the date of publication**

SHPN: (ACI) 210287 | ISBN: 978-1-76081-681-0 | TRIM: ACI/D20/2511-51