

## Evidence check

7 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 This brief has not been peer-reviewed and should not be a substitute for individual clinical judgement, nor is it an endorsed position of NSW Health.

## Pulmonary rehabilitation and COVID-19

### Rapid review question

What is the guidance for the provision of pulmonary rehabilitation for people recovering from COVID-19?

### In brief

- 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 intensive care unit (ICU) to limit the severity of ICU-acquired weakness and promote rapid functional recovery.
- Expert opinion suggests pulmonary rehabilitation could relieve the symptoms of dyspnoea, anxiety and depression, and eventually improve physical function and quality of life.
- One article lists a range of common practices used in respiratory physiotherapy that are not recommended in with patients with COVID-19 in the acute phase including diaphragmatic breathing, pursed lips breathing, manual mobilisation or stretching of the rib cage, respiratory muscle training, exercise training and mobilisation during clinical instability. Other guidance suggests early mobilisation and physical exercises to improve respiratory and diaphragmatic muscle strength and promote recovery.
- A living guideline for allied health professionals recommends that case prioritisation consider the potential impact on critical outcomes of a patient not receiving immediate rehabilitation.
- Guidance suggests continuing rehabilitation care in the outpatient setting, and at home through ongoing therapy either in-person or via telehealth.
- The American Thoracic Society does not endorse a specific approach to pulmonary rehabilitation during COVID-19. However a patient education factsheet has been published suggesting some ways to continue pulmonary rehabilitation at home. The British Thoracic Society released a resource kit with guidance to support pulmonary rehabilitation remote assessment during COVID-19.
- The Lung Foundation Australia is facilitating an at-home exercise series through the initiative COVID-19 - Maintaining Movement.

## Limitations

The evidence base is dynamic and information is still emerging about best responses for the provision of pulmonary rehabilitation in the post-acute recovery phase of COVID-19. The evidence that is available is generally low level and opinion-based. Recommendations are copied from source material and no attempt has been made to integrate the different guidance. There may be additional evidence, guidance and resources not included in this rapid review.

## 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 models have also been described for COVID-19. (2, 3) 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. (4) Organisations such as the Lung Foundation of Australia, and societies such as the American Thoracic Society have limited rehabilitation resources available on their websites. (5-7).

## Methods (Appendix 1)

PubMed and grey literature sources were searched on 27 April 2020 and 7 May 2020.

**Results**

**Table 1: Provision of pulmonary rehabilitation after COVID-19**

Title and author	Findings and recommendations
<b>Peer reviewed journals</b>	
Systematic rapid living review on rehabilitation needs due to COVID-19: Update to 31 March 2020  Ceravolo, et al. 2020 (8)	<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>
Respiratory rehabilitation in elderly patients with COVID-19: A randomized controlled study  Liu, et al. 2020 (9)	<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 six weeks of respiratory rehabilitation in the intervention group, significant differences in FEV1 (L), FVC (L), FEV1/FVC%, DLCO% and 6 minute walk test were found. 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, quality of life, and anxiety of elderly patients with COVID-19, but it has little significant improvement on depression in the elderly</li> </ul>
Clinical effect of pulmonary rehabilitation on patients with severe or critically severe COVID-19 pneumonia  Li, et al. 2020 (10)	<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, and 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 deep vein thrombosis 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>

Title and author	Findings and recommendations
<p>Rehabilitation of COVID-19 patients (letter)</p> <p>Brugliera, et al. 2020 (11)</p>	<ul style="list-style-type: none"> <li>• An integrated neuromotor 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> <li>• Neuromotor rehabilitation is a key concept of recovery from immobilisation syndrome. It is 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 and/or 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 are 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 (12)</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 (13)</p>	<ul style="list-style-type: none"> <li>• Main repercussions are respiratory, central nervous system 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 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 acute respiratory distress syndrome survivors showed cognitive sequelae at two years after the injury</li> </ul>

Title and author	Findings and recommendations
	<ul style="list-style-type: none"> <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 setting: clinical practice recommendations</p> <p>Thomas, et al. 2020 (14)</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> <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>
<p>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)</p> <p>Zhu, et al. 2020 (15)</p>	<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>
<p>Respiratory physiotherapy in patients with COVID-19 infection in acute setting: a position paper of the Italian Association of Respiratory Physiotherapists (ARIR)</p> <p>Lazzeri, et al. 2020 (16)</p>	<ul style="list-style-type: none"> <li>• Common practices used in respiratory physiotherapy that are not recommended on patients with COVID-19 in the acute phase: diaphragmatic breathing, pursed lips breathing, bronchial hygiene or lung re-expansion techniques, incentive spirometer, manual mobilisation or stretching of the rib cage, nasal washings, respiratory muscle training, exercise training and mobilisation during clinical instability</li> </ul>

Title and author	Findings and recommendations
<p>Core outcome set for clinical trials on coronavirus disease 2019 (COS-COVID)</p> <p>Jin, et al. 2020 (17)</p>	<ul style="list-style-type: none"> <li>• After two rounds of Delphi survey and one consensus meeting, the most important outcomes for the different clinical classifications of COVID-19 were identified and determined to constitute the core outcome set for clinical trials on COVID-19. One outcome was for the rehabilitation period (pulmonary function)</li> </ul>
<p>Recommendations for respiratory rehabilitation of coronavirus disease 2019 in adult (article in Chinese) (18)</p>	<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>
<p>Rehabilitation following critical illness in people with COVID-19 infection (review)</p> <p>Simpson, et al. 2020 (19)</p>	<ul style="list-style-type: none"> <li>• Care is best delivered by a multidisciplinary team</li> <li>• Existing evidence for effectiveness suggests that multidisciplinary team rehabilitation should start early in the course of hospital treatment, involve patients and family in goal planning as much as possible and 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 such as 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> <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 (20)</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>

Title and author	Findings and recommendations
<p>Medical rehabilitation in pandemics: Towards a new perspective (commentary)</p> <p>Khan 2020 (21)</p>	<ul style="list-style-type: none"> <li>• Organisational                             <ul style="list-style-type: none"> <li>○ Include rehabilitation personnel in the COVID-19 response team</li> <li>○ Use an 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 an electronic platform for effective collaboration and communication with other healthcare service providers</li> <li>○ Coordinate with emergency and other relevant stakeholders</li> <li>○ Undertake stringent risk assessment from every aspect</li> </ul> </li> <li>• Operational                             <ul style="list-style-type: none"> <li>○ Establish specific COVID-19 units separate from non-COVID-19 units within rehabilitation units</li> <li>○ Use stringent safety and cleaning procedures: personal protective equipment (PPE) for staff, environmental cleaning and disinfection procedures</li> <li>○ Strictly monitor patients, healthcare professionals, employees, visitors for signs of infections</li> <li>○ Adhere to droplet and airborne precautions during patient care, as per requirements (e.g. use of PPE)</li> </ul> </li> </ul>
<p>COVID-19: the challenge of patient rehabilitation after intensive care</p> <p>Thornton 2020 (22)</p>	<ul style="list-style-type: none"> <li>• Three case studies from the UK</li> <li>• Patients with COVID-19 seem to be ventilated for far longer than the average ICU patient, causing higher levels of deconditioning</li> </ul>
<p>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</p> <p>Kiekens, et al. 2020 (23)</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 and recommendations
<p>Redefining pathways into acute rehabilitation during the COVID-19 crisis</p> <p>Gitkind, et al. 2020 (4)</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>• 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>Considerations for post-acute rehabilitation for survivors of COVID-19</p> <p>Sheehy 2020 (24)</p>	<ul style="list-style-type: none"> <li>• Three areas relevant to rehabilitation after COVID-19 were identified.                             <ul style="list-style-type: none"> <li>○ How patients might present: comorbidities, complications from an intensive care unit stay +/- intubation, and the effects of the virus on multiple body systems, including cardiac, neurological, cognitive, and mental health</li> <li>○ Suggested procedures regarding design of an inpatient rehabilitation unit for COVID-19 survivors, staffing issues, and considerations for outpatient rehabilitation</li> <li>○ Guidelines for rehabilitation (physiotherapy, occupational therapy, speech-language pathology) following COVID-19, with respect to recovery of the respiratory system as well as mobility and function</li> </ul> </li> <li>• A thorough assessment and individualised, progressive treatment plan which focuses on function, disability, and return to participation in society will help each patient to maximise their function and quality of life</li> <li>• Careful consideration of the rehabilitation environment will ensure that all patients have the most complete recovery</li> </ul>
<p>The war on COVID-19 pandemic: role of rehabilitation professionals and hospitals</p> <p>Lew, et al. 2020 (25)</p>	<ul style="list-style-type: none"> <li>• Description of the anticipated rehabilitation demands, and the strategies to meet the needs of this population</li> <li>• The complications from COVID-19 can be reduced by delivering interdisciplinary rehabilitation that is initiated early and continued throughout the acute hospital stay, providing patient/family education for self-care after discharge from inpatient rehabilitation at either acute or subacute settings, and continuing rehabilitation care in the outpatient setting, and at home through ongoing therapy either in-person or via telehealth (1-3)</li> </ul>
<p>Rehabilitation management of patients with COVID-19. Lessons learned from the first experiences in China</p> <p>Li 2020 (26)</p>	<ul style="list-style-type: none"> <li>• Some of the patients may have long-term impairment and dysfunctions, including pulmonary fibrosis, heart, liver, kidney, nerve and immune system</li> <li>• Rehabilitation has certain beneficial effect in the acute stage, and especially in the recovery stage, including improving respiratory function, exercise endurance, self-care in daily living activities, as well as psychological support</li> <li>• A reasonable rehabilitation program needs scientific research to avoid arbitrary conclusions</li> </ul>
<p>Beyond acute care: why collaborative self-</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> </ul>

Title and author	Findings and recommendations
<p>management should be an essential part of rehabilitation pathways for COVID-19 patients</p> <p>Wainwright, et al. 2020 (27)</p>	<ul style="list-style-type: none"> <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 (28)</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 the first option for those who can</li> <li>○ Infection control measures such as handwashing</li> <li>○ Hospital management should designate and prepare isolation rooms with adequate PPE and trained staff</li> </ul> </li> <li>• Business continuity plans</li> <li>• Communication with staff</li> </ul>
<p>How to conduct an outpatient telemedicine rehabilitation or prehabilitation visit</p> <p>Verduzco-Gutierrez, et al. 2020 (29)</p>	<ul style="list-style-type: none"> <li>• Outline of the components of an outpatient telemedicine visit for physiatrists with a particular focus on an adapted virtual physical examination.</li> <li>• Includes:                             <ol style="list-style-type: none"> <li>1. a system-based approach to performing and documenting a physical exam via telemedicine</li> <li>2. examples of special tests that may be performed during telemedicine physical examination</li> <li>3. types of virtual services and associated billing codes during this public health emergency</li> <li>4. documentation criteria and examples for the telemedicine visit</li> </ol> </li> </ul>

Title and author	Findings and recommendations
<p>Postacute care preparedness for COVID-19 - thinking ahead</p> <p>Grabowski, et al. 2020 (30)</p>	<ul style="list-style-type: none"> <li>• All patients need to be tested for COVID-19 when they are being discharged to a postacute care setting regardless of whether they were being treated for COVID-19 at the hospital. No individual who has COVID-19 should be discharged to a mainstream postacute care setting except for those rare instances in which the facility can safely and effectively isolate the patient from other residents</li> <li>• Specialised postacute care environments will need to be developed to treat patients who are recovering from COVID-19 and cannot receive care at existing facilities while still potentially contagious. These specialised environments could potentially take several forms. One approach would be to dedicate certain postacute care facilities in each area to be 'centres of excellence' specialising in, and exclusively assuming, the care of patients recovering from COVID-19</li> </ul>
<p>Implications for online management: two cases with COVID-19</p> <p>Huang, et al. 2020 (31)</p>	<ul style="list-style-type: none"> <li>• Satisfactory outcome was observed in one mild case and one severe case of COVID-19 pneumonia after the use of the online and offline multidisciplinary quarantine observation form, online monitoring, and classified diagnosis and treatment, as well as strict compliance with quarantine measures. Conditions of both patients were improved, and cross-infection and disease onset clustering were not observed. The multidisciplinary self-quarantine model provides early judgment, identification, and treatment of disease, improves compliance with early rehabilitation, increases confidence in recovery, and enhances self-management capabilities</li> </ul>
<p><b>Grey literature</b></p>	
<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 2020 (32)</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, a referrals discussion via phone with nursing staff, patient 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>

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<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 (33)</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 (chronic obstructive pulmonary disease, asthma, idiopathic pulmonary fibrosis, etc.) can be considered for non-infectious COVID-19 survivors</li> </ul> </li> </ul>
<p>COVID-19 hospital discharge service requirements</p> <p>NHS 2020 (34)</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> <li>○ Deliver enhanced occupational therapy and physiotherapy seven 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> </li> </ul>
<p>Rehabilitation in the wake of COVID-19: a phoenix from the ashes</p> <p>British Society of Rehabilitation Medicine 2020 (35)</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 PPE to manage this safely</li> </ul> </li> </ul>

Title and author	Findings and recommendations
	<ul style="list-style-type: none"> <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>○ Multidisciplinary rehabilitation teams comprising all the relevant disciplines, including rehabilitation medicine, psychiatric and neuropsychiatric support, rehabilitation nursing, physiotherapy, occupational therapy, clinical psychology and neuropsychology, speech and language therapy, dietetics and social work</li> <li>○ Facilities that include specialist equipment, electronic assistive technology and orthotics</li> </ul> </li> </ul>
<p>Rehabilitation for patients with COVID-19 guidance for occupational therapists, physical therapists, speech-language pathologists, and assistants</p> <p>McMaster University, et al. 2020 (36)</p>	<ul style="list-style-type: none"> <li>• Determine risk                             <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> </ul> </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 PPE 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 (37)</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> </ul>

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	<ul style="list-style-type: none"> <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>
<p>Pulmonary rehabilitation resources in a complex and rapidly changing world</p> <p>Garvey, et al. 2020 (7)</p>	<ul style="list-style-type: none"> <li>• Unable to endorse a specific approach to pulmonary rehabilitation during the current challenges.</li> <li>• To date, home alternatives have not had a robust body of evidence to suggest they are a substitute for centre-based pulmonary rehabilitation</li> <li>• Provides some resources for pulmonary rehabilitation during COVID-19</li> <li>• Remote pulmonary rehabilitation should delivery the essential components including exercise training, education and behaviour change</li> </ul>
<p>Pulmonary rehabilitation toolkit</p> <p>The Lung Foundation of Australia 2020 (5)</p>	<ul style="list-style-type: none"> <li>• Pulmonary rehabilitation toolkit – to provide an adaptable version of rehabilitation:                         <ol style="list-style-type: none"> <li>1. home based pulmonary rehabilitation</li> <li>2. lung support services (texting for wellness)</li> </ol> </li> <li>• COVID-19: Maintaining Movement started on 1 April 2020 and is facilitated by the pulmonary exercise manager and exercise physiologist. The online series takes people through step-by-step experiences that can be completed at home.</li> </ul>
<p>COVID-19: information for the respiratory community</p> <p>British Thoracic Society 2020 (6)</p>	<ul style="list-style-type: none"> <li>• Pulmonary rehabilitation resource packs:                         <ol style="list-style-type: none"> <li>1. remote assessments during the COVID-19 pandemic</li> <li>2. supporting pulmonary rehabilitation when face to face isn't possible</li> </ol> </li> </ul>
<p>What to do when pulmonary rehabilitation is unavailable</p> <p>Corn 2020 (38)</p>	<ul style="list-style-type: none"> <li>• Patient education information series through the American Thoracic Society. The factsheet offers some ways to continue with pulmonary rehabilitation at home</li> </ul>

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## Appendix 1

### PubMed

((rehabilitation[MeSH Terms] OR rehabilitation[title/abstract] OR exercise\*[title/abstract])) AND (pulmonary OR respiratory) AND ((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 ((english[Filter]) AND (2019:2020[pdat]))

### Grey literature using Google and Twitter

(COVID-19 or covid or coronavirus) and (pulmonary rehabilitation or pulmonary exercise)