

Canadian Thoracic Society position statement on rehabilitation for COVID-19 and implications for pulmonary rehabilitation

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This position statement aims to provide rapid guidance for pulmonary rehabilitation in adults with COVID-19 illness. These recommendations are based on the consensus of the authors, who are members of the Canadian Thoracic Society (CTS) Chronic Obstructive Lung Disease, Interstitial Lung Disease, Pulmonary Vascular Disease and Canadian Respiratory Health Professionals Assemblies. Changes in our understanding of COVID-19 and the course of the pandemic may affect the guidance in this statement. We plan to update this guidance as new information becomes available and recommend periodically checking the Canadian Thoracic Society website for updates.

Background

Since the beginning of the COVID-19 pandemic, there have been more than 229 million cases and 4.7 million deaths worldwide with over 1.5 million cases and 27,000 deaths in Canada.¹ Most people with COVID-19 experience mild to moderate illness; however, 10-15% will develop severe illness and 5% will become critically ill.² In addition, although the typical time course of recovery for COVID-19 is 2 to 6 weeks, there is increasing recognition that for many patients, symptoms persist for several months after the acute infection, irrespective of the severity of the initial illness.² Given that many patients with COVID-19 experience lung injury and chronic respiratory symptoms, pulmonary rehabilitation has an important role to play in patient recovery after COVID-19. The World Health Organization and other bodies have recommended the provision of rehabilitation,

including pulmonary rehabilitation, for individuals living with the long-term effects of COVID-19.³ The purpose of this statement is to summarize the position of the Canadian Thoracic Society (CTS) on rehabilitation in patients with persistent symptoms after SARS-CoV-2 infection, with a focus on implications for pulmonary rehabilitation, including defining what is meant by post-COVID conditions, selection of patients for pulmonary rehabilitation, rehabilitation delivery and safety considerations and resource concerns for existing pulmonary rehabilitation programs.

Long-term effects of COVID-19

The term “post-COVID condition” has been adopted by many major organizations to represent the wide range of health impacts that can persist beyond a month after severe, mildly symptomatic or asymptomatic acute SARS-CoV-2 infection.⁴ This is often referred to as “long COVID” or “Post-Acute Sequelae of SARS-CoV-2 infection” (PASC). Common types of post-COVID conditions^{2,4} include:

1. Persisting symptoms such as fatigue, dyspnea and brain fog that can occur after varying degrees of acute illness;
2. Multiorgan effects of COVID-19: an array of health effects documented in various body systems (eg, pulmonary fibrosis, myocarditis) as well as multisystem inflammatory syndrome and autoimmune disease;
3. Effects of COVID-19 treatment or hospitalization: well-documented long-term effects after critical illness, including post-intensive care syndrome and post-traumatic stress disorder.

A growing number of studies have documented persistent symptoms in both hospitalized and non-hospitalized populations.⁵⁻⁷ The proportion of patients with one or more persisting symptoms varies from 68%⁶ to as high as 96%,⁸ and a recent study has reported ongoing symptoms up to 7 months after acute illness.⁹ Although fatigue and dyspnea are among the most commonly reported lingering symptoms experienced by patients post-COVID, a recent systematic review has identified more than 50 long-term effects including headache and attention issues, mental health concerns, autonomic dysfunction and sleep problems.¹⁰ Few studies have examined physical functioning using standardized instruments; however, there is emerging evidence to suggest severe limitations in performance-based measures of physical function among patients with COVID-19 following discharge from acute care.¹¹ In a large UK study of over 670,000 patients with self-reported long COVID, 62% of patients reported at least some limitation in their day-to-day life activities at 12 weeks, with 18% reporting their activities were substantially impacted.¹² Taken together, these data on long-term effects of COVID-19 may support the need for multidisciplinary rehabilitation for a substantial proportion of patients.

Rehabilitation for COVID-19: Early considerations

Rehabilitation for COVID-19 should occur along the continuum of clinical care. Hospitalized patients should receive rehabilitation at the bedside (ICU and/or ward) including interventions to relieve respiratory distress and early mobilization activities such as sitting out of bed, sit to stand exercises, standing and walking with support as able.^{3,13} It is important to note that early aerobic exercises may not be well tolerated and could result in postexertional malaise and rapid desaturation in hospitalized COVID-19 patients;¹⁴⁻¹⁶ therefore, rehabilitation professionals are encouraged to avoid pushing patients through fatigue, to keep activity within manageable amounts, monitor oxygen saturation and other vital signs and to use energy conservation techniques before and after activities early during hospitalization.¹⁴ Cognitive impairment, intubation complications resulting in voice and speech disorders (exacerbated by the sound muffling effect of masks) and swallowing difficulties should prompt consideration of augmented communication and swallowing strategies and referral to a speech language pathologist.³ In the first 6-8 weeks after hospital discharge, patients should be encouraged to resume regular daily activities gradually, based on symptoms and tolerance. Resumption of low-intensity physical activity at home should be done conservatively, especially if a formal assessment of exertional desaturation was not conducted.¹³

Patient selection for rehabilitation programs and indications for pulmonary rehabilitation

International guidelines have recommended an assessment 6-8 weeks after acute COVID-19 illness to identify potential

unmet rehabilitation needs.^{13,15} While patients who required hospital admission during their acute illness are more likely to have functional limitations (ie, difficulty in performing daily activities) and ongoing rehabilitation needs, patients whose initial disease was mild may still develop such limitations and persistent, sometimes debilitating symptoms.^{10,17}

We therefore suggest that all patients with COVID-19 be assessed for persistent or new symptoms and functional limitations 6-8 weeks after their acute infection. Although all patients with persistent symptoms and functional limitations can benefit from rehabilitation, the need for pulmonary rehabilitation specifically should be based on several indicators. In the following insert, we provide a summary of characteristics that can be used to identify patients most likely to benefit from a comprehensive pulmonary rehabilitation program after COVID-19. Patients with ongoing symptoms and functional limitations post COVID-19 who do not fit these criteria may still be considered for other forms of rehabilitation (eg, cardiac or geriatric), depending on local availability and clinical presentation.

In the absence of robust evidence to guide current practice, we suggest that patients with the following features be considered for referral to a comprehensive pulmonary rehabilitation program:

New or ongoing respiratory symptoms (dyspnea and/or cough and/or exercise intolerance) and functional limitations (difficulty in performing daily activities) after resolution of acute COVID-19*
AND
New or ongoing requirement for supplemental oxygen after resolution of acute COVID-19*
OR
AT LEAST ONE OF:
<ul style="list-style-type: none"> Persistent radiographic pulmonary abnormality (ie, Chest X-ray and/or CT chest demonstrating new/persistent reticular changes and/or fibrosis after resolution of acute COVID-19)*
or
<ul style="list-style-type: none"> Pulmonary Function Test results demonstrating new/persistent reduction in lung volumes, airflow limitation, and/or reduction in diffusing capacity after resolution of acute COVID-19*

*in patients with preexisting chronic lung disease (eg, asthma, COPD, bronchiectasis, interstitial lung disease, etc), changes must be new/worse than baseline to meet criteria.

Pulmonary rehabilitation provision considerations in post-COVID patients

The principles of pulmonary rehabilitation can be adapted to meet the needs of patients who had COVID-19 and complain of cough, dyspnea, and/or reduced exercise capacity and functional limitations.^{3,15} Evidence on the effectiveness of pulmonary rehabilitation for patients with COVID-19 is limited; however, data from mostly small uncontrolled studies suggests that patients who were previously hospitalized for COVID-19 experience improvements in exercise capacity, pulmonary function, and health-related quality of life following a course of pulmonary rehabilitation.¹⁸ Studies in nonhospitalized patients are still lacking; nonetheless,

patients who meet the criteria recommended above are likely to derive similar benefits from a comprehensive pulmonary rehabilitation program. Recommendations for adapting pulmonary rehabilitation for patients with post COVID-19 conditions include beginning at lower intensities for aerobic exercise,¹⁹ conservative progression and monitoring of symptoms to prevent post-exertional malaise,^{3,20} gradual introduction of strengthening exercises and modifying education modules to consider the specific challenges related to COVID-19.¹⁵ Notably, patients with long COVID-19 may experience considerable activity-induced mental and cognitive fatigue, sleep and mood disturbances, persistent cognitive problems and difficulty with return to work. Input from occupational therapy and psychology should be sought, as necessary. In addition, as COVID-19 disproportionately impacts marginalized groups, for maximal uptake and adherence, pulmonary rehabilitation should be targeted and individualized to ensure that these groups are given the opportunity to participate (eg, accessible language, access to transportation and virtual rehab).¹⁵

Recommended outcome assessments

For patients who were critically ill with COVID-19, the ERS/ATS task force recommends the use of the core outcome measurement set for acute respiratory failure survivors, which includes an assessment of health-related quality of life, mental health, pain, cognition, physical function, muscle and/or nerve function and pulmonary function.^{21,22} For patients beginning a modified pulmonary rehabilitation program, we recommend an assessment of the following domains (examples given in brackets):²³

- Dyspnea (eg, UCSD, SOBQ)
- Exercise capacity (eg, 6MWT, 1-min sit-to-stand test)
- Physical function (eg, short physical performance battery (SPPB))
- Health-related quality of life (eg, EQ-5D-5L)
- Mental health (eg, Impact of Event Scale)
- Fatigue (eg, VAS scale)
- Return to work items as applicable

Safety precautions

The following safety precautions should be considered in the context of rehabilitation for COVID-19:

- The possibility of **myocarditis** should be considered and investigated in patients with COVID-19 who had acute heart failure and/or a coronary syndrome, particularly in the absence of preexisting cardiovascular disease or cardiovascular risk factors.¹⁵ In such cases, rehabilitation should be postponed until approved by a cardiologist. Patients with new or worsening symptoms of heart disease post-COVID should also have a cardiologist assessment to rule out myocarditis prior to beginning rehabilitation.
- **For patients with acute deep vein thrombosis and/or pulmonary embolism** during the acute COVID

illness and who are on anticoagulation, rehabilitation can be considered in the absence of bleeding or other complications. Early mobilization activities are safe during the acute presentation of such events, and supervised exercise training can begin after a period of therapeutic anticoagulation (given the absence of clear evidence, this time period should be based on the clinician's judgement).¹⁵

- **Other precautions:** Exercise-induced desaturation and preexisting health issues should be considered.¹⁵ Use of a risk stratification/checklist to identify general contraindications to exercise is also recommended (examples: American College of Sports Medicine risk stratification flowchart, The Physical Activity Readiness Questionnaire (PAR-Q+)).

When patients present with severe impairment in non-respiratory body systems, other types of rehabilitation should be considered (eg, cardiac rehabilitation, neurological or stroke rehabilitation).^{15,19} Patients from assisted living settings, those with severe frailty, active cancer and patients with palliative care needs may also be better managed using alternative pathways.^{15,19}

Resource implications for existing pulmonary rehabilitation programs

The COVID-19 pandemic placed tremendous strain on the healthcare system and has required an unprecedented redeployment of resources to manage severely and critically ill patients in hospitals. Looking ahead, a major investment in rehabilitation services will be required to support the needs of patients with post-COVID conditions. As outlined in this statement, pulmonary rehabilitation will be an important part of recovery for many patients (ie, respiratory symptoms with lung function impairment; preexisting lung disease) however, access remains a concern. In 2015, the available pulmonary rehabilitation capacity in Canada was sufficient for only 0.4% of Canadians with COPD who could benefit from it.²⁴ Pandemic-related delays, shutdowns, and redeployment of personnel have all impacted the ability of existing programs to deliver pulmonary rehabilitation to individuals with chronic lung disease. At the same time, lockdowns and public health restrictions have negatively impacted patients with chronic lung disease,²⁵ which could lead to an even greater demand for pulmonary rehabilitation in the future. Given the preexisting shortfall in pulmonary rehabilitation it will be vitally important for programs to be allocated additional resources and support if they are to be able to play a role in the delivery of services to post-COVID patients in addition to continuing supporting patients with non-COVID-related chronic lung disease. Simply shifting existing limited pulmonary rehabilitation resources to support post-COVID patients will be insufficient to meet the needs of both those who live with lung disease and those who now suffer the consequences of COVID-19.

One bright spot for pulmonary rehabilitation during the COVID-19 pandemic has been the expanded and accelerated rollout of virtual programs. Pulmonary rehabilitation can be safely and effectively delivered virtually,^{26,27} but uptake of virtual pulmonary rehabilitation at the program level was inconsistent prior to the COVID-19 pandemic. The expansion of virtual programs during the pandemic has been endorsed by the CTS in our statement on delivering pulmonary rehabilitation during the COVID-19 pandemic, which includes resources for programs looking to initiate or expand a virtual program.²⁸ This expansion represents an opportunity to improve access to pulmonary rehabilitation for both traditional chronic lung disease patients and for patients with post COVID-19 conditions, and we encourage programs that have temporarily implemented virtual pulmonary rehabilitation during the pandemic to continue with such approaches long-term (where feasible), and to consider formal evaluation of their effectiveness in COVID-19.

Useful Links:

- University Health Network, Toronto Rehabilitation Institute Telerehab Toolkit: <https://kite-uhn.com/tools/tr-telerehab-toolkit>.
- University of Plymouth Telerehab Toolkit: <https://www.plymouth.ac.uk/research/telerehab>.
- CTS Guidelines and COVID-19 resources: <https://www.cts-sct/guideline-library/>.

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