

Rehabilitation Perspectives in Long COVID-19

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Abstract

Long COVID is a term used to describe the persistence of symptoms in people who have had COVID-19 for an extended period. It affects multiple systems including neurological (fatigue, brain fog, attention issues, memory issues), neuromuscular (sarcopenia, myositis, arthritis and myopathy), cardiovascular (myopericarditis, right ventricular dysfunction, vasculitis and aortic, arterial and venous thrombosis) and respiratory (pulmonary fibrosis, pleurisy, pulmonary embolism and pneumonitis). This results in functional impairments which adversely affect the quality of life of patients. The rehabilitation of persons who have experienced long COVID-19, also known as "long haulers," is a relatively new field of study. We have described potential rehabilitation interventions to improve functional capacity and quality of life in patients with long COVID. These rehabilitation interventions include but are not limited to, endurance, flexibility and strength training, pulmonary rehabilitation, task specific exercises to improve Activities of Daily Living (ADL), psychological rehabilitation, medical rehabilitation, pain management and management of dysphagia.

Keywords: Long haulers; Chronic COVID; aerobic training; cognitive behavioural therapy; activities of daily living; rehabilitation

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Introduction

Long COVID is a term used to describe the persistence of symptoms in people who have had COVID-19 for an extended period.¹ Various terminologies like Long Hauler COVID, Chronic COVID, Long Tail COVID, post COVID-19 syndrome and late sequelae of SARS-CoV-2 infection have been used in medical literature to describe this condition.¹ There are various definitions available in literature to describe long COVID, but the most widely accepted description is the persistence of symptoms of COVID-19 for more than three months after first symptom onset.¹ Most of the patients with Long COVID have symptoms relating to cardiac, pulmonary and neurological systems.¹ In a recent meta-analysis by Premraj et al., following

neurological manifestations of Long COVID were described: fatigue (37%, 95% CI: 24%-50%), brain fog (32%, CI: 9%-55%), memory issues (27%, CI: 18%-36%), attention disorder (22%, CI: 10%-34%), myalgia (18%, CI: 4%-32%), anosmia (12%, CI: 7%-17%), dysgeusia (11%, CI: 4%-17%) and headache (10%, CI: 1%-21%).² Most common neuropsychiatric manifestations include sleep disturbances (31%, CI: 18%-43%), anxiety (23%, CI: 13%-33%) and depression (12%, CI: 7%-21%).² Cardiovascular manifestations include myopericarditis, right ventricular dysfunction, vasculitis and aortic, arterial and venous thrombosis.³ Pulmonary fibrosis, pleurisy, pulmonary embolism and pneumonitis are common pulmonary manifestations.³ Neuromuscular manifestations include sarcopenia, autoimmune and inflammatory myositis, arthritis and myopathy.³ Long COVID also affects other systems as gastrointestinal system (pancreatitis, ischaemic colitis, irritable bowel syndrome), endocrine system (orchitis, stress induced hypo pituitary adrenal axis changes, epididymitis), dermatological system (pernio, vesicular, urticarial, morbilliform rash, reticular purpura) and renal system (post-inflammatory glomerulonephritis, embolic renal infarction).³ These patients may present with one or more of the following symptoms such as fatigue, shortness of breath, cough, palpitations, breathlessness, syncope, malaise, joint pain, headache, memory loss, insomnia, abdominal pain, bloating, heat and cold intolerance, oliguria and haematuria.³ The term "long COVID" is used to distinguish these ongoing symptoms from the acute illness caused by COVID-19.

The potential risk factors for long COVID include more than five initial symptoms of COVID-19 infection, female gender, initial disease severity, increased level of D-dimers or C-reactive protein and lymphopenia.¹ The prevalence of Long COVID varies in different countries(USA 16-53%, Bangladesh 16-46% and China 49-76%).³ Where the exact pathophysiology for Long COVID has not been pin pointed as yet, persistent neurological inflammation resulting in microglial activation, metabolic brain disorders, micro thrombosis, disorders in muscle due to mitochondria dysfunction, endothelial dysfunction, lung fibrosis and pulmonary vasculature damage, chronic dysregulated immune system activation and microbiota alteration of gut are some of the pathophysiological mechanisms that might be involved.⁴ With such a varied pool of mechanisms that have been postulated, researchers are continuing to

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study long COVID and trying to understand more about this phenomenon.

Rehabilitation of Long COVID-19

The rehabilitation of persons who have experienced long COVID-19, also known as "long haulers," is a relatively new field of study. Many people who have had COVID-19 continue to experience ongoing symptoms such as fatigue, shortness of breath, and difficulty concentrating for weeks or even months after their initial infection. These symptoms can significantly impact a person's ability to function and carry out daily activities and may require rehabilitation to help improve or restore function.⁵

Screening for Long COVID can be done by using COVID-19 Yorkshire Rehabilitation Screen, chest X-Ray, pulmonary function test and blood tests (liver and renal function test, CRP, clotting profile and / or D- dimers).⁵ Yan et al. presented a three tier model for rehabilitation of patients with Long COVID.⁵ Patients with mild long COVID can be managed with home surveillance and telemedicine.⁵ Community therapy with regular follow up can be used to manage patients with moderate long COVID.⁵ multi-disciplinary team care should be used to manage patients with severe long COVID.⁵ This three tier model can serve as a framework to design Rehabilitation services depending upon service provider's financial and human resource constraints.

Rehabilitation can be a valuable approach for helping people who have experienced long COVID-19 to manage and treat their ongoing symptoms. By focussing on improving physical function, daily activities, and overall well-being, rehabilitation can help people who have experienced long COVID-19 to improve their quality of life and return to their normal daily activities.⁶

There are several approaches to rehabilitate people who have experienced long COVID-19. Patients should receive education and explanation for their symptoms of long COVID and should be guided how to manage it.⁷ One approach is to focus on managing and treating the specific symptoms that a person is experiencing.⁷ For example, someone who is experiencing fatigue may benefit from a programme of gradually increasing physical activity, while someone who is having difficulty breathing may benefit from a programme of breathing exercises and low intensity exercise (≤ 3 METs or equivalent).⁷ Other approaches may focus on more general goals, such as improving a person's overall physical fitness, or helping them to return to work or other daily activities.

Rehabilitation can also be helpful in addressing the emotional impact of long COVID-19, such as anxiety and depression. By providing effective communication, support

and guidance, rehabilitation can help people who have experienced long COVID-19 to cope with the physical and emotional challenges they may be facing.⁷

One important aspect of rehabilitating people who have experienced long COVID-19 is the need for a multidisciplinary approach.⁷ This means that the rehabilitation team may include a variety of healthcare professionals, such as rehabilitation physicians, nurses, physical therapists, occupational therapists, and psychologists, who can work together to address the person's needs and goals.

Rehabilitation Interventions for Long COVID-19

In a recent systemic review by Fuggazzaro et al., rehabilitation improved dyspnoea, anxiety, muscle strength, walking capacity, sit to stand performance and quality of life.⁸ There are several specific rehabilitation interventions that may be used to help people who have experienced long COVID-19 to manage and treat their symptoms. These interventions may include:

1. **Medical Rehabilitation:** In patients with multiple pathologies, an assessment by rehabilitation consultant is recommended with a multiple disciplinary approach to rehabilitation.⁸ In some cases, medications may be prescribed to help manage specific symptoms of long COVID-19, such as fatigue, shortness of breath, or difficulty concentrating.
2. **Endurance, flexibility and strength training:** This should begin with low level stretching, strengthening and light activity (≤ 3 METs or equivalent). Once a patient tolerates this and there are no contraindications, a high intensity aerobic training (60-80% of maximum heart rate) can be started.^{7,8}
3. **Pulmonary rehabilitation:** Interventions to improve pulmonary functions may include a low intensity pulmonary rehabilitation programme which includes respiratory muscle training, diaphragmatic training and cough exercises. It improves FVC and FEV1/FVC ratio and quality of life.^{8,9}
4. **Pain Management:** Rehabilitation Physicians can help manage the chronic pain that is often associated with Long COVID¹⁰ using oral medications and interventions to mitigate its affects.
5. **Task specific training for Activities of Daily living:** Occupational therapy can help a person to regain the skills and abilities needed to carry out daily activities. This may include activities such as dressing, bathing, and cooking, as well as returning to work or other activities.

6. Swallowing and Speech Rehabilitation: Speech therapy can help a person who is experiencing difficulty with communication, swallowing, or other speech-related problems.
7. Psychological rehabilitation: Patients should be screened and reviewed in the recovery phase to identify individuals who might have adverse psychological outcomes. Specific interventions may include cognitive behavioural therapy (CBT), cognitive processing therapy or eye movement desensitization and reprocessing for those with moderate to severe symptoms of acute stress disorder.⁸
8. Lifestyle changes: Making changes to a person's lifestyle, such as improving their diet and increasing physical activity, may also be beneficial for managing long COVID-19 symptoms.

Conclusion

Rehabilitation of long COVID-19 is a relatively new field, and much is still unknown about the best approaches to treatment, therefore, it is important for people who are experiencing long COVID-19 symptoms to work closely with their healthcare team to develop a plan that is tailored to their specific needs and goals. The rehabilitation of long COVID-19 is an important aspect of helping people who have experienced this illness to recover and regain their function. By incorporating rehabilitation interventions and following laid down basic protocols, people who have experienced long COVID-19 can make progress towards improving their overall health and well-being.

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