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PULMONARY REHABILITATION POST-COVID-19: STRATEGIES FOR FUNCTIONAL RECOVERY AND REDUCTION OF READMISSIONS

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ABSTRACT

The COVID-19 pandemic has resulted in a substantial population with persistent respiratory sequelae requiring effective rehabilitation strategies. Pulmonary rehabilitation (PR) involving respiratory techniques and early mobilization has emerged as a critical approach to support functional recovery and reduce hospital readmissions in patients recovering from COVID-19-related pulmonary complications. This article reviews current evidence on the evaluation of respiratory techniques and the role of early mobilization in the rehabilitation of post-COVID-19 patients, highlighting improvements in exercise capacity, lung function, dyspnea perception, and quality of life.

Keywords: Pulmonary Rehabilitation. Respiratory Sequelae. COVID-19. Intensive Physiotherapy.

1 INTRODUCTION

Pulmonary rehabilitation is increasingly recognized as a vital intervention to address the multisystemic impairments caused by COVID-19, particularly in patients who experienced severe illness requiring prolonged hospitalization or intensive care. Persistent respiratory symptoms such as dyspnea and reduced exercise tolerance are common, often accompanied by muscle weakness and fatigue. Rehabilitation strategies focusing on respiratory muscle training, breathing exercises, and airway clearance techniques contribute significantly to the restoration of lung function and alleviation of respiratory symptoms. Techniques like diaphragmatic breathing, pursed-lip breathing, and incentive spirometry have demonstrated effectiveness in improving respiratory muscle strength and functional capacity in COVID-19 survivors (Siddiq et al., 2020).

Early mobilization during hospitalization and continuation through outpatient programs is essential in preventing complications related to immobility, such as muscle atrophy, joint stiffness, and venous thrombosis, while enhancing cardiopulmonary function and overall physical recovery. Clinical studies show that early rehabilitation interventions result in improved muscle strength, functional capacity, and quality of life, alongside a reduction in the duration of mechanical ventilation, ICU stay, and overall hospital length of stay (Bonorino et al., 2021; Wittmer et al., 2021). Importantly, early mobilization combined with comprehensive pulmonary rehabilitation has been associated with reduced hospital readmission rates and better long-term health outcomes, underscoring the need for their integration into COVID-19 management protocols (Santana et al., 2021).

Evidence from randomized and observational studies supports that pulmonary rehabilitation programs lasting 4 to 12 weeks, which include aerobic and resistance exercises alongside respiratory muscle training, lead to significant improvements in key clinical parameters such as six-minute walk distance (6MWT), dyspnea scores, and health-related quality of life (HRQoL) (Li et al., 2025). These multicomponent exercise regimens not only enhance physical capacity but also reduce psychological symptoms like anxiety and depression, commonly experienced by post-COVID-19 patients. While notable gains in physical performance may plateau after 8 weeks, extended rehabilitation fosters sustained improvement in fatigue and HRQoL (Li et al., 2025).

Integration of respiratory techniques and early mobilization is critical to addressing the heterogeneous and prolonged recovery trajectories seen in post-COVID-19 patients. Individualized assessments guided by multidisciplinary rehabilitation teams enable optimal tailoring of interventions according to severity and patient-specific needs. Considering the global scale of COVID-19 sequelae and the burden on healthcare systems, investment in

accessible pulmonary rehabilitation services, including tele-rehabilitation options, is a crucial strategy for promoting recovery and reducing hospital readmissions (Siddiq et al., 2020; Santana et al., 2021).

Recent clinical guidelines also emphasize the importance of nutrition management, psychological support, and education alongside physical therapies to enhance the effectiveness of pulmonary rehabilitation in COVID-19 survivors. Moreover, coordinated efforts involving policymakers, healthcare providers, and community stakeholders are necessary to expand rehabilitation services and improve post-COVID-19 care infrastructure worldwide (Santana et al., 2021; Siddiq et al., 2020). Continued research is needed to clarify optimal rehabilitation protocols, including exercise intensity, duration, and timing to maximize recovery outcomes.

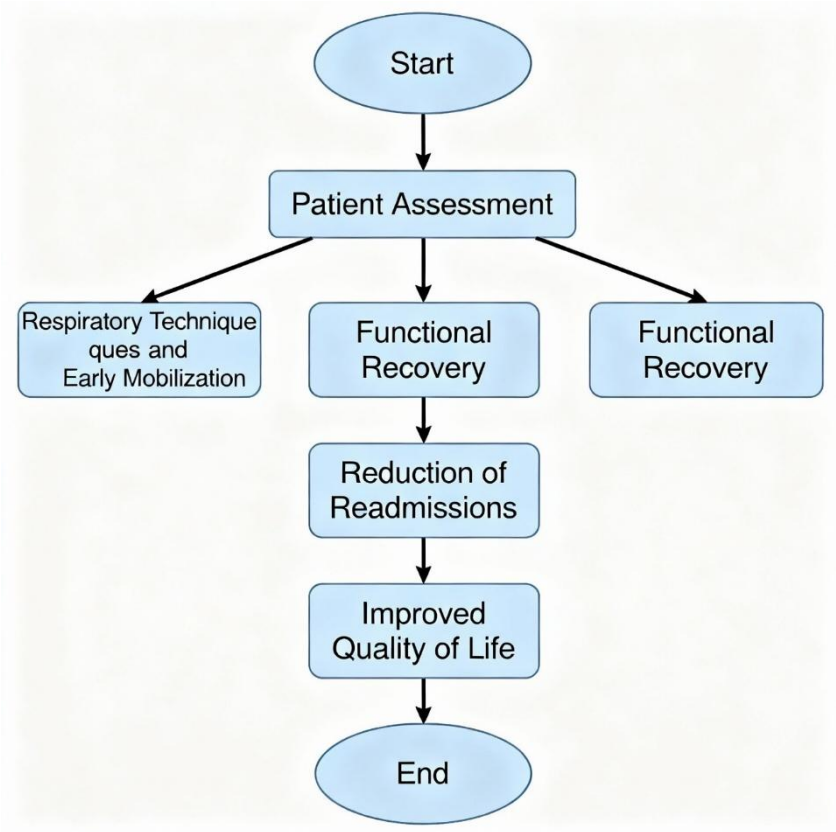
Furthermore, respiratory rehabilitation post-COVID-19 may mitigate long-term pulmonary fibrosis risk by improving ventilation-perfusion matching and promoting alveolar recruitment. Emerging data suggest that patients engaged in structured pulmonary rehabilitation exhibit decreased inflammatory markers and improved radiological findings, highlighting the biological benefits of these interventions (Aljazeeri et al., 2023). These improvements contribute directly to enhanced functional capacity and reduced symptoms, such as chronic cough and exertional dyspnea, significantly impacting quality of life.

In addition to physiological benefits, pulmonary rehabilitation programs contribute to psychological well-being by addressing anxiety, depression, and post-traumatic stress disorder, prevalent among post-COVID-19 patients. The multi-dimensional approach combining physical and mental health support in rehabilitation fosters holistic recovery and better adherence to long-term health maintenance plans. Effective communication and patient education about self-management techniques are vital components supporting sustainable outcomes (Del Corral et al., 2025).

The flowchart illustrates the pulmonary rehabilitation process for patients recovering from COVID-19. It begins with patient assessment to identify respiratory impairments and functional limitations. Based on the assessment, the rehabilitation program initiates respiratory techniques such as breathing exercises and respiratory muscle training to improve lung function. Concurrently, early mobilization is introduced to prevent complications related to immobility and enhance physical recovery. These interventions work together to promote functional recovery, leading to improved exercise capacity, reduced respiratory symptoms, and better quality of life. Ultimately, the combined approach aims to reduce hospital readmissions and support sustainable long-term health outcomes for post-COVID-19 patients.

Figure 1

Flowchart of Pulmonary Rehabilitation Post-COVID-19 Process



Source: Created by author.

In conclusion, pulmonary rehabilitation that encompasses respiratory techniques and early mobilization represents an evidence-based approach for improving respiratory function, exercise tolerance, psychological well-being, and quality of life in post-COVID-19 patients. These interventions contribute significantly to reducing hospital readmissions and functional disability, making them indispensable components of comprehensive COVID-19 recovery programs.

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