

Role of Physiotherapy in Respiratory Rehabilitation and Managing COVID-19 Patients in All Stages of the Disease

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Abstract

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Background: Physiotherapists play a crucial role in the management of corona virus disease (COVID-19) patients in all stages for better health (physical and social) outcomes. This document outlines and summarizes the updated official guidelines on roles and recommendations for physiotherapists in the management of all COVID-19 stages in acute hospital settings issued by World Confederation for physical therapy, World Health Organization and Associations of Physical Therapy in various countries. **Methods:** An introductory literature search was conducted by using keywords including “COVID-19”, “respiratory rehabilitation”, “physical therapy”, and others in the database of the Associations of Physical Therapy.

Results: Using coronavirus disease-2019 rehabilitation-related articles data was summarized on various guidelines and recommendations involving respiratory rehabilitation and general physiotherapy evaluation; treatment; indications; contraindications; and termination indicators for patients in different stages (acute, stable and recovery) of (COVID-19)

Conclusion: Respiratory and physical therapy (PT) for patients with coronavirus disease should be conducted according to the stage of the disease and condition of the patient. This article is intended for use by physiotherapy personnel and other relevant health personnel in the acute care setting caring for patients with confirmed COVID-19 highlighting their roles regarding patient assessment, management strategies, indications, contraindications and termination of physical therapy.

Keywords: *Physiotherapist, Respiratory rehabilitation, Physical therapy, Coronavirus, COVID-19.*

INTRODUCTION

A new severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) outbreak occurred in December 2019, which caused various clinical symptoms leading to a syndrome called “Corona virus disease of 2019 (“COVID-19”) [1]. COVID-19 can lead to the occurrence of symptoms such as fever, cough, increased airway secretions, dyspnoea and others. Patients incur weakness, sarcopenia, and decreased exercise tolerance due to long-term bed rest in isolation or treatment in the Intensive care unit ICU [2]. There is a lack of knowledge about the long-term outcomes of the disease and the possible sequelae and rehabilitation. The roles and recommendations to safely rehabilitate COVID-19 patients is an issue that has led to concerns among physiotherapists at present. This document provides pulmonary rehabilitation recommendations for adult COVID-19 patients and has been developed in the light of the guidelines on the diagnosis and treatment of COVID-19 provided by the World Health Organization, World Confederation for Physical Therapy (WCPT) and other authorities including the Association of Physical Therapy as of April 16, 2020.

Physical Therapy interventions for COVID-19 Patients in Acute Stage (ICU, Critical Stage):

Data analysis showed that for patients who had been admitted to ICU all commonly experienced impairments in all three domains of the international classification of functioning, disability and health (ICF) classification, (including body functions and structures, activity limitations, and participation restrictions) [3]. The impairments involved decreased pulmonary function, reduced 6-minute test distance walk, reduced strength of the respiratory and limb muscles, decreased ability to perform normal daily activities [4]. The debilitating effects of COVID-19 mainly on the respiratory system, calls for insightful need for respiratory rehabilitation and physical therapy interposition. The objective of respiratory physiotherapy is to improve associative symptoms such as dyspnoea, reduced lung capacity, complications resulting from respiratory failure immobilization, and to reduce anxiety and depression [5].

Patient assessment

It is a recommended and vital role for every physiotherapist to perform a comprehensive assessment in severely and critically ill patients before initiating

physiotherapy. This involves assessing the state of consciousness, respiratory system, cardiovascular system and musculoskeletal system. Patients meeting the physiotherapy inclusion criteria should be started on treatment as soon as possible. With the main evaluation including: (i) basic vital signs: respiratory rate, heart rate, blood pressure, temperature, blood oxygen saturation; (ii) Joint range of motion (passive and active); (iii) degree of dyspnoea [6,7].

Patient management strategies various treatment strategies include the following:

Position change

Position change while avoiding bad posture is important for critically ill patients. It promotes sputum excretion, reduce the degree of dyspnoea and lessens the occurrence of bedsores and. whenever possible it should be noted that (45 to 60 degrees) half seated or seated postures are encouraged. In a case where the patient is unable to sit the bed angle can be raised between 30 and 45 degrees. For more effective clinical outcomes Postural changes is to be performed 3 times in a day for at least 20 minutes [8, 9].

Prone position ventilation

Considering the benefits of prone position ventilation on oxygen binding and pulmonary dynamics and the debilitating respiratory effects of COVID -19, severe COVID-19 patients make ideal candidates for prone position ventilation. As a routine strategy use of prone ventilation is recommended for patients with partial pressure of oxygen (PaO₂) less than 150 mmHg. Ventilation should be maintained for at least 16 hours per day and halted under the following conditions when the oxygenation Index (PaO₂/ fraction of inspired oxygen FiO₂) exceeds 150 mmHg, a positive end-expiratory pressure (PEEP) less than or equal to 10 cm or the fraction of oxygen concentration in the inhaled air (FiO₂) is less than or equal to 60% [10].

Respiratory control

It is performed in a sitting or semi-recumbent position, and the patient’s accessory muscles of inspiration are relaxed (especially in the upper limbs and neck), by inhaling through the nose (making the air warm and moist), and taking slow, prolonged breaths and exhaling [11]. A shallow, slow, calm breathing pattern is

established. Expiration could be pursed-lip breathing. The model could be adopted during rest or exercise. The exact frequency and utilization are controlled by the patients themselves to avoid worsening effort of breathing caused by the training [12, 13].

Precautions to be taken before initiating treatment; It is recommended to check the following. (i) The electrocardiogram (ECG), oxygen saturation (SaO₂), mean arterial pressure (MAP) with other vital signs being monitored during the course of physical therapy. (ii) Depending on individual patients, SpO₂ should be maintained between 95–100% levels of oxygen, however, in patients with coexisting conditions like (chronic obstructive pulmonary disease, COPD), oxygen saturation must be kept at 88–89% (iii). Physiotherapists must be cautious not to temper with catheters with urine collection bags, cardiac monitoring devices, central catheters, gastric tubes etc attached to the patient. (iv). Sometimes exacerbation of respiratory load can result from pulmonary therapy treatments, in such instances physiotherapists must avoid performing the following excessive intensive respiratory training (such respiratory endurance training, thoracic traction, tracheobronchial clearance, excessive intensive training of respiratory muscle strength, and resistance muscle strength training) due to the instability of the patients' respiratory function during this period [14,15]. Exclusion criteria for therapy includes; Temperature >38 degrees Celsius; severe dyspnoea; resting heart rate >120 Beats Per Minute; X-ray manifestations: progression of thoracic infiltration >50% within 24–48 hours; SpO₂ <95%; blood pressure <90/60 mmHg or >140/90 mmHg [16,17].

Therapy termination

Termination of therapy is indicated under the following circumstances: SpO₂: 4% decrease from baseline; respiratory rate >30 breaths/min; systolic blood pressure 180 mmHg; MAP 110 mmHg, or more than 20% change from baseline; arrhythmia or myocardial ischemia; anxiety; fatigue and physical activity intolerance [17].

Physical Therapy for COVID-19 Patients in Stable condition (General Admission, Isolation Period):

The best way to prevent the spreading of the virus for patients in stable condition is isolation, which disadvantages their natural activity as the living space is limited and hence leading to reduced muscle strength, physical activity intolerance and lowered expectoration efficiency and mental health challenges [5,18]. Patient assessment

The following is a recommended evaluation tool employed before commencing therapy in COVID - 19 stable patients. (i) vital signs: respiratory rate, heart rate, blood pressure, body temperature, oxygen saturation; (ii) Muscle strength: grip strength, isometric muscle strength test; (iii) Joint range of motion (passive and active); (iv) Ability to balance (especially in patients who have been in bed for a long time); (v) Physical strength and exercise endurance (6-minute walking test); (vi) Presence of anxiety or depression [11-13].

Treatment strategies for stable COVID -19 patients; for stable patients with COVID-19 the following treatment strategies were recommended for effective clinical health outcomes: (i) Depending on the treatment results of respiratory control in the acute stage, respiratory training and respiratory muscle training can be initiated with moderate respiratory muscle strength training being performed according to the patient's respiratory function. (ii) clearance of airway secretions: sputum can be expelled by hand; postural drainage (to avoid head drop); active cycle of breathing techniques (ACBT); induced or assisted cough and many other techniques; (iii) Abdominal breathing and diaphragm training. (iv) Exercise therapy: this is important to counteract exercise intolerance, mild exercise training (with a Borg score of 3–4 or visual analog scale (VAS) score 5–6), 1 to 2 times a day for 30 minutes each time. (v) Sitting and standing balance training; (vi) Psychological support to assist with mental health issues like depression and anxiety [16, 19, 20].

Physical therapy Termination Indicators

The exercises are to be terminated if the patient is presenting with the following (i) SpO₂ decreased by 4 percentage points; or (ii) the patient is experiencing perspiration, nausea

and vomiting, dizziness, blurred vision, etc. (ii) severe sudden dyspnoea; (vi) chest compression or pain; (v) rapid heart rate or arrhythmia; (vi) patient is unable to maintain balance [20]. Physical therapy Inclusion, exclusion criteria and precautions for physiotherapy are the same as those in the acute phase.

Physical Therapy for COVID-19 Patients in Recovery Period (Discharge, Home Isolation, Suspected):

Studies showed that prolonged hospital admission during the acute phase or isolation period significantly affected the amount of exercise during the recovery period, resulting in muscle weakness, low exercise endurance, weakness or fatigue. Prolonged absence from social interactions and family activities in isolation lead to negative psychological effects (depression and anxiety) and including post-traumatic stress disorder [8,14,21].

Hence physiotherapists play a major role on discharged patients to enable them to return to society, restore their normal daily activities and prevent psychological disorders. Home based Physical therapy focuses mainly on remote guidance, social education, psychological support, to help patients understand the need for respiratory rehabilitation and PT. Using various communication means like brochures or videos can help patients adopt healthy lifestyles, and promote their return to the family and society [21, 22].

Patient Assessment

The appraisal of the patient's condition includes the following in this phase. (i) General clinical evaluation: physical examination, laboratory microbiological examination, pulmonary function test, nutritional evaluation; (ii) Symptomatic examination: dyspnea, fatigue test, anxiety and depression scale; (iii) Muscle strength: general muscle and respiratory muscle strength examination; (iv) Active and passive joint range of motion examination; (v) Functional examination: Timed Up and Go test (TUGT), 6-minute walking test. (vi) Balance function evaluation. (vii) Endurance and physical strength evaluation; (viii) Activity of daily living evaluation [20-23].

Treatment strategies For COVID -19 patients in the recovery phase

The following were recommended as treatment guidelines. (i) Aerobic exercise: walking up and down the stairs, walking and dancing at home. Physical therapy should last for at least 6 weeks, five times a week for 30–60 min/day, beginning with low-intensity exercise and increasing the intensity by 10% every week. A limit of 70% of the maximum heart rate is recommended [24].

(ii) Resistance training: Progressive resistance training method is used, in groups of 1–3/day, intensity 8–12 repetition maximum, with 8–12 exercises in each group, for at least 6 weeks, 2–3 times/week; (iii) balance training: cross obstacles; (iv) breathing training: normal breathing mode is used for breathing training; abdominal breathing; pursed-lip breathing; thoracic expansion exercise are other exercises suggested. (It is imperative to be careful while treating not to cause respiratory muscle fatigue and respiratory system problems); (v) Keeping airway clear; (vi) ADL training: guide transfer, bathing, toilet, daily hygiene maintenance, etc. can be encouraged in this phase [24,25].

Contraindications for physical therapy

Physical therapy should not be commenced given the following circumstances: (i) blood pressure $\geq 140/90$ mm/Hg or $\leq 90/60$ mm/Hg; (ii) resting heart rate > 120 BPM; (3) SpO₂ $\leq 95\%$; and other coexisting conditions not suitable for exercise [23-25].

Physical therapy termination Indicators

In an event where the following occurs (i) elevated Temperature > 38.2 degrees; (ii) difficulties or shortness of breath with no relief after resting; (iii) chest pain, tightness, dyspnoea, aggravated cough, dizziness, blurred vision, headache, night sweat, palpitation, and unable to maintain balance [21-26].

The initiation criteria and precautions of physiotherapy are the same as in the acute and isolation stage. It is clear that respiratory function in COVID-19 patients has a negative association with mortality during admission. An improvement in respiratory function associated with physical therapy tends to shorten the treatment period in ICU from an average of 20.4 days to 12.8 days [11] Furthermore rehabilitation interventions could shorten the admission time by 20% and reduce the total medical expenses [12] leading to

reductions in mortality rate of patients and health related costs. Physical therapy and rehabilitation have the potential to maintain patient well-being similar to that prior to illness and also reducing the negative impact on society, the country and the world economy. Physical therapy intervention has proven to provide the following benefits in COVID-19 patients: it directly affects the physical function of patients especially the respiratory function. Its effects on ICU patients facilitates early transfer of patients to the general wards due to improved clinical outcomes [15]. Normal daily activities and exercise endurance training also enables discharged patients to return to social life much earlier [27, 28].

CONCLUSION

The role of physiotherapists in the management of COVID-19 patients at all stages of the disease will not only reduce hospital admission time, medical expenses and mortality rate of patients, but also reduce personal and national economic losses by saving medical resources. The impact of respiratory rehabilitation and physical therapy further reduces the probability of adverse social stability events such as medical collapse. As a result, calling for the mandatory need, to introduce physical therapy into the mainstream treatment of COVID-19 patients as early as possible.

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