

Management and Rehabilitation of COVID-19: A Physiotherapist Perspective

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ABSTRACT: Background: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a new coronavirus that emerged in 2019 and causes coronavirus disease 2019 (COVID-19). Many people experiencing ongoing health effects following COVID-19 infection manage their condition independently at home while acutely infected without a health professional's aid. The number of patients who need post-COVID syndrome management, focusing on recovery and rehabilitation, is likely to grow as COVID-19 infection rates continue to rise. Per the WHO, as of February 2021, 107 million people were affected, with 59.8 million recoveries across the world, and in UAE, 3,32,603 cases have been reported, with 3,13,060 recoveries.

Purpose: The current paper highlights the importance of physiotherapy rehabilitation service for patients with confirmed COVID-19 in the acute hospital setting, including screening to determine indications for physiotherapy, respiratory physiotherapy, exercise interventions, and postdischarge period.

Methods: A thorough literature search was conducted. The electronic databases PubMed, Google Scholar, Science Direct, and Scopus were searched using a combination of keywords and included randomized trials, recommendations, quasi-randomized or prospective controlled clinical trials, reports, guidelines, and letters to the editor.

Results: Based on the current research and guidelines given by the World Confederation for Physical Therapy and Physiotherapy Associations in various countries, a detailed physiotherapy assessment and management for patients in different stages of COVID-19 is presented.

Conclusion: We conclude that early physiotherapy rehabilitation should be started to avoid post-COVID complications and improve patients' quality of life.

KEY WORDS: COVID-19, coronavirus, respiratory rehabilitation, physiotherapy, pneumonia, acute respiratory distress syndrome, exercise training and physical function, vaccines

ABBREVIATIONS: ARDS, acute respiratory distress syndrome; **COVID-19**, coronavirus disease 19; ICU, intensive care unit; **SARS-CoV-2**, severe acute respiratory syndrome coronavirus 2

I. INTRODUCTION

The novel coronavirus disease known as COVID-19 is caused by a new strain of zoonotic coronavirus known as SARS-CoV-2, human-to-human transmission of which

was first documented in December 2019.¹ The rapid spread of these respiratory tract diseases through droplet infection has caused increased incidence of novel coronavirus-infected pneumonia (NCIP),² severe cases leading to acute respiratory distress syndrome (ARDS), arrhythmias, hemodynamic instability, and finally death. SARS-CoV-2 is extremely infectious and differs from other respiratory viruses in that it appears that human-to-human transmission takes place approximately 2 to 10 days before the person becomes symptomatic.³

The infection is spread from person to person by respiratory secretions—large droplets from coughing, sneezing, or rhinorrhea on surfaces within two meters of the infected person. SARS-CoV-2 stays viable on hard surfaces for at least 24 hours and on soft surfaces for 8 hours.³ The virus can be transmitted to another human due to direct contact with an infected site, accompanied by touching the lips, nose, or eyes. Airborne infected particles produced during a sneeze or cough (within 1 meter) remain viable in the air for 3 hours.⁴ These airborne SARS-CoV-2 particles can then be inhaled by another human or land on the mucosal membranes of the eyes.⁴

Most people with COVID-19 have a mild to moderate respiratory illness; others experience severe illness. Clinical manifestation includes cough, sore throat, high temperature, headache, muscle or joint pain, fatigue, loss of sense of smell and taste, and diarrhea.⁵ Individuals with COVID-19 can experience influenza-like illnesses, and respiratory infections that display fever (89%), cough (68%), exhaustion (38%), sputum development (34%), and shortness of breath (19%).³ Taking results from several studies into account, Chowell opined that “asymptomatic or mild cases combined represent about 40–50% of all infections,”⁶ 15% of patients are severe (oxygen-requiring infection), and 5% are critical, requiring ventilation and life support (with high mortality).⁷ Preliminary findings suggest that chest X-rays may have diagnostic limitations in COVID-19⁸ (Fig. 1). Lung computed tomography (CT) scan results often include multiple mottling and ground-glass opacity⁹ (Fig. 2). Lung ultrasound is often used on the bedside for B-line multilobar distribution and diffuse lung consolidation.¹⁰

Early assessment and rehabilitation measures are required for patients with COVID-19 to effectively prevent further worsening of the condition and reduce the risk of significant postrecovery impairment.¹¹ COVID-19 has a variable effect on various people, varying from moderate to extreme symptoms requiring ICU entry. Prolonged

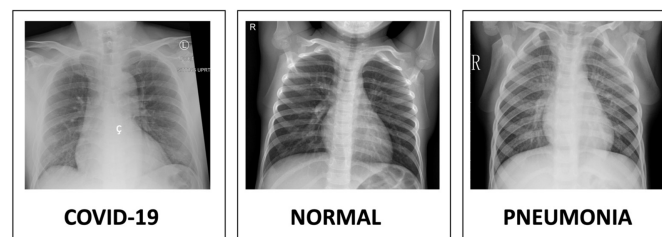


FIG. 1: Chest X-ray changes in COVID-19

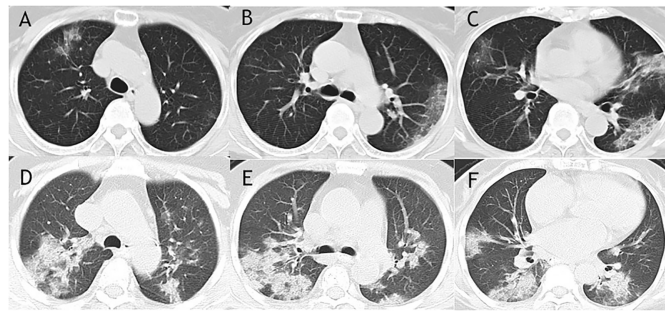


FIG. 2: CT scan changes in COVID-19. Comparison of CT images between survival group and mortality group. A–C represent the survival group. D–F represent the mortality group.

intensive care, including mechanical ventilation, airway management, oxygen therapy, drug prophylaxis, and the need for essential, case-based rehabilitative measures are mandated to prevent further morbidity and mortality. Critical care rehabilitation measures of patients with COVID-19 need further in-depth analysis based on clinical features and supportive therapy in the ICU.

The disease is currently expected to result in substantial morbidity over 3–6 months (intermediate phase) with demand on regular medical and recovery facilities for 12 months and beyond (chronic phase). Patients diagnosed with COVID-19 range between asymptomatic illness who are instructed to stay at home and to those with symptoms such as fever, cough, body aches, and headache and are admitted to the hospital. The National Institute for Health and Care Quality (NICE; United Kingdom) advises that comprehensive rehabilitation programs should be implemented in the first 30 days (postacute phase) to affect recovery significantly.¹²

Rehabilitation is patient-centered and tailored to specific patient needs; any rehabilitation service should recognize comorbidities that can impair the patient's progress or willingness to continue in the program.¹³ Education and preventive measures play a crucial part in any successful rehabilitation program. Preventive measures such as social distancing attempt to reduce contact between individuals regardless of their infection status. Face masks should be used in public venues to avoid spreading the virus. Promoting good hand hygiene is one of the most basic yet powerful tools to combat COVID. As COVID-19 is a novel disease, education on the effects of the disease and possible complications need to be shared with patients.¹³ There is a lack of evidence-based guidelines for rehabilitation following COVID-19. Further research on the sequelae of COVID-19 and the long-term effects on individuals is required.

II. METHODS

The present study summarizes the findings from the available research on physiotherapy rehabilitation of COVID-19 patients among adults (over 18 years old). The following

inclusion criteria were considered: (1) articles written in English, (2) full-text versions of the articles could be retrieved and read. Articles were excluded based on the following criteria: (1) articles outside the rehabilitation or physiotherapy field, (2) nonpatient articles (such as viral studies or animal experiments). A thorough literature search was performed from inception to November 2020 in MEDLINE, PubMed, Scopus, Google Scholar, and Cochrane Library. Articles were searched using the key terms “acute respiratory distress syndrome,” “coronavirus disease-19,” “intensive care unit,” “physiotherapy,” “severe acute respiratory syndrome coronavirus-2,” “respiratory muscle strength training,” “pulmonary function,” “assessment,” and “breathing exercise,” using the Boolean operators AND, OR, and NOT.

III. ROLE OF PHYSIOTHERAPY REHABILITATION IN PATIENTS WITH COVID-19

The present paper has been prepared to provide physiotherapists and acute health care providers with details on physiotherapy’s future function in post-COVID-19 treatment. Physiotherapists working in primary health services are expected to have a part to play in treating patients admitted to the hospital with reported or suspected COVID-19 and on discharge.

In general, cardiorespiratory physiotherapy focuses on treating acute and chronic respiratory problems such as and optimizing physical rehabilitation after a severe illness. Physiotherapy can be helpful for the respiratory and physical recovery of COVID-19 patients. While an effective cough is a less frequent symptom (34%),⁴ physiotherapy might be suggested if patients with COVID-19 have copious airway secretions that cannot be individually removed. It can be measured on a case-by-case basis and measures applied based on clinical indicators.

A. Patient Selection

Physiotherapy treatments can only be offered where there are clinical indicators to reduce workers’ exposure to COVID-19 patients. Physiotherapy can consult with senior medical personnel daily to assess if physiotherapy is indicated. Respiratory physiotherapy procedures in hospitals or ICUs can be recommended for individuals with mucous hypersecretion and difficulties in clearing secretions. Physiotherapists may have an ongoing role to play in providing mobilization, fitness, and recovery strategies.

B. Comprehensive Physiotherapy Assessment

A thorough assessment of patients, particularly the state of consciousness, respiratory system, cardiovascular system, and musculoskeletal system, should be performed before beginning physiotherapy in seriously and critically affected patients. Depending on the category of severity, the need and patient goals may differ. Table 1 categorizes the patients into mild, moderate, and severe pulmonary impairments.

TABLE 1: Recommendation for Post COVID-19 categories

Patient categories		Categories of pulmonary impairment	
Patient characteristics	Mild	Moderate	Severe
	Asymptomatic Does not need oxygen support on exercise or activity MRC dyspnea grade < 2	Requires oxygen support on mild physical activities MRC dyspnea grade 3	Requires oxygen support at rest and/or ADL MRC dyspnea grade 4

The main goals of rehabilitation are to improve lung function, oxygenation, decrease the patient's dependency and improve residual function, limit patient morbidity and mortality, reduce the number of hospitalization days of the patient, reduce complications, and improve quality of life.

Based on the published literature on recommended cardiorespiratory rehabilitation and physiotherapy methods, one can generate comprehensive procedures for treating post-COVID-19 patients. These are based on individual patient's state and need to be tailored to suit their needs.¹

1. Physiotherapy for COVID-19 Patients in Acute Stage

Such patients who have been admitted to the ICU had 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). These impairments include diminished lung function, shortened walking distance in the 6-minute walk test, reduced muscle control of the respiratory and limb muscles, and reduced capacity to perform everyday life tasks.¹⁶ COVID-19 primarily damages the respiratory tract, which is of great importance for respiratory recovery and physiotherapy. The main goal of respiratory physiotherapy is to reduce dyspnea symptoms, improve lung capacity, counteract the complications resulting from respiratory failure and immobilization, decrease the level of anxiety, and counteract depression.¹⁵

a. Assessment

Before starting physiotherapy in severely and critically ill patients, a comprehensive valuation of the patients should be carried out, particularly his/her 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. The primary evaluation included (1) basic vital signs (respiratory rate, heart rate, blood pressure, temperature, blood oxygen saturation); (2) joint range of motion (passive and active); (3) degree of dyspnea (Table 2).

TABLE 2: Physiotherapy for COVID-19 patients in acute stage¹⁷

Treatment	Initiation criteria	Contraindications	Termination indicators
<ul style="list-style-type: none"> Position change: Half-seated (45 to 60 degrees) or seated postures are encouraged whenever possible. If unable to sit, the bed angle is raised between 30 and 45 degrees. Postural intervention should be performed three times/day for at least 20 min/time. Prone position ventilation. Respiratory control: A shallow, quiet, calm breathing pattern is established. Expiration could be pursed-lip breathing. Passive joint motion. Muscle stretching. Neuromuscular electrical stimulation. Beside standing training (in patients with lower limb muscle strength greater than grade. Walking exercises. Maintaining physical strength and exercise endurance. 	<ul style="list-style-type: none"> $\text{FiO}_2 \leq 60\%$ $\text{SpO}_2 \geq 93\%$ Respiratory rate of ≤ 30 breaths/min PEEP ≤ 10 cm of H_2O Systolic pressure ≥ 90 mmHg and ≤ 180 mmHg MAP ≥ 65 mmHg and ≤ 110 mmHg Heart rate ≥ 40 beats per minute (BPM) and ≤ 120 BPM Temperature $< 38.5^\circ\text{C}$ No new arrhythmias or myocardial ischemia No new unstable deep vein thrombosis and pulmonary embolism No aortic stenosis No severe hepatorenal disease or further, progressive impairment of liver and kidney function 	<ul style="list-style-type: none"> Temperature $> 38^\circ\text{C}$; severe dyspnea Resting heart rate > 120 BPM X-ray manifestations: progression of thoracic infiltration $> 50\%$ within 24–48 hours $\text{SpO}_2 < 95\%$ Blood pressure $< 90/60$ mmHg or $> 140/90$ mmHg 	<ul style="list-style-type: none"> $\text{SpO}_2 : < 93\%$ or $> 4\%$ decrease from baseline Respiratory rate > 30 breaths/min Systolic blood pressure < 90 mmHg or > 180 mmHg MAP < 65 mmHg or > 110 mmHg, or more than 20% change from baseline Arrhythmia or myocardial ischemia Anxiety Fatigue Physical activity intolerance

b. Precautions

Before beginning treatment, it is essential to assess the electrocardiogram (ECG), oxygen saturation (SaO_2), mean arterial pressure (MAP), and other vital signs that must be monitored throughout physiotherapy. SpO_2 is maintained at 95–100% level of oxygen, but in patients at risk of hypercapnia (i.e., in patients with coexisting chronic obstructive pulmonary disease [COPD]), oxygen saturation is kept at 88–89%. It is essential to be careful not to disconnect the patient's lines, including catheters with urine collection bags, cardiac monitoring devices, central catheters, gastric tubes or gastrostomy (percutaneous, endoscopic gastrostomy [PEG]) tubes, etc. To avoid the exacerbation of respiratory load caused by some PT treatments, it is recommended not to carry out excessive intensive respiratory training (such as respiratory endurance training, thoracic traction, tracheobronchial clearance, extreme intensive training of respiratory muscle strength, and resistance muscle strength training) as the patients' respiratory function is unstable during the period.

2. Physiotherapy for COVID-19 Patients in the Recovering Phase

In the face of the COVID-19 pandemic, physiotherapy plays a frontline role in the acute and recovering rehabilitation phases of COVID-19 patients and the continuation of rehabilitation for people with disabilities and the elderly with appropriate modifications to the delivery of services to ensure safety as the pandemic demands. During the pandemic, physiotherapists have explored a viable service delivery option of remote consultations (also known as telehealth or telerehabilitation) to ensure a continuation of rehabilitation services. Isolation is an effective way to prevent the virus's spread, limiting the patient's living space and reducing their natural activity. This may also decrease muscle strength, reduce expectoration efficiency, and cause intolerance to physical activity and mental problems.¹⁷

a. Assessment

The following evaluations are recommended before therapy in the current phase: (1) essential vital signs (respiratory rate, heart rate, blood pressure, body temperature, oxygen saturation); (2) muscle strength (grip strength, isosmotic muscle strength test); (3) joint range of motion (passive and active); (4) ability to balance (especially in patients who have been in bed for a long time); (5) physical strength and exercise endurance (6-minute walking test); (6) presence of anxiety or depression (Table 3).

3. Physiotherapy for COVID-19 Patients in Rehabilitation Phase

Prolonged hospital admission or isolation significantly reduced the amount of exercise in the present stage, resulting in muscle weakness, low exercise endurance, weakness, or fatigue. Long periods of absence from social and family activities can also make

TABLE 3: Physiotherapy for COVID-19 patients in the recovering phase¹⁸

Treatment	Initiation criteria	Contra-indications	Termination indicators
<ul style="list-style-type: none"> Respiratory muscle training: Based on the treatment results of respiratory control in the acute stage, moderate respiratory muscle strength training should be carried out according to the respiratory function of patients Airway secretion clearance: sputum can be expelled by hand; postural drainage (to avoid head drop); an active cycle of breathing techniques (ACBT); induced or assisted cough and other methods Abdominal breathing and diaphragm training Exercise therapy: mild exercise training (maintaining a Borg score of 3–4 or visual analog scale (VAS) score 5–6), 1–2 times a day, 30 minutes each time is carried out; Trying to walk, bedside bicycling, and other exercises with intensity less than 3 Mets Resistance training: Using progressive resistance training, three groups per day, ten times per group, with a one-repetition maximum of 50–70% Sitting and standing balance training Psychological support 	<ul style="list-style-type: none"> $\text{FiO}_2 \leq 60\%$ $\text{SpO}_2 \geq 93\%$ Respiratory rate of ≤ 30 breaths/min PEEP ≤ 10 cm of H_2O Systolic pressure ≥ 90 mmHg and ≤ 180 mmHg MAP ≥ 65 mmHg and ≤ 110 mmHg Heart rate ≥ 40 beats per minute (BPM) and ≤ 120 BPM Temperature $< 38.5^\circ\text{C}$ No new arrhythmias or myocardial ischemia No new unstable deep vein thrombosis and pulmonary embolism No aortic stenosis No severe hepatorenal disease or further, progressive impairment of liver and kidney function 	<ul style="list-style-type: none"> Temperature $> 38^\circ\text{C}$; severe dyspnea Resting heart rate > 120 BPM X-ray manifestations: progression of thoracic infiltration $> 50\%$ within 24–48 hours $\text{SpO}_2 < 95\%$ Blood pressure $< 90/60$ mmHg or $> 140/90$ mmHg 	<ul style="list-style-type: none"> SpO_2 decreased by four percentage points The patient had sweat, nausea, and vomiting, dizziness, blurred vision, etc. Severe sudden dyspnea Chest compression or pain Rapid heart rate or arrhythmia Unable to maintain balance

patients feel isolated. Prolonged isolation may also lead to adverse psychological effects (depression, anxiety) and including PTSD.¹⁹ The purpose of PT of discharged patients was to enable patients to return to society, restore their organic functions, and prevent psychological disorders. PT at home mainly uses remote guidance, psychological support, social education, and other means to let patients understand the importance of PT, through brochures or videos to make patients understand respiratory rehabilitation, adopt a healthy lifestyle, and promote their return to the family and society.

a. Assessment

The appraisal of the patient's condition including the following: (1) general clinical evaluation (physical examination, laboratory microbiological examination, pulmonary function test, nutritional evaluation); (2) symptomatic examination (dyspnea, fatigue test, anxiety and depression scale); (3) muscle strength (general muscle and respiratory muscle strength examination); (4) active and passive joint range of motion examination; (5) functional examination (timed up and test [TUG], 6-minute walking test); (6) balance function evaluation; (7) endurance and physical strength evaluation; (8) activity of daily living evaluation (Table 4).

TABLE 4: Physiotherapy for COVID-19 patients in rehabilitation phase²⁰

Treatment	Contraindications	Termination Indicators
<ul style="list-style-type: none"> • Aerobic exercise: walking up and downstairs, walking at home, dancing. A limit of 70% of the maximum heart rate is set. • Resistance training: Squatting is permitted, or medium weight items can be carried. The 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 six weeks, 2–3 times/week. • Balance training: cross obstacles. • Breathing training: abdominal breathing; pursed-lip breathing; thoracic expansion exercise are other exercises suggested. • Keeping airway clear. • ADL training: guide transfer, bathing, toilet, daily hygiene maintenance. 	<ul style="list-style-type: none"> • Resting heart rate > 120 BPM • Blood pressure \geq 140/90 mm/Hg or \leq 90/60 mm/Hg • SpO₂ \leq 95% • Other coexisting diseases that are not suitable for exercise 	<ul style="list-style-type: none"> • Temperature > 38.2°C • Difficulty or shortness of breath with no relief after resting • Chest pain, chest tightness, dyspnea, aggravated cough, dizziness, headache, blurred vision, palpitation, night sweat, unable to maintain balance, etc.

IV. EXERCISE PRESCRIPTION IN PATIENTS WITH COVID-19

A. General Considerations and Recommendations for Exercise Prescription for Specific Patient Categories

Current literature²⁰ suggests that the frequency, intensity, type, and time (FITT) of exercises would vary depending on the patient category.

B. Exercise Program

To achieve maximum benefit, the exercise program should be for at least 6–12 weeks with 2–3 supervised sessions per week of at least 30 minutes duration. Oxygen support and monitoring should be observed during exercise.²⁰ Continuous monitoring of oxygen saturation is recommended for patients who require oxygen support or at risk of desaturation. Exercise-induced desaturation needs to be evaluated before exercise prescription. The oxygen requirement should be re-evaluated during the follow-up visit. The patient should be advised to maintain SpO₂ above 88% at rest and during activity. Resting blood pressure should be checked along with saturation, if possible for normally acceptable ranges, and resting heart rate should be < 100 beats per minute.

C. Exercise Prescription

Aerobic and resistance training exercises should be applied per the FITT principle. The recommendations based on the category of patients for exercise are listed in Table 5.²⁰

D. Special Considerations [Level 3A]

Exercises should be titrated to tolerance level without desaturation below 88% for patients in severe and moderate categories. A combination of face-to-face and telerehab sessions can be considered for patients with mild impairment.

E. Recommendation for Termination of Exercises [Level 2A]

It is recommended to terminate the exercise session immediately if patients show the following: American College of Sports Medicine (ACSM) oxygen saturation (SpO₂) drops < 88%; develops symptoms such as palpitations, sweating, chest tightness, and shortness of breath, leg cramps, physical or verbal manifestation of severe fatigue, exercise-induced hypotension; uncontrolled hypertensive response to exercises (SBP > 260 mmHg; DBP > 115 mmHg) especially for known hypertensive patients; temperature fluctuation (> 37.2°C); and exacerbation of respiratory symptoms and fatigue that are not alleviated after rest.

TABLE 5: Recommendations for exercise prescription for specific patient categories (Level 3A)²⁰

Components of exercises		Patient categories		
Patient characteristics		Mild	Moderate	Severe
Frequency		Minimum 3 to 5 sessions per week	Minimum 3 to 5 sessions per week	2 to 3 times/day and all days of the week
Intensity		Low to moderate intensity exercises RPE of 11–13 (20 point scale) or RPE 3–4 (10 point scale)	Low-intensity exercises RPE of 10–13 (20 point scale) or RPE 2–4 (10 point scale)	Very low-intensity exercises RPE of 9–12 (20 point scale) or RPE 1–3 (10 point scale)
Type	Aerobic exercise	<ul style="list-style-type: none"> • Incorporate group exercises and interval training • Brisk walking, jogging, cycling, stepper • Upper and lower extremity free exercises, treadmill, and cycle ergometer • Balance exercises in sitting and standing should be given 	<ul style="list-style-type: none"> • Walking, cycling, upper and lower extremity free exercises • Treadmill and cycle ergometer if available • Balance exercises in sitting and standing Unilateral lower limb exercises can be added as per tolerance • Interval training can be incorporated 	<ul style="list-style-type: none"> • Sit to stand activity • Walking • Bed-cycling • Upper and lower extremity free exercises
	Resistance exercise	<ul style="list-style-type: none"> • Upper and lower extremity low weight exercises • Bodyweight exercises can be added • Exercises can be grouped in 1–3 sets/time with 8–12 reps with a 1-minute rest interval between a set • 5% to 10% increase per week • Progressive resistance exercises of minimum 2–3 sessions per week for upper and lower extremities as per patient tolerance (RPE) 	<ul style="list-style-type: none"> • Upper and lower extremity low weight exercises as per patient's tolerance (RPE) • Exercise with 1–3 sets/time with 8–12 reps with 2 minutes rest interval • Progress according to the patient's tolerance 	<ul style="list-style-type: none"> • Upper and lower extremity low weight exercises as per patient's tolerance (RPE) • Begin with 2–3 sets with 5–10 repetitions as per tolerance

TABLE 5: (continued)

Components of exercises		Patient categories		
Patient characteristics		Mild	Moderate	Severe
Type	Respiratory muscle training	<ul style="list-style-type: none"> • The threshold training minimum of 2 sessions per week along with upper and lower limbs • Strength training as per patient's tolerance (RPE) 	<ul style="list-style-type: none"> • The threshold training minimum of 2 sessions per week training as per patient's tolerance (RPE) 	
	Time/duration	<ul style="list-style-type: none"> • Minimum of 30 minutes of continuous activities and progress up to 60 minutes of continuous activities according to patient's tolerance 	<ul style="list-style-type: none"> • Minimum of 15 minutes and progress up to 45 minutes according to the patient's tolerance 	<ul style="list-style-type: none"> • Multiple short sessions with adequate rest periods to accumulate 10–15 minutes

V. THE CURRENT STATE OF TREATMENT OF COVID-19

Scientists around the world are developing many potential vaccines for COVID-19. These vaccines are all designed to teach the body's immune system to recognize and block the virus that causes COVID-19 safely. Several different types of potential vaccines for COVID-19 are in development:

1. Inactivated or weakened virus vaccines use a form of the virus that has been inactivated or weakened, so it does not cause disease but still generates an immune response.
2. Protein-based vaccines use harmless fragments of proteins or protein shells that mimic the COVID-19 virus to generate an immune response safely.
3. Viral vector vaccines, which use a virus that has been genetically engineered so that it cannot cause disease but produces coronavirus proteins to generate an immune response safely.
4. RNA and DNA vaccines, a cutting-edge approach that uses genetically engineered RNA or DNA to generate a protein that safely prompts an immune response.

Clinical trials are being carried out. Potential antiviral therapy targets are tested, such as inhibiting viral enzymes responsible for genome replication or blocking viral entry into the human cell.²¹ Many vaccines have appeared at the forefront, including Pfizer-BioNTech, Moderna, Oxford-AstraZeneca, Gamaleya, CanSino, Johnson & Johnson Novavax, Sinopharm, Sinovac, Bharat Biotech & Sinopharm-Wuhan, that are currently being administered globally.^{22,23}

VI. SUMMARY

While treatments for COVID-19 are advancing rapidly, there is only limited evidence of the impact of rehabilitation after COVID-19 patients are discharged or free from symptoms. It can be expected that physiotherapists will be increasingly involved in the care of these patients to improve pulmonary function, physical and psychological efficiency, and restore good quality of life. Therefore, physiotherapy should be introduced into the mainstream treatment of COVID-19 patients as early as possible.

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