



REVIEW ARTICLE

Comprehensive physiotherapy management in covid-19 – a narrative review

Tratamento fisioterápico na covid-19 - uma revisão narrativa

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Recebido em: 13 mar.2020.

Aprovado em: 21 mai. 2020.

Publicado em: xx xxx. 2020.

ABSTRACT: The 2019 novel coronavirus officially named as coronavirus disease 2019 (COVID-19) pandemic by the World Health Organization, has spread to more than 180 countries. The ongoing global pandemic of severe acute respiratory syndrome coronavirus, which causes COVID-19, spread to the United Kingdom (UK) in January 2020. Transmission within the UK was confirmed in February, leading to an epidemic with a rapid increase in cases in March. As on April 25- 2020, there have been 148,377 confirmed cases of COVID-19 in the UK and 20,319 people with confirmed infection have died. Survival of critically ill patients is frequently associated with significant functional impairment and reduced health-related quality of life. Early physiotherapy and community rehabilitation of COVID-19 patients has recently been identified as an essential therapeutic tool and has become a crucial evidence-based component in the management of these patients. This comprehensive narrative review aims to describe recent progress in the application of physiotherapy management in COVID 19 patients. Assessment and evidence-based treatment of these patients should include prevention, reduction of adverse consequences in immobilization, and long-term impairment sequelae. A variety of techniques and modalities of early physiotherapy in intensive care unit are suggested by clinical research. They should be applied according to the stage of the disease, comorbidities, and patient's level of cooperation.

Keywords: COVID-19; physical therapy; hospital and community rehabilitation

RESUMO: O novo coronavírus de 2019 oficialmente nomeado como pandemia da doença por coronavírus 2019 (COVID-19) pela Organização Mundial de Saúde, se espalhou para mais de 180 países. A pandemia global em curso da síndrome respiratória aguda grave causada pela COVID-19, se espalhou para o Reino Unido em janeiro de 2020. A transmissão no Reino Unido foi confirmada em fevereiro, levando a um rápido aumento de casos em março. Em 25 de abril de 2020, houve 148.377 casos confirmados de COVID-19 no Reino Unido e 20.319 pessoas, com infecção confirmada, morreram. A sobrevivência de pacientes críticos está frequentemente associada ao comprometimento funcional significativo e redução da qualidade de vida relacionada à saúde. A fisioterapia precoce e a reabilitação comunitária de pacientes com COVID-19 foram recentemente identificadas como uma ferramenta terapêutica essencial e tornaram-se um componente crucial baseado em evidências no tratamento desses pacientes. Esta revisão abrangente tem como objetivo descrever o progresso recente na aplicação do manejo da fisioterapia em pacientes com COVID-19. A avaliação e o tratamento baseado em evidências desses pacientes devem incluir a prevenção, a redução de consequências adversas da imobilização e as sequelas de comprometimento a longo prazo. Uma variedade de técnicas e modalidades de fisioterapia precoce em unidade de terapia intensiva são sugeridas por pesquisas clínicas. Eles devem ser aplicados de acordo com o estágio da doença, com as comorbidades e com o nível de cooperação do paciente.

Palavras-chave: COVID-19; terapia física; reabilitação hospitalar e comunitária.



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ABBREVIATIONS: COVID-19, coronavirus disease 2019; CPAP, continuous positive airway pressure; ICU: Intensive care unit; MERS, Middle East Respiratory Syndrome; METs, Metabolic Equivalent of Task; SARS, Severe Acute Respiratory Syndrome; UK, United Kingdom.

INTRODUCTION

In late December 2019, a virulent disease of mysterious pneumonia characterized through fever, dry cough, and fatigue, and occasional gastrointestinal signs and symptoms took place in a seafood wholesale wet marketplace, in Wuhan, Hubei, China [1]. The preliminary outbreak was reported in the market in December 2019 and involved approximately 66% of the personnel there. Furthermore, the virus travelled to other international locations, which includes Asia, Asia Pacific countries, Commonwealth nations, European countries, the United States of America, and the United Kingdom (UK) [2]. The ongoing pandemic of coronavirus disease 2019 (COVID-19), spread to the UK in early 2020 [4]. The first few cases were identified in late January [4], and transmission within the UK was confirmed in late February [5], followed by a rapid increase in March [6]. As of April 25, there have been 148,377 confirmed cases of COVID-19 in the UK [3] and 20,319 people with confirmed infection have died [3]. COVID-19 like the previous epidemics of Severe Acute Respiratory Syndrome (SARS), Middle East respiratory syndrome (MERS) and COVID-19 has been related to global travel. The popularity of educational institutions, Multicultural tourism, and increased transportation through the UK has seemed to have led to the quick transmission of COVID-19 into the UK.

The usual clinical manifestation after an incubation period of 4 days includes fever, dry and persistent cough, myalgia, and shortness of breath. Rare but life-threatening cases result in pneumonia and acute respiratory distress syndrome. According to the Center for Disease Control, up to 80% of infected people will experience mild to moderate illness requiring few interventions [7]. However, the remaining will be severely affected and will require intensive medical care. Although difficult to accurately estimate, the World Health Organization reports a case fatality rate of 3.4% [7]. Moreover, in the case of SARS which is another contagion in

the coronavirus family, Lee et al. reported that at one-year post survival, individuals continued to experience elevated levels of stress, depression and anxiety [8]. Therefore, while there is a global focus on 'flattening the curve' by reducing the surge of new COVID-19 cases, we propose a need to expand our collective "peripheral vision" and consider the magnitude and long term impact of physical, mental and emotional decline post survival. To be effective, rehabilitative interventions must be considered during the planning and allocation of resources used to fight a disease outbreak. Otherwise, we will be playing, yet again, a deadly game of 'catch-up' in reducing disability-related outcomes of COVID19 [9]. At present, there is little information about the health, rehabilitation and social needs of those who survive COVID-19. Data is limited regarding the proportion of patients with COVID-19 in other countries who have needed post-acute care, and the longer-term outcomes of these patients [10]. After long periods in intensive care, patients experience physical, psychological and cognitive dysfunction. Those with Acute Respiratory Distress Syndrome can develop sleep deprivation, bone disease, thirst, delirium and pain. Patients who stay longer are more likely to develop muscle wasting, neuropathies, loss of mobility, loss of function and weakness. The under-recognized post intensive care syndrome is associated with poor long-term outcomes, especially for patients who have had acute respiratory distress syndrome, prolonged ventilation and sepsis. [10, 11]

Currently, we do not know the longer-term physical, physiological and psychological outcomes for this novel corona virus. However, there is some evidence from the SARS, Middle East respiratory syndrome, influenza A (H7N9) and H1N1 epidemics describing longer-term ongoing reduction in pulmonary function, reduced quality of life as well as physical function [12, 13]

This article has been prepared to provide information to physiotherapists in the management of hospital admitted patients with confirmed or suspected COVID-19. Physiotherapists who work in primary healthcare facilities are likely to have a role in supporting these patients who would benefit from the respiratory physiotherapy assessment

and management of productive cough which is a less but not unusual symptom (34%) [14]. However, physiotherapists who work in the intensive care unit (ICU) provide airway clearance techniques for ventilated patients who show signs and symptoms of inadequate airway clearance. They can also help in positioning patients with severe respiratory failure associated with COVID-19, inclusive of using susceptible position to optimize oxygenation [15]. Given the in-depth medical management for some COVID-19 patients including prolonged protective lung ventilation, sedation and use of neuromuscular blockading agents, patients with COVID-19 who are admitted to ICU may be at high risk of developing ICU acquired weakness [16]. This might lead to worsening of their morbidity and mortality [17] and therefore essential to anticipate early rehabilitation after the acute phase of acute respiratory distress syndrome with a purpose to restrict the severity of ICU-acquired weakness and promote rapid functional recovery. Patients who have been infected by a coronavirus and admitted in the hospital need respiratory physiotherapy management as soon as their condition allows. Seriously ill patients who are on ventilators and are confined to a hospital bed for long periods experience problems with breathing and other physical issues, due to their protracted inactivity. Physiotherapists are of great value to patients and their care in this regard.

The objective of the comprehensive narrative review study focuses on the rehabilitation overview for patients admitted with COVID -19 during and after hospital treatment. The purpose of respiratory rehabilitation within the hospital is to enhance the signs and symptoms of dyspnea, relieve anxiety, and maximize function. However, the rehabilitation should be carried beyond the hospital stay within the community to ensure there is retention and improvement in the high-quality of life.

RESPIRATORY REHABILITATION (Table 1)

Acute phase (very severe respiratory condition)

The rehabilitative intervention in this phase had to be started when the patient has reached

minimum clinical stability. Treatments should be withdrawn in case of: high fever; worsening dyspnea; respiratory rate > 30 breaths/min; pulse oximetry < 93% on oxygen therapy or requiring the fraction of inspired oxygen > 50% during noninvasive ventilation; positive end-expiratory pressure or continuous positive airway pressure (CPAP) >10cmH₂O; respiratory distress; arterial hypertension; bradycardia or tachycardia; intercurrent arrhythmias; shock; profound sedation; evidence of radiological lesions' progression (> 50%) within 24-48 hours. [18].

The usual respiratory physiotherapy procedures aimed at promoting the reduction of dyspnea, tracheobronchial clearance, training of the skeletal muscle and the maintenance/recovery of the activities of daily living are contraindicated. Furthermore, they can determine a further loading of the respiratory system exposing the patient to an increased risk of distress when treating by noninvasive ventilation or weaning from mechanical ventilation, it is recommended to use similar protocols to those indicated for acute respiratory failure (e.g. fraction of inspired oxygen reduction, positive end-expiratory pressure reduction) [19-22].

Airways clearance techniques are not recommended during the acute phase in patients without significant problems of bronchial obstruction. The risk, benefit ratio should be evaluated on a single case basis in patients with bronchiectasis or with the evident bronchial encumbrance, using tools that guarantee a safe distance from the patient [18]. Twice per day evaluation of respiratory clinical parameters (temperature, oxygen saturation, oxygen saturation to fraction of inspired oxygen ratio, cough, dyspnea, respiratory rate, and thoracoabdominal dynamics) is indicated. Evaluation of the peripheral muscle strength trend (by the Medical Research Council scale and dynamometers) should be made as soon as practicable. Frequent changes of posture, passive mobilization and neuromuscular electrical stimulation should be planned in the unconscious patient. Positional therapy (seated, semi-orthopneic, prone) with close monitoring is indicated to improve the ventilation/perfusion ratio and to prevent damage from immobilization [18,23-32].

Acute phase (severe condition)

In hospitalized patients with mild/moderate disease, respiratory rate can improve symptoms (dyspnea, anxiety and depression), physical capacity and quality of life, at least potentially [20, 23-36]. Physiotherapy should be withdrawn in case of high fever, worsening dyspnea, pulse oximetry <93% or at least 4-point drop during exercise (desaturation), chest tightness, belching, dizziness, headache, unclear vision, palpitations, sweating, inability to keep balance, increased need for oxygen or noninvasive ventilation support, evidence of radiological lesions' progression (>50%) within 24-48 hours [18].

Post-acute phase (post-discharge from acute care to an intermediate setting)

Similar to patients recovering from acute respiratory distress syndrome due to H1N1 infection [37-40], those with an acute COVID-19 event may present with disability and functional damage (respiratory function, critical illness myopathy and neuropathy), reduced participation and deterioration in the quality of life, both in the short and long term following discharge. Recovery time is variable depending upon the degree of normocapnic respiratory failure, and the associated physical (asthenia, peripheral muscle weakness) and emotional (anxiety, depression, sense of abandonment, post-traumatic stress syndrome) dysfunction [41]. Patients with comorbidities will take a more extended period to return to their earlier condition, protocols for evaluating clinical parameters (temperature, oxygen saturation, oxygen saturation to fraction of inspired oxygen ratio, cough, dyspnea, respiratory rate, thoracoabdominal dynamics) are indicated daily [18].

Repeatable and straightforward treatment protocols to wean oxygen therapy are indicated. It is recommended to evaluate peripheral muscle strength with the Medical Research Council scale, manual muscle test, isokinetic muscle test and measurement of joint range of motion. In weaned patients and those with prolonged weaning from mechanical ventilation and oxygen use, reconditioning interventions are indicated

to improve the physical status and to correct the motor and cognitive effects of prolonged immobilization in the intensive care area [42-50].

As the effect of muscle activity in infections related to viral agents is not known, exercise aiming with gradual load increase based on subjective symptoms are recommended to maintaining a regular function [35]. Low-intensity exercise (<3.0 metabolic equivalent of task - METs), daily patient counselling and education are indicated. For patients in isolation, rehabilitation programs can be eventually conducted remotely by telehealth system (educational videos, teleconsultation, webcams, etc., with disinfectable tools) [18]. Patients discharged home or to other facilities in the community should receive indications on how to cope with physical activity, which need to be closely monitored regarding function, capacity and participation when the patient is cured with no longer risk of contagion.

An assessment of balance function is recommended as soon as possible (especially for patients who were bedridden for long) Assessment of exercise capacity, oxygenation response during effort (by the 6-Minute Walk Test) and nighttime should be planned.

COMMUNITY REHABILITATION

1. A comprehensive assessment to evaluate the effect of long-term immobilizations such as ICU-acquired weakness, deconditioning, ICU polyneuromyopathy, pulmonary dysfunction.
2. Assessment of quality of life using Health-Related Quality of Life Assessment and Interventions [51].
3. Assessment of posture [52] and musculoskeletal assessment using Extra Short Musculoskeletal Function Assessment [53].

Physiotherapy Intervention should include limb exercises and peripheral muscle training through individual and/or group sessions. Interventions can also be provided virtually through telephone-based health coaching, use of apps to structure exercise programs and report on progress [54, 55].

TABLE 1 – Physiotherapy for covid-19 patients.

CRITICAL PHASE	ACUTE PHASE	POST-ACUTE PHASE
<p>Ventilation support / weaning</p> <ol style="list-style-type: none"> 1. Monitoring of clinical conditions (parameters and signs) 2. Adjustment of the mechanical support and oxygen therapy 3. Extubation protocols with or without noninvasive ventilation / CPAP 	<p>Ventilation support / weaning</p> <ol style="list-style-type: none"> 4. Monitoring of clinical conditions (parameters and signs) 5. Adjustment of oxygen therapy 	<p>Weaning</p> <ol style="list-style-type: none"> 1. Monitoring of parameters 2. Mechanical ventilation weaning in tracheostomized patients 3. Management of problems related to tracheostomy (phonation, secretions encumbrance) 4. Adjustment of oxygen therapy
<p>Disability Prevention</p> <ol style="list-style-type: none"> 1. Passive/active mobilization 2. Frequent posture changes Therapeutic postures (early sitting/pronation) 3. Neuromuscular electrical stimulation 	<p>Disability prevention</p> <ol style="list-style-type: none"> 1. Mobilization (getting patient out of bed) 2. Frequent posture changes/continuous rotational therapy 3. Therapeutic postures (early sitting/pronation) 4. Active limb exercises (also with dedicated devices) and muscle reconditioning 5. Strengthening the peripheral muscles 6. Neuromuscular electrical stimulation 7. Respiratory muscle training in case of inspiratory muscle weakness 	<p>Recovery from disability</p> <ol style="list-style-type: none"> 1. Mobilization (getting patient out of bed) 2. Frequent posture changes (sitting posture, prone positioning) 3. Strengthening of peripheral muscles 4. Reconditioning with specific aids (upper/lower limb devices/cycle-ergometer) 5. Neuromuscular electrical stimulation 6. Respiratory muscle training in case of inspiratory muscle weakness <p>Chest physiotherapy</p> <ol style="list-style-type: none"> 7. The non-productive dry cough should be sedated to avoid fatigue and dyspnea 8. Bronchial clearance techniques are indicated in hyper secretive patients with chronic respiratory diseases, by preferably using disposable devices with self-management (closed plastic bags for sputum collection help to prevent any spread of the virus). 9. Pre-discharge counselling concerning physical activity. 10. Support for the care team.

CPAP, continuous positive airway pressure

Conclusion:

During the current crisis, it is easy to assign a low priority to the long-term effects of hospital admission on patients with the coronavirus. However, from the SARS outbreak, we understand the lack of long term Rehabilitation has had significant consequences in the health and quality

of life outcomes. Given the large numbers of patients with the coronavirus needing intensive care in the UK, we can expect an increase in the number of patients requiring rehabilitation following discharge. It is, therefore, essential to address this issue promptly. As the understanding of COVID-19 continues to increase and a large

number of patients are cured and discharged, the experience acquired in the management of chronic and acute respiratory failure is proving to be an essential asset for the management of patients throughout COVID-19 epidemic. Though the main focus of this article is on the Rehabilitation of Patients with COVID-19 admitted to hospitals, we strongly advocate the need for ongoing respiratory rehabilitation in the community. There is also an audit and research opportunity for physiotherapists to investigate and provide vital data on the trajectory of recovery post-discharge and return to their usual quality of life. Finally, we would like to pay the highest tribute to all medical staff who are fighting in the front line of the epidemic.

Notes

Funding

This study did not receive financial support from external sources

Conflicts of interest disclosure

The authors declare no competing interests relevant to the content of this study.

Authors' contributions.

All the authors declare to have made substantial contributions to the conception, or design, or acquisition, or analysis, or interpretation of data; and drafting the work or revising it critically for important intellectual content; and to approve the version to be published.

Availability of data and responsibility for the results

All the authors declare to have had full access to the available data and they assume full responsibility for the integrity of these results.

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